Reviving the Cultural Arts of the Islamic Geometries into Contemporary Interior Design

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Abstract

This research is an attempt to find a synthesis of cultural identity within contemporary design. The proposed framework explores key features of a cultural and a contemporary style design language, as well as their modifications, to where both styles can be integrated. The drive behind this study is the need to revive cultural identity within the fabric of the Middle Eastern society as contemporary style has influenced and taken over the region, particularly Kuwait. Since the discovery of oil, Kuwait has dramatically changed due to its economic development as the rush towards modernization caused a loss in cultural identity within the arts.

In the Middle East, the art of the Islamic geometries (IG) is a footprint to its cultural identity as well as a landmark. The loss of an art culture is the loss of a rich artistic heritage and design language. Therefore, enabling contemporary design to embrace the art of the IG is an attempt to revive and maintain cultural identity. The focus of this research encompasses a semiotic design methodology of both contemporary interior design (IKEA as a focus study) and the cultural arts of the IG; as they are explored, investigated and analysed. IKEA is targeted for this study as the contemporary commercial design style for its international success in the design field worldwide, particularly within Kuwait's home interiors.

The aim of this research is to create a link between the two styles by investigating their design language and finding commonalities identifiable to both, then merging them as one contemporary yet cultural design language, hence style. By adapting a semiotic design research methodology, this study explores ways of allowing cultural art to synthesize with, and integrate within, contemporary design. The balance between maintaining the artistic soul of the IG, and IKEA's style and vision, is key. For an art of a different time and place to be part of today, a semiotic design style analysis was conducted in order to identify commonalities for defining a single style DNA that encompasses both styles; in order to formulate an integrated contemporary-cultural design language.

Having a semiotic thread through-out the study entails qualitative properties, yet the data collection and analysis of the qualitative subject matter involved quantitative investigations; therefore, a mixed research methodology was carried out in order to investigate the developed outcome of the two styles synthesis. A main study survey questionnaire was conducted in Kuwait to test for style

identity of the cultural art of IG and for the contemporary style of IKEA, in addition to measuring the likability to the integrated IKEA-IG design style. The study results identified the top IKEA-IG pattern designs (PD) that were of both the IG style, the IKEA style, as well as the most liked PDs. To further affirm the test results and findings, an evaluative study was then conducted, also in Kuwait, to compare the outcomes of both questionnaires to which turned out to have similar resulting top PDs. The evaluative study questionnaire was then also conducted for a second time, in the UK, in order to compare results of a different cultural background to that of the first.

In all three studies, the demographic data was also analysed, using stratified sampling method in relation to the top PDs. Further analysis of the PDs was also investigated to present the method in which the found design language of the IKEA-IG style is demonstrated. The key to reviving cultural art within contemporary style was to initially measure each of the IG and the IKEA design languages, and then identify common style features composed of geometry and symmetry. Specific geometric shapes and symmetry rules of both styles are identified using shape grammars to refine and finalize the design language of the IKEA-IG style.

This research provides the established framework of the PDs and shape grammars for the IKEA-IG style design language. This study concludes that it is possible to integrate and revive cultural arts within contemporary design and proved to be successful; both the IG and IKEA style were recognizable and likable by tested participants. Results and conclusions of this research contribute to knowledge by providing the design language of the IKEA-IG style; to the practice of interior design by leading to the possibility of exploring other cultural art preservations using shape grammars; and, to society by ultimately being able to revive and maintain cultural identity within present day design market and practice.

Glossary of Terms

Composite PDs, also referred to as 'multiple construct composite PDs' are the study's top pattern design outcomes that lie within more than one construct. Moreover, composite PDs resulting in all three of the survey questionnaires of this research study are called 'Top Composite PDs'; the *ideal* cultural-contemporary style outcome of this design study.

Design Language, the vocabulary of shapes within a style that forms its communication basis on principle of symbolic relativity and creativity. The language of symbols and symbolic reference; the structuring of the style DNA coding. To identify a design language of a style is to identify its elements (DNA coding), and the unique formations that hold its identity. It is created with variables (shapes) that follow a specific set of rules of composition, repetition, and creative processes.

Shape Grammar, a tool to extract design elements, and create new concepts, of a style. It unfolds the design language of a style DNA by decoding its language into shapes, their associations (shape-rules) and applications (shape-rule applications). It enables the analysis and synthesis of design language by deconstruction and reconstruction of style (Eves, B. and Hewitt, J. 2009).

Semiotics, the "implication or connotation of signs and symbols" (Eves, W. R., 1997, p. ix). Semiotics analyses style and investigates style DNA bringing awareness to the construction of style identity (Eves, B. and Hewitt, J. 2009).

Semiotic Deconstruction, it can extract a design language. Semiotic deconstruction identifies the elements of style using shape grammar as a tool; one that captures a styles essence and encode it into a language of shapes and shape-rules.

Semiotic Reconstruction, it regenerates the style into a new design concept. Semiotic reconstruction is therefore an extension of the style, carrying the same DNA coding; therefore, maintaining its style identity.

Style DNA, the distinctive components and coding of style providing its unique identity. The intensity of DNA components and their application generates a design language variety within a style identity (Hewitt, J. 2009).

Style Identity, the core set of elements and values of aesthetic style, or visual communication, maintained through a linked DNA thread.

List of Abbreviations

ESQ	Evaluative Study Questionnaire.
ESQ-1	Evaluative Study Questionnaire – Kuwait.
ESQ-2	Evaluative Study Questionnaire – UK.
IG	Islamic Geometry.
IKEA-IG	Style outcome of the IKEA and the IG design language synthesis and integration.
IS	Initial Shape.
MSQ	Main Study Questionnaire.
PD	Pattern Design.
PSQ	Pilot Study Questionnaire.
SPSS	Statistical Package for the Social Sciences.
SG	Shape Grammar.
SGA	Shape Grammar Applications.
SR	Shape-Rule.
SRA	Shape-Rule Application.
TP	Table-Panel.

Table of Content

Appendences

List of Figures

List of Tables

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Chapter 1: Introduction

1.1 Study Background

The idea from which this research project developed started during an MFA degree in interior design entitled 'Exploring Islamic Geometries', acquired from Georgia State University. The aim of the research was to expand the realm of the art of the Islamic Geometries by fusing its cultural art design fundamentals with contemporary design concepts for interiors.

The study focused on developing a geometric grid, from which the Islamic Geometric patterns form and multiply, in order to provide structural grounds for design expansion and exploration. In an intricate geometric path, the development of pattern formations conveyed conceptual explorations of the Islamic Geometries. Based on mathematical principles, the geometries of the Islamic art led to rhythmic and infinite shapes and patterns. The iterative process reveals explicit relations between unity and multiplicity defining geometric pattern developments and creations.

The design study investigation led to introducing new concepts of pattern formations of the cultural art, enabling its artform to develop from a two-dimensional platform into a three-dimensional structure. The intended study outcome of expanding the Islamic Geometries within contemporary design concepts was achieved as the development of form explorations exhibited an expression of cultural and contemporary art engagement.

Since the shift towards contemporary arts has taken place in the Middle East, the loss of its cultural art persisted causing a loss in cultural identity. Therefore, exploring the Islamic geometric artform under a contemporary scope to create a design language that encompasses both design styles was the drive behind the MFA project. It is from these explorations of the Islamic Geometries that led to the idea for this PhD research study to develop.

This research proposes innovative design and research methods of integrating the cultural art form into a contemporary interior design setting in effort to revive cultural art identity. From the cultural arts of the Middle Eastern region, this study focuses on the art of the Islamic Geometries (IG); and, from the contemporary design world, on IKEA for its international success in today's home design industry. The design language of each of the IG and IKEA styles is semiotically investigated to further understand and encapsulate their core identities; then evolving the cultural art within the contemporary where both styles can coexist. For an integrated IKEA-IG style identity and design language, the semiotic investigation requires the use of shape grammar procedures for their synthesis to develop. Evolving the cultural art by synthesizing with, and integrating within, contemporary design (Figure 1.1) enables its revival and preservation, hence a culture's identity.

Figure 1.1 Evolving the Cultural Arts into Contemporary Design.

1.1.1 Research Problem

In a culture where art is guided and inspired by the mathematical phenomenon in creation and the universe, Kuwait is one of the many Middle Eastern countries that experienced loss of its cultural art identity. In its early beginnings, Kuwait's local artists created design artefacts for centuries providing its inhabitants with cultural artistic prints of heritage and style identity (Slot, B. 1991). With the discovery of oil in 1938, modern developments and technological advancements led to a shift of the region's design style, increasingly diminishing its cultural identity (Al Najdi, K. & McCrea, R. 2012). Over time, society evolved into a global multicultural era as loss of cultural arts and art identity became a growing concern (Mahgoub Y., 2004; Cullingford, C., Gunn, S., 2005). As cultural arts are essential in defining cultural identity, the fast-paced shift towards modernization without comprehending its effects on the arts almost led to Kuwait's cultural identity to be abolished.

Although its presence still is evident in the architecture of mosques and in a few public interiors, the Kuwait 'home' has evolved far from its artistic print. This study aims to revive cultural arts within contemporary interior design; design interiors give a sense of ethnicity, belonging, and cultural identity to our home living environments. Growing up in Kuwait offers familiarity to its cultural art identity, the growing design developments and concerns in the area, as well as direct insight of the market effect on society's fabric. Tensions between globalization and localization are evident in Kuwait's built environment and interior design; as discussed in Habitat International by Yasser Mahgoub (2004):

> "There is a need for an alternative understanding of what global architecture can be; one that understands the essential need to preserve and respect diversity as well as house seemingly disparate philosophies of space, people, and their interactions with and within the built form." (p.505).

In the Middle East, cultural identity is diminishing in today's evolving society of multi-cultural backgrounds. As current design is predominantly imported (Al Najdi, K, & McCrea, R 2012), the shift from arts being created locally to non-local arts being mainstream in the design market, ultimately caused the cultural arts to fade from the fabric of society (Shiber, 1964). This evolutionary shift led to a 'westernized' landscape of home interiors in-line with todays' contemporary style and market (Mahgoub Y., 2004). This does not imply that the market imposes the style of our living environment, but that successful design is one that provides for society preferences, needs and wants of the living environment; one that is sensitive to cultural diversity within the built environment. Although Kuwait's cultural identity has shifted away from its artistic roots, yet this does not mean that its form cannot be conveyed across time for it to be revived within contemporary society.

1.1.2 Identifying the Style

Identifying the style of a cultural art is undoubtedly significant in the revival of its cultural identity. For its design language to exist within current design, identifying the style of the contemporary component is also equally significant. Thus, for an integrated design language to develop, both styles must be identified. This can be achieved by applying a semiotic design methodology in order to capture and analyse style. Applying semiotics to design provides a set of invaluable tools for analysing issues like identity, metaphors and visibility in artefacts (Emiroğlu, M.K., 2017).

Semiotics can derive, transform and generate a model of language (Van Holk, A.G.F., 1975). The key in reviving the IG into IKEA's style is to identify and capture the core identity of both design languages (IG and IKEA) and find a balance in which both can synchronize. This entails identifying each of the IG and IKEA style DNA (deconstruction), identifying differences and similarities in design language; and then developing a new concept by synthesizing the identified design language of the styles (reconstruction). Derived and analysed, the integrated style DNA can then be used in generating contemporary-cultural designs that embrace both style identities.

1.1.3 Shape Grammar of Design Language

Structured in stages of analysis; synthesis; and, execution of design, the semiotic investigation process requires the use of shape grammar procedures as a design tool. While semiotics investigates style through connotated meaning, shape grammars unfold the design language of the style DNA by decoding its composition into shapes and their associated set of rules. The indicative creation process is detailed in the design chapter (Ch 3) of this thesis.

The design outcome of this investigation, outlined by the semiotic approach, departs from shape grammars analysing and synthesizing both design languages. Both parallels that define the IG and IKEA styles are unified into an integrated language through the merging of their coded grammars composed of shapes, shape-rules, and shape-rule applications.

While IG is the cultural art to be revived, IKEA provides the commercial credibility; meanwhile, semiotics gives design credibility using shape grammar as the tool. As the integrated identity of the IKEA-IG style is developed, the revival of the cultural art of IG within the contemporary style of IKEA is enabled.

1.1.4 Summary of Work Divided

The main purpose of this study is the revival of the cultural arts of the Middle Eastern identity back into its evolving fabric of society.

The work is divided into three sections (see figure 1.2):

1. Investigating the Style –
   - Identifying and reading IKEA and IG style elements (semiotic investigation):
     - Extracting and identifying design language geometries (style DNA);
     - Analysing operative measures of design language.
   - Comparing and Synthesizing IKEA and IG style (shape grammar):
     - Investigating similarities and differences in style (shapes and shape-rules);
     - Modifying and generating an integrated style grammar;
     - Establishing the new concept.
2. Measuring the Style –
   - Testing and Evaluating the IKEA-IG style:
     - Stage One. Main Study Questionnaire (design illustrations)
       - MSQ (Kuwait)
     - Stage Two. Evaluative Study Questionnaires (artifact prototype)
       - ESQ-1 (Kuwait)
       - ESQ-2 (UK)
3. Finalizing the Style –
   - Analysing and Refining the style:
     - Comparing MSQ outcome to ESQ-1
     - Comparing ESQ-1 outcome to ESQ-2
   - Defining the IKEA-IG style:
     - Presenting the top IKEA-IG pattern designs
     - Presenting IKEA-IG shape grammar

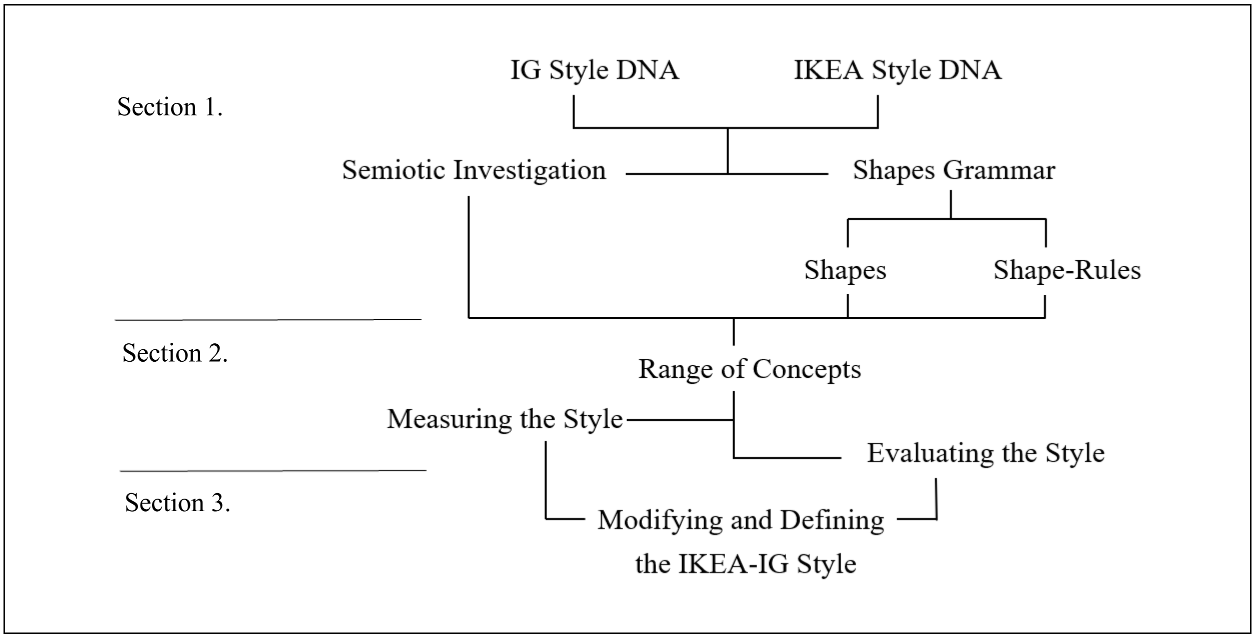


Figure 1.2 Research Methodology Process.

1.2 Research Question

The main research question is: How can the cultural arts of IG be revived through translation and embodiment into the contemporary design style of IKEA? In order to achieve this, the following research sub-questions were challenged:

- What is the design language of both the IG and IKEA styles?
- Are there common features or parameters between the two styles?
- Can a shape grammar synthesis of the IG and IKEA design language be developed?
- How can the integrated shape grammar language be embodied into an IKEA furniture product?

1.3 Aims and Objectives

The research aim is to revive the cultural art of IG and re-introduce it into contemporary interior design, with IKEA as the adaptive vessel for its transformation and revival. For a contemporary-cultural style of the Middle Eastern region to collaborate, the following research objectives are addressed:

- Identify initial shapes of both the IG and IKEA style DNA (Semiotic Deconstruction);
- Analyse shape and shape-rules of the IG and IKEA design styles (Shape Grammar Analysis);

- Establish, correlate, and combine the prevalent elements and aesthetic features of the IG and IKEA design styles to create a new language of design (Semiotic Reconstruction);
- Generate illustrations and physical artifact prototypes of the developed integrated concept of the IKEA-IG design style (Shape Grammar Synthesis);
- Evaluation and validation of the cultural-contemporary style.

1.4 Research Methodology

The study takes on a rigorous mixed methods approach. Following an initial pilot study, this investigation was covered in two stages: a main study in stage one, and two evaluative studies in stage two of the research methodology. A total of three study questionnaires were conducted in order to gather data, analyse, and compare results to examine and identify the contemporary-cultural design style of IKEA-IG. Stratified sampling method was also used in order to analyse the demographic data in relation to the top IKEA-IG pattern design (PD) outcomes. The results and findings of both stages of the research methodology questionnaires were also essential to refining and finalizing the contemporary-cultural design language of the IKEA-IG style.

1.4.1 Stage One

A main study questionnaire (MSQ) was set in order to evaluate and identify each of the IKEA and IG styles, and measure likability of the integrated IKEA-IG style. The questionnaire was conducted in Kuwait among 379 participants to test 26 compiled line-drawings of the integrated style and derive top IKEA-IG PDs. Demographic data to the resulting top PDs was also investigated and analysed.

1.4.2 Stage Two

Of the 26 IKEA-IG PDs, 12 top PDs resulted from the MSQ and are put into physical production for further testing in two evaluative study questionnaires (ESQ-1 and ESQ-2). This is to further investigate the outcome of the two styles' synthesis for conclusive analysis and validation of the IKEA-IG style. The first questionnaire (ESQ-1) was conducted in Kuwait holding 33 participants, and the second (ESQ-2) in the UK holding 30 participants. The test results and analysis are compared to that of each other, as well as to the MSQ results and findings.

1.5 Research Structure

In brief, the report will be structured as follows:

Chapter one: introduces background to the study as well as presenting the research problem, question, aims and objectives, methodology, and research structure.

Chapter two: presents the main literature review; it includes sections on cultural and contemporary design style origins, cultural identity, style, semiotics in design, design language and shape grammars.

Chapter three: deals with semiotic design investigations of the IG and IKEA styles, identifying and comparing the styles, shape grammar analysis and synthesis, and the integrated cultural-contemporary style (geometric pattern formation, structured formula, illustrations, and prototype).

Chapter four: discusses the research philosophy, methodology, and hypothesis. Research methods include study questionnaires, data collection and analysis. An initial pilot study to check the validity and reliability of the measuring instrument, followed by a main study questionnaire (Stage one), and two evaluative study questionnaires (Stage two).

Chapter five: explores the research study data analysis and discussion. Data analysis methods included descriptive statistics, correlation, linear regression, factor analysis, and stratified sampling. Top resulting IKEA-IG pattern designs were also investigated and compared towards demographic data. All study questionnaire results (main study and two evaluative studies) were presented, analysed, and compared.

Chapter six: unfolds the research conclusions and recommendations; summary of study findings and conclusions, highlights philosophies and methodologies of design and research, and contributions to knowledge. Further research recommendations are also addressed towards this research, or the revival of other cultural art context, to bridge within contemporary interior design.

Chapter 2: Literature Review

2.1 Introduction

This chapter covers the breadth of literature considered in the research and includes: cultural identity, contemporary design, and style. These were considered in order to define the elements of each of the cultural and contemporary design styles, in addition to methods for finding unifying grounds for both art styles to integrate. This is in efforts to revive the cultural art of the IG within the contemporary design style of IKEA.

Starting with cultural identity, cultural background to the art of the IG is presented in addition to its regional origins of the Middle East. IKEA's background, style, evolution and expansion were also presented, as well as its need for cultural diversity inclusion within its contemporary interior design industry. The bridging of these two design identities (IG and IKEA) were also discussed in this chapter for methods of reviving cultural arts within contemporary style.

Style was discussed to clarify and define methods and concepts of design such as style DNA, design language and semiotics. This allows for a deeper understanding of style to help unfold the steps taken to identifying the IG and IKEA styles. Delving further into reviewing style also covers the shape grammar method of analysing design elements in terms of shapes, shape-rules, and its application, for the purpose of this study.

2.2 Cultural Identity (IG)

Art is the fabric of society giving it a sense of place and time through aesthetics. The arts are a major part of a cultures identity as it shapes the fabric of society creating its unique language of design. In the Middle East, art is deep rooted within the Islamic culture and beliefs taking its role as a footprint and landmark to its cultural identity. Because of the non-figurative nature of the Islamic art, for centuries the Arab region flourished in three art forms in particular: Calligraphy – the art of writing, Arabesque – the art of organic or biomorphic form reminiscent of nature, and Islamic Geometries – the art of maths; which became an essential part of the Arabian cultural identity within the arts. Illustrating the three Islamic artforms, Figure 2.1 presents an artistic form of writing in the Arabic language for 'Calligraphy', an artistic design computation based on geometric principles for 'Geometry', and an artistic intertwined floral pattern for 'Arabesque'.

Calligraphy Geometry Arabesque

Figure 2.1 The Islamic Decorative Canon (Wade, D., 2006).

The three cultural arts of the region have developed to be used purely as the art itself, interchangeably, or in combination. In fact, out of the three arts in the Islamic realm, the Islamic geometry (IG) is the connecting factor for the interplay within the Islamic arts. From this perspective, since the study follows parametric equations based within the IGs, the geometric pattern of this design study could also be applied to all three of the Islamic arts: Islamic geometry, calligraphy, and arabesque.

Islamic design is a rich art form with spiritual and meditative meaning expressed through its infinite pattern. The IGs have a direct relation to and from nature, relating to stars for path finding and guidance, to the unity and infinity of time and space within the geometries, meditative reflections of creation (Embi, 2012). The IG presents a pattern infused design language; a language possessing meditative qualities that explore unity, multiplicity, and the infinite. Within the realm of interior design, the art of the IG is expressed through shapes, pattern, symmetry and an interplay of intricate artistic and mathematical proportions.

There is a very strong link between art and mathematics in symbolism as well, particularly numbers. Much of the intellectual interplay of mathematics and design are based on Pythagorean mathematics. Put simply, Pythagoras believed that the intrinsic character of numbers reflected Nature. It followed that, if the character of Nature can be known, then the nature of numbers can be determined. Abstract concepts were held to be expressions of numbers; Justice, for instance, was thought to be four, and the Universe, ten (Dabbour, 2012).

With its roots in meditative and creative entities, the IG style is a reflection of perfection in nature, simple yet complex. These geometries create infinite patterns that follow a precise geometric path of symmetry, unity, balance and harmony. This interplay between maths and art creates visual impressions characterized by geometric pattern and pattern compositions. These compositions are what made the IG framework stand as an iconic design style of the region.

As Seyyid Hossein Nasr (1987) argued, a doctrine of unity is central to Islam and that it manifests itself not in iconography but in geometry and rhythm, arabesques and calligraphy. To be more precise, he argues that this sacred (not just abstract) art development, based on mathematics, goes to the very heart of Islam (Nasr, 1987). The IGs set a contemplative state of mind, which conceives "unity in multiplicity and multiplicity in unity" (Burckhardt, 1967, p.6).

2.2.1 Sacred Geometries

The art of IG is unique in style for its use of geometries to create patterns – an interplay of maths and art with a natural structural quality. Geometry can be seen in the Islamic arts as a design generator; using symmetry, multiplicity, and proportion to produce its intricate pattern designs. The mathematical tessellations of the art of Islam inherently reveal practical and philosophical basis of the sequential patterns. Inseparable from the science of mathematics, this work of art is of organized geometrical creations; a reflection of the Divine Truth, affirming the underlaying elemental unity of all things (Critchlow, 1983). It is a visual representation of mathematical patterns found in nature carrying both aesthetic and philosophical values (Dabbour, 2012).

This intrinsic relationship between mathematical and geometrical proportions of universal truth has been a deep interest since ancient times. Critchlow (1983) explains that "the study of sensible geometry leads to skill in all the practical arts, while the study of intelligible geometry leads to skill in the intellectual arts" (p.7). In the geometrical arts of the Islamic world, the geometric compositions were prevalent within Arabia as they were present in several design fields including local artifacts, furniture and interiors, architectural elements and architecture.

Motivated by and versed in spiritual disciplines, the masters of this art gave both content and meaning to their design creations, aiding in spiritual contemplation through the traditional art of the IG (Critchlow, 1976). The Islamic arts are not merely aesthetic ornamentations, they are gates through which cognitive and spiritual realms can be accessed, carrying truths of the cosmos, revelation, and oneself (Ogunnaike, 2017).

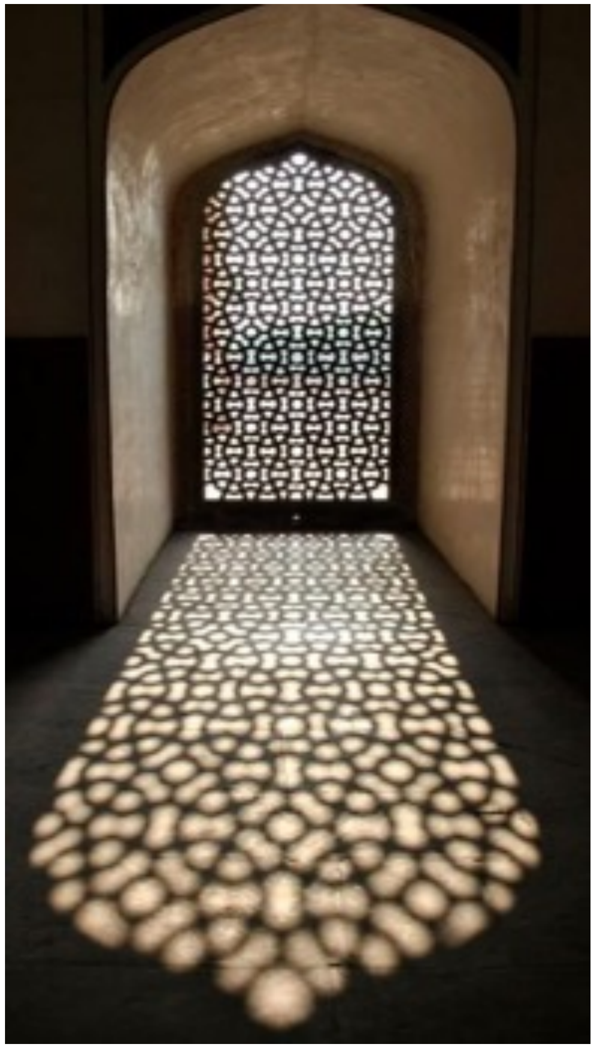


Figure 2.2 Sacred Architecture (Nikitichna, n.d.).

Sacred geometries, often called sacred architecture (Figure 2.2), possess meditative and contemplative qualities expressed through calculated precisions in an amalgamation of math and art from which beauty, intellect and spirituality are accessed. This holistic display of geometries is considered an ancient science of patterns that creates and unifies all things under a universal geometric coding – 'the architecture of the universe'. These patterns and codes, significant to awareness of self, the universe and higher consciousness, are present in all nature uniting all creation. Sacred geometries underlie everything, woven into the fabric of all creation, projecting harmony within ourselves, and our connection with the universe (Morgan, 2019).

These geometric arrangements of aesthetical and philosophical connotations convey reflections in nature of the origin of all forms. They embody unity as the omnipresent arrangements of pattern unravell the structures of creation and the universe (Kalpana, 2022), informing of its connections and all its components. Its physical manifestation, of intricate and dynamic pattern amalgamations that form its kaleidoscopic entity, is a result of scientific formula.

> “Sacred Geometry is the medium through which significance and characteristics are attached to different patterns and designs. It signifies the culmination of the spiritual, soul and mind with the physical, substance and structure.” ("The Omnipresence of Sacred Geometry", 2018, p.1).

Sacred Geometry brings awareness of deep-rooted connections to nature, our surroundings, and shared ideals and consciousness, delivering a sense of unity and oneness while exuding divinity, elegance and implicit wholeness. Sacred geometry reveals the all-encompassing structure that unifies all existence as part of the one whole. The more aware of its intricacy, the more engaged with the totality of existence as a connected whole, spirituality, and its inner sanctum ("The Omnipresence of Sacred Geometry", 2018).

2.2.2 Structural Formation

Traditionally, the art of IG was displayed as carvings on wood; surface engravements or carved cut-outs, such as on window-screens, room partitions, and most commonly on wooden interior furniture such as tables and Quranic book-chairs (see Appendix A, p.265). The IG patterns also took form on different materials and surface adornments, some of which were stone, stucco and tiles; creating an experience transformed between material, form and meaning simultaneously. Through structural formations, this art addresses and reflects the harmonies in nature – a manifestation of the geometry of creation. The mathematical progression of these IGs unfolds an endless variety of ever-expanding pattern of infinite structural formations (Dabbour, 2012).

Embellishing surfaces they adorn, the IGs take form on a ‘canvas’ providing ethnicity and cultural identity to its unique structural forms. Canvas surfaces were of walls, ceilings, domes and doors amongst other architectural and interior elements. The carvings not only serve as an aesthetic embellishment that convey contemplative design, but some serve a cultural and climatical purpose. For instance, other than providing cultural identity, the IG window-screens (such as in Figure 2.2) also provide privacy as well as create an ornament shading mechanism to manage the harsh climate of the region’s geographical location.

Wood material is not naturally available in the Middle Eastern region, so before the discovery of oil, boats would sail from the Arabian Gulf Peninsula to neighbouring countries, such as India, to supply its homeland. Richer quality of wood was more valuable; and, richness and intensity of IG pattern was considered, by artists and locals alike, more unique. All artifacts are one of a kind, hand-made by local craftsmen (Figure 2.3); some may look similar but no two are identical. These patterns drape over surfaces and structural elements with order and balance guided by rules of symmetry. The development of these geometries carried out precisions depending on specific task construction factors, such as: pattern style and detail, symmetry and proportion, material type, and implementation method.

Figure 2.3 Traditional Craftsmanship (Emad & Kamal, 2015).

The powerful visual compositions of the Islamic geometric patterns explore hidden structures that lead to infinite grounds of pattern finding. As explained by Critchlow, K. (1976), the exploration and understanding of these geometric grounds can lead to finding the key aspects within the geometric patterns that fit within a contemporary composition; an encompassing cultural-contemporary composition of meditative reflections of a nexus universal language. Realized, geometric design can be applied for the creation of innovative design concepts structured through mathematical interventions. These mathematical patterns, with the esoteric philosophical values, are “the invisible foundation upon which the ‘art’ was built” (Critchlow, K. 1976, p.8). Therefore, the great masters of this art were versed in mathematics, both in the geometric sense and as a ‘universal’ structure that characterize all true art (Critchlow, 1976).

2.2.3 Pattern and Symmetry

Geometry and architecture existed long before the birth of Islam. In ancient Rome (80 bc to 15 bc) architect Marcus Vitruvius Pollio stated, “For without symmetry and proportion, no temple can have a regular plan” (Embi, 2012, p. 28). In the natural world, argued Marcus du Sautoy, there is a tendency towards the achieving of symmetry in all its aspects; addeding that “Symmetry is thought to be beautiful with a character illustrative of completion, an end to be sought” (TED Talks, 2009). Geometry offers the mind visual comprehensions to the order and harmony (found in symmetry) inherent in creation.

Both quantitative and qualitative in nature as described by Dabbour (2012), “Geometry explores and explains the patterns that unify and reveal the structure of the Creation” (p.381). Its quantitative dimension sets the pattern’s structural form, while its qualitative dimension sets the visual representation expressing the order of the universe (Dabbour, 2012). Geometry in design is built on symmetry and symmetrical proportions. In the cultural arts of the IG, pattern formations reveal a play of mathematical coding and symmetrical measures. The patterns illustrate mathematical rhythms of infinite variety of contemplative reflections. These complex and intricate compositions unfold as the geometries form and re-form. Yet, the method in which the patterns were developed relies on basic geometric principles of symmetry, originating from an initial shape ‘circle’. The following, Figure 2.4, is an example of an IG pattern extraction derived from a circle.

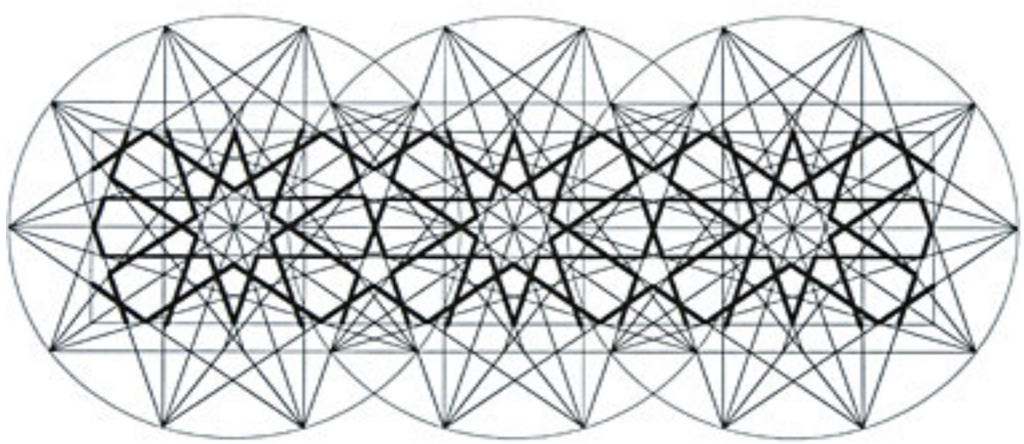


Figure 2.4 Islamic Geometries: The Art of Math (Lockerbie, J., 2016).

The point at which all IG patterns begin is from the circle and its center. Of a religion that emphasizes One God, the circle and its center symbolize the role of Mecca towards which all

Muslims pray (Embi, 2012) and the universal unity in His creation (Burckhardt, 1967). All IG patterns are within the divisibility of a circle, grounded in symmetry and maths. The circle is significant as it is the only shape that can constitute all other geometric shapes and proportions (Dabbour, 2012), and encompasses symmetry at every point and angle. There are many ways of understanding symmetry. At its basics, symmetry refers to a geometric quality where there is a precise balance that can be described mathematically; often taken upon relations of a shapes axis or midpoint. The following diagram illustrates the basic methods by which symmetry is witnessed.

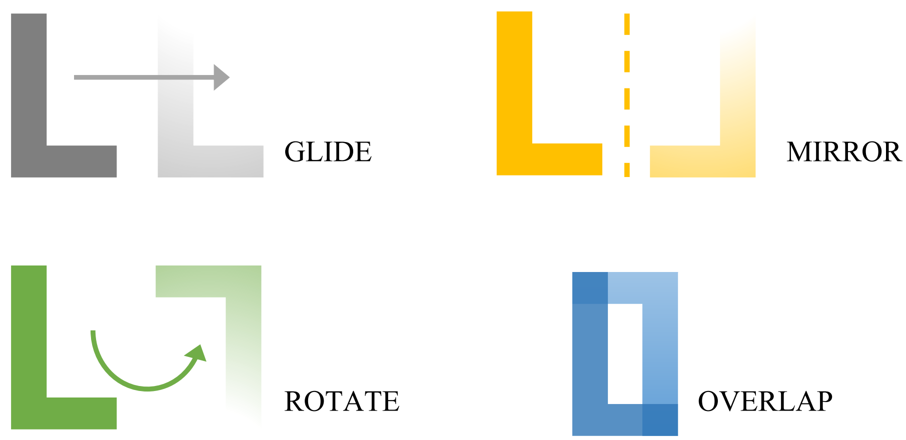


Figure 2.5 Measures of Symmetry.

These basic symmetry measures (Figure 2.5) can be used simultaneously and interchangeably within the creating and formation of pattern. It is in asymmetry that we often notice the beauty of symmetrical designs, for while the eye is drawn to eccentricities, it tends to prefer perfection to imperfection. The issues here also relate to a state of mind. Symmetry and perfection lead to a relaxed, peaceful and contemplative state of mind. Whereas, asymmetry heightens observation, leading to a more interested state of awareness, one is more focused on what one is looking at and, by definition, less relaxed.

Symmetry can be defined in terms of grid and detailed design; and although only four basic symmetry measures are presented, there are an infinite number of pattern formations that can be developed from them. It should be understood that a pattern is symmetrical if there is at-least one symmetry rule (Glide, Mirror, Rotate or Overlap) that leaves the pattern unchanged (Catnaps: Islamic Geometry 2012).

Symmetry applies to both the cultural and contemporary design styles of this study. The symmetrical proportions of IG are a direct reflection of symmetric measures in all its density as it multiplies and evolves (Figure 2.6). This is also the power of shape grammars: design complexity from simple shapes and rules (Ch. 2.6). In addition, the design style of IKEA carries basic geometric forms within its language (Ch. 2.3). The design chapter of this thesis covers more in-depth detail of geometric forms – as shapes – derived from both design cultures as part of initial investigations of the style deconstruction.

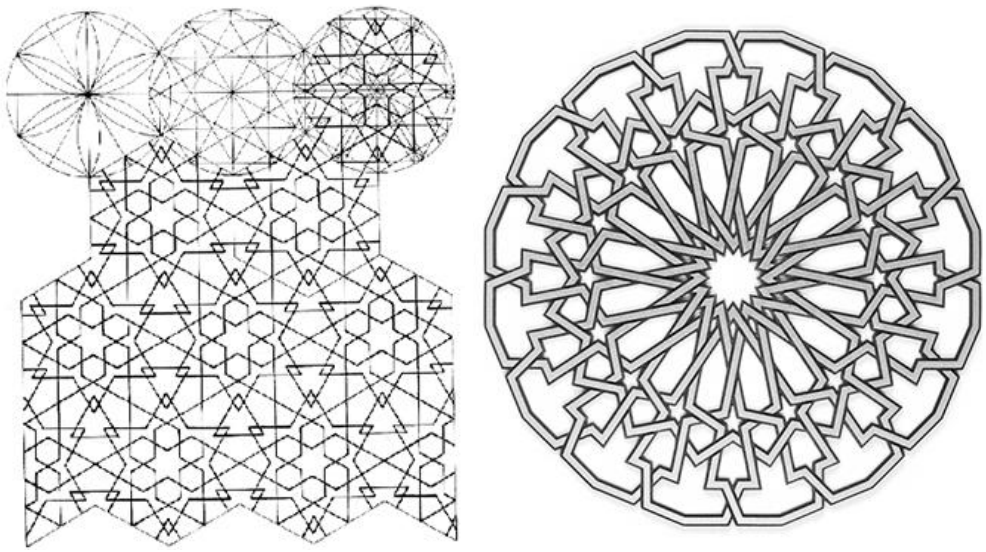


Figure 2.6 Multiplying Geometries (Toetenel, R., 2014).

2.2.4 Pattern Reading and Framing

IG patterns, by their very nature, do not have an implied direction in reading their geometry as does the written words. Yet, they are formed on grounds of infinite fields, reflecting perfection in nature, with no apparent ending (El-Said, I. and Parman, A., 1976). The IG structural foundation reveals implications for broader application, resolving themselves around the issues of symmetry. Understanding the basic geometry enables the viewer to read the overall patterns more readily and, in so doing, identify with their complexity.

These simple yet complex geometries carry powerful shape grammar of specific IG aesthetic DNA, towards this semiotic design study (Ch. 3). The IGs are also unique in terms of framing, distinctive to that of Western art. The relationship of artwork to its frame is not similar to that of the west in that it is not contained or bound within the frame; yet centred. It implies continuity of repetitive pattern, resonating a frequency, that the brain sees beyond the frame. This phenomenon lends itself to the contemplative power of the math, art, and rules of symmetry (Figure 2.7). Therefore, divisions of symmetrical proportions determine the framing of the IG pattern.

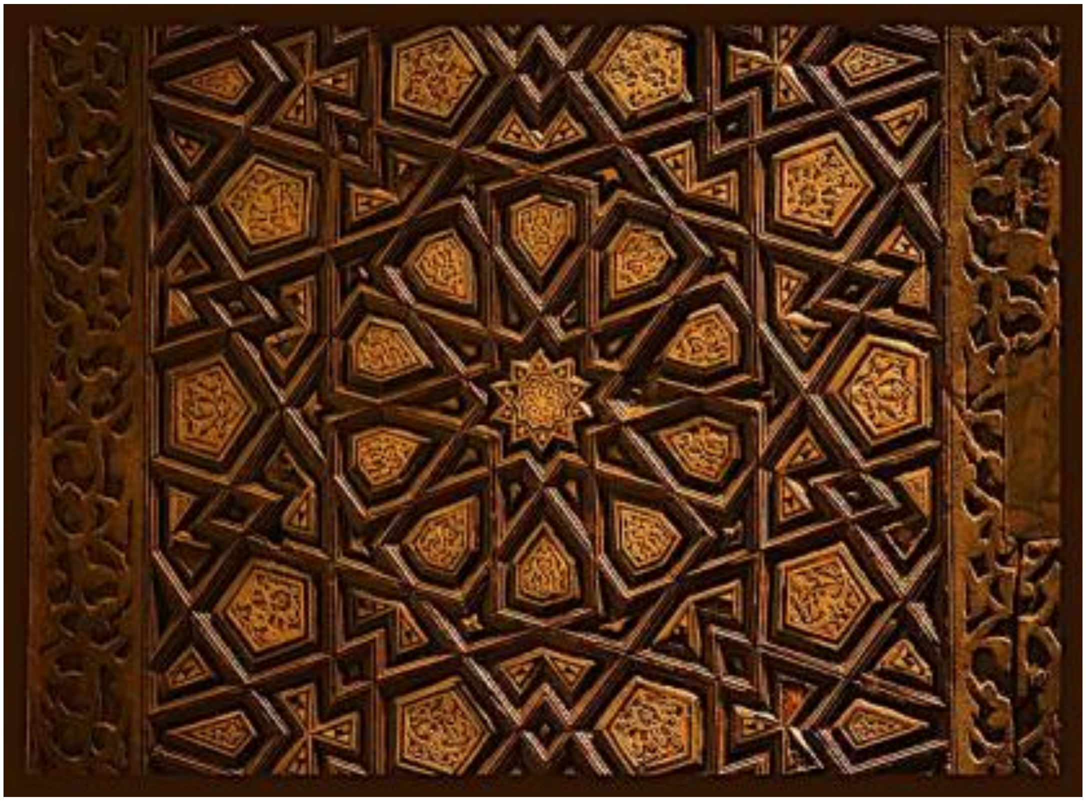


Figure 2.7 Framing Islamic Geometries (Lawrence, O.P., 2008).

Reading the IG patterns illuminates cultural meaning relevant to a particular time and a specific place. The geometric configurations of the IGs are a true example of how style represents cultural identity; it is how a specific culture can be identified through its art. Style can relate to diverse measures of perception in design such as a designated location, era, ethnic origin and background among many others. As social and cultural values and beliefs shape the form and function of society, style recognition can be perceived as an entity that possesses variables with identifiable properties recognized across a geographical location; or a period of time (Chan, 2000).

2.3 Contemporary Identity (IKEA)

Current interior design market is immersed with contemporary style from within leading design companies (Deloitte, T. 2010). Founded in 1943 by Ingvar Kamprad, IKEA is one of the world's largest furniture retailers today. Recognized for its Scandinavian style, IKEA is founded upon Scandinavian design philosophy and principles; in formation and distinction; and with respect to the connection between designing and production (Smith Brothers Construction: Scandinavian Design 2016). IKEA embodies and epitomizes the Scandinavian design movement that is of modernism and minimalism.

Modernism is the design period of the mid 20th century which generally refers to design derived from the innovations of mid-century modern designers. Core influencers such as Le Corbusier, Frank Lloyd Wright, Walter Gropuis, and Ludwig Mies van der Rohe shaped what modern design is today. Put simply, the aphorism 'Less is More', as stated by Mies van der Rohe, succinctly defined the modernist ethic (ICON, 2020). Modernism celebrates the emerging technologies that developed post WWII, along with new materials, such as plywood, fiberglass and metal tubing as part of the design construction. A new era of design that brought upon a shift in design from traditional forms and construction techniques. Modernism movement style traits lean towards clean lines and simple design rejecting elaborate decorative design and ornamentation (Mulvey, 2018). The emphasis on the natural expression through use of raw materials, such as exposed concrete, steel columns and raw timber, was of the modernism language of design. Ultimately, the modernist design movement was guided with two main principles: 'form-follows-function', and truth to materials (ICON, 2020). Scandinavian design embraced modernism aesthetic using clean lines, natural wood, as well as modern material and construction methods.

Often described as International Style, the movement did not separate form from social function. Arising during the Machine Age, Modernism was more than mere style, a strong relationship came about linking design with new inventions and progress with emphasis on mass-production for all; this in effect, connects the modern movement with social values (McDermott, C. 1994).

Minimalism, having its roots in the Modernism movement, is a term describing the art and design of the 1960's that referred to reduced 'artwork', use of materials, and forms of expression involved in an object. Developed in the USA, the Minimalism movement emphasis was on the 'object quality' of art, stripping away reference to meaning, forms of expression, or ornamentation. "Perception and experience were to become more important" (McDermott, C. 1994, p.146). Focusing on the relationship between art, society and technological developments, the movement is not only about function, but is also about simplicity - the reduction of design to pure form leaving emphasis on the art object (Henry Tate, 2021).

Characterised by simplicity, geometric shape, order, harmony and repetitive form, minimalist art offers a purified form of beauty. With the absence of artwork such as hand-crafted art object, artists' touch, and expression, emphasis was now on the physical space in which the artwork resides (The Art Story Foundation, 2009); focusing on spatial elements and efficient design.

Artists like Donald Judd sought precision, clarity and simplicity for the composition of constructed object and the space created by it. Often working with mass-produced and accessible material, his work is often arranged in predetermined mathematical series sequenced for placement by the artist (McDermott, C. 1994). Judd's *Untitled* (1969) reductive abstract art (Figure 2.8) exemplifies minimalist design in a display of repetitive basic geometric forms of industrial material creating a unified whole, bringing awareness to the object and spectator relationship within the space (Khan Academy, 2007).

Figure 2.8 Donald Judd, *Untitled*, 1969 (Khan Academy, 2007).

Minimalism is a trend in design wherein the subject is reduced to its necessary elements (MasterClass, 2021) embracing the most of fewer things. More than just a design movement, minimalism is about prioritizing, functionality, practicality and innovation. As many countries faced financial challenges in the post-war era, the development of infrastructure provided accessibility to new materials and technological advancements creating a global influence on the design market. The need to function with the bare minimum was also prominent in Denmark. The movement began to develop in Scandinavia around the 1950s, then in the mid-20th century, Danish design living standards were set with the notion of innovative design leading to a better everyday life (Larsen & Eriksen, 2015).

The minimalist philosophy emphasizing clean lines and simple designs is also if the Nordic simplistic lifestyle. As part of a modern movement in Nordic design, Scandinavian design emerged as a style movement in itself; prioritizing function and affordability over preciousness and luxury (Smith Brothers Construction: Scandinavian Design 2016). Scandinavian design movement exudes simple home environment that enhances an unencumbered, creative and affordable lifestyle; creating objects that last rather than be replaced. It promoted beautiful design, quality, functional and sustainable products, affordable and accessible to the many people, which is where IKEA adopted its vision statement 'to create a better everyday life for the many people' (Smith Brothers Construction: Scandinavian Design 2016).

A pillar of Scandinavian design, IKEA is characterized by both modernism and minimalism. All three of the design movements (Modernism, Minimilism, and Scandinavian Design Movement) are defined by simplicity, geometric forms, clean lines and functional design. With a limited space housing situation, Scandinavian design furniture and interior elements also are designed to be multifunctional; stylish and practical. Items are built to last and be efficient in their simplicity, authentic to the object form, and acknowledge the surrounding. The awareness of space and form gives the style a more contextual presence (Larsen & Eriksen, 2015).

IKEA has always had concern for the people and environment at the heart of the industry business. Ingvar Kamprad's philosophy is the reason behind IKEA's success and what created the company's identity (IKEA: Retail Industry, 2015). Focusing on profit and improving people's quality of life, IKEA has been introducing its goods into more countries over time in order to globalize product distribution; its success in doing so is due to IKEA's contemporary product identity desired by today's consumers (Baxter, M and Landry, A 2017). With its global expansion, IKEA's style and design language, that of Scandinavian, influenced the American furniture market as well and became one of the go-to design styes in the developed world. Internationally known, producing furniture and decorative items, this global retailer defines the identity of contemporary design style (Megan Buerger, 2016).

2.3.1 Origin and Design Style of IKEA.

Scandinavian design principles are an established movement. They are one of the only true philosophical design cultures, at all levels, that are true to design and production in the world. This is embodied in the entire culture, from architecture to artifact, and is why they always led the way in sustainable design. In the same sense, this is also possibly why IKEA is such a successful commercial organization (Smith Brothers Construction: Scandinavian Design 2016).

The minimalist style of Scandinavian design emerged during the 1930s. From the 1930s to the 1970s, Scandinavian design was in its golden age as it promoted simplistic ways of living and showcased various works by Nordic designers. The main purpose of Scandinavian design is improving daily life. To accomplish that, designers focused on interior design (from, furniture, to lighting, textiles, accessories, as well as everyday utilitarian items) of simple elements to sustain basic spaces of living, that are lasting, affordable, and of functional structure, style and context.

The idea that 'beautiful and functional everyday objects should be affordable to all', is a core theme in the development of modernism and functionalism. This notion emerged in the 1950s as part of the Scandinavian design movement when increased supply of new low-cost materials and methods for mass-production was available (Smith Brothers Construction: Scandinavian Design 2016). Marked by soft colours and natural materials, Scandinavian interiors are known for lean, leggy, simple geometry furniture for practical interiors (Smith Brothers Construction: Scandinavian Design 2016).

While there is a considerable overlap between Scandinavian and the mid-century modernism design movement, lighting and colour palette are of the main differences in style. Mid-century modern interiors tend to explore darker hues in colour choice, whereas Scandinavian interiors aim to maximize the sense of light or brightness to a room (Megan Buerger, 2016). Complimenting 'the art of living well' Scandinavian design philosophy, the IKEA style is characterized by functionality, structuralism, simplicity, and clean lines; popular and mainstream in current design (Megan Buerger, 2016).

Scandinavian design inspires to apply simple yet practical ideas; with a 'form-follows-function' strategy (that of the modernism movement), restraint and balance are crucial to its structure (Megan Buerger, 2016). In order to make products in-line with IKEA's identity, the design and product development team focuses on price and quality, design and function, environment and health. "They scrutinize every product idea with regard to the best use of raw materials and manufacturing opportunities" (IKEA: Design Product and Development, 2019).

IKEA's furniture is mass-produced, machine-cut, of smooth finishes and surfaces, with mix and match flexibility allowing the consumer to have individualized selection to create their own interior preference and experience. Products vary from tough and resilient materials to soft but sturdy; individualized yet share a common style; stackable to practical with smart storage solutions. Using sustainable, recyclable, environmentally friendly low-weight construction along with unbeatable low-prices make for a successful combination of the IKEA product design; one that reflects its Scandinavian design style origin (IKEA: Facts and Figures, 2010).

2.3.2 Local and Global Retailer

Originated in Sweden, IKEA started as a small business meeting needs of individual sale calls with products at reduced prices. The growing business first introduced furniture into its product range in 1948. As the IKEA line expanded, the business plan and concept started with the idea of providing a wide range of well-designed, functional home furnishing products, at consistently affordable prices to as many people as possible (IKEA Concept, 2015). In the development of its concept, the first furniture showroom opens in 1953; an important step in its innovation. As IKEA demonstrates the function and quality of its home furnishings, for the first time, customers can experience its products before ordering for the best value at hand. The innovation was a success. From then, IKEA grew to be an industry of world-wide expansion (see Appendix C, p.271).

The global furniture retailer is known for its ‘flat-pack and ready to be assembled by the consumer’ furniture. This allows for a reduction in costs and packaging, as well as ease of distribution. From the early stages of design and production to packaging, handling and distributing, IKEA designs with its customers’ needs in mind. IKEA combines function, quality, design and value in effort to create a better quality of life at home; enabling its products to flourish in local and international retailing (IKEA Concept, 2015).

Similarly, Habitat is also a furniture retailer with an in-house design team that focuses on combining functionality with affordability (Habitat, 2016). It was when designer Terence Conran and friends embarked on bringing ‘contemporary homeware’ to London in 1964, opening Habitat. Initially, Conran was creating flat-pack furniture but quickly realized that retailers didn’t know how to promote the idea properly. Yet, Habitat brought about an innovative ‘contemporary’ style of merging traditional pieces such as the chesterfield sofa with ‘modernist-influence’ design, as well as focusing on affordability and accessibility to the many people. By 1980, with 47 stores globally, Habitat was also one of the world’s largest furniture retailers (Dezeen, 2014).

Habitat's first hurdle was the arrival of IKEA in the UK, 1987. Habitat's success was also affected by the loss of Conran in early 1990's and was eventually bought by IKEA in 1992. Although IKEA was enjoying its massive growth, Habitat created a challenge for it as it only made two annual profits since 2001. Designer Tom Dixon, head of Habitat design from 1998 to 2008 commented that it will struggle especially when it comes to global suppliers like IKEA dominating the increasingly competitive market. In 2011, what remained of Habitat was bought by Home Retail Group (Dezeen, 2014).

One of IKEA's key competitive advantages that led to its expansion and rapid growth spreading in worldwide locations is its extensive knowledge to customer needs and wants. IKEA always tries to do things as efficiently and cost-effective as possible. Low prices are the cornerstone of the company business idea therefore it incorporates new and innovative ways into its business model. The business' innovations include new materials, using the newest ways of packaging, handling and transporting materials that are less costly; contributing to a more sustainable environment (Statista: IKEA 2015). Delivering form, function and quality at low prices, IKEA's quality is not compromised despite the low-price tag (IKEA Concept, 2019). IKEA's contemporary style, wide selection of product range, low-cost, material availability, and online marketing paved way for expansion and success; its mass-production technology led its industry to global scale (Designing Class: Ikea and Democracy as Furniture. 2015).

According to Millward Brown Optimor's "Brandz Top 100 Most Valuable Global Brands 2016", IKEA is the most valuable furniture retailer brand in the world; and is the fifth most valuable retailer world-wide (WWP: Top Brands 2016). IKEA's worldwide rapid growth and expansion timeline (see Appendix C, p.271) reveal store, catalogue and web developments of this privately held international home products company. A few highlights of the IKEA worldwide timeline reveal that, by the year 2004, IKEA opens its 200th store (IKEA: Facts and Figures, 2010); since then, the number of IKEA stores worldwide almost doubles by the year 2016. That year, the IKEA Group worldwide statistics depict the number of stores by region as follows:

Europe (268 stores), North America (54 stores), Asia (44 stores), Middle East and North Africa (13 stores), Australia (9 stores), and the Caribbean (1 stores); totalling 389 stores (Statista: IKEA 2016).

A closer look at store openings within the Middle East region reveals (Statista: IKEA 2016):

1983 – Jeddah, Saudi Arabia.

1984 – Kuwait City, Kuwait; 2007 – store expansion.

1991 – Dubai, UAE.

1993 – Riyadh, Saudia Arabia (SA); 2001 – Abu Dhabi, SA; and 2008 – Dhahran, SA.

2013 – Doha, Qatar.

2014 – Amman, Jordan. (Mike-barker, 2016)

2018 – Bahrain; IKEA's biggest store to open in the Middle East (*Franarabia, 2017*).

By 2019, IKEA had over 430 stores in 53 countries worldwide (IKEA: Company Information, 2019). A genius at selling, flat packing, transporting, and reassembling its style across the globe, IKEA's goal by 2020 was to reach 500 stores world-wide (IKEA: Retail Industry, 2015).

As the focus of this research study is based on Kuwait, IKEA's first store to open in Kuwait was on April 24, 1984. The original IKEA Kuwait had the first navigation tower from all the IKEA stores world-wide; and since its first opening, its iconic catalogue has been distributed in Kuwait. The stores opening revealed to be very successful and IKEA's design style very desirable; so, IKEA decided to refurbish and expand its branch, launching a significantly bigger store 'IKEA Kuwait' in 2007. The new IKEA Kuwait showroom almost doubled the number of room settings; from 22 in the original department store, to 42. The expansion was a response to the increasing number of consumers by providing a larger facility for space, product supply and display, to meet their needs, wants and desires (IKEA: Kuwait, 2014).

An apparent shift in style to the fabric of society has taken effect within Kuwait home interiors as it drifted away from its cultural footprint (Ch. 1.1.1). This as a result to cultural developments, technological advancements, contemporary design style influence, and due to most current furniture in Kuwait being imported and market driven (*The Ministry of Planning in Kuwait*, 2008); making IKEA idyllic for its compilation. Since its arrival in 1984, IKEA had well established its mark in Kuwait as it 'celebrates 30 years of furnishing Kuwait's homes' (IKEA: Kuwait, 2014).

2.3.3 Product Expansion and Evolution

Furniture was introduced into the IKEA range in 1948; since then, the IKEA furniture product timeline (see Appendix D, p.272) is still in continuum. The Swedish company names its products after towns in Northern Europe as a nod to its Nordic heritage; further embedding its cultural identity. IKEA design manager Marcus Engman and team create some 2,000 new product designs every year, including redesigns of existing items (Kowitt, B 2015; p. 174). Today, the company is the world's largest furniture retailer designing and selling ready-to-assemble furniture such as chairs, tables, beds, appliances and home accessories (Statista: IKEA 2016).

The discovery of flat packs and self-assembly become part of the IKEA concept in 1956. Its exploration began when Gillis Lundgren, one of IKEA's earliest co-workers, was unable to fit the 1956 Lövet table (featured in Figure 2.9, bottom right) in his car. By sawing off the table legs, Lundgren inadvertently created flat-pack furniture; after this discovery, flat packs and self-assembly become part of the IKEA concept.

Figure 2.9 IKEA Catalogue, 1956 (Andrews, K., 2013).

With the concepts of form, function and price in mind, designers and product developers of IKEA work hard to ensure that the products meet day-to-day needs and eliminate the unnecessary (IKEA Concept, 2015). IKEA has a wide product range connected through its identity; thus, the products harmonize in style that varies to suit different customer preference in style and function. The following timeline underlines a few of IKEA's furniture, production processes and developments (IKEA: Facts and Figures, 2010); refer to (see Appendix D, p.272) for full IKEA product timeline.

1956 – Lövet table; flat-pack and self-assembly concept sparked a 'flatpack revolution'.

1960's – Developing wooden products to maintain low and affordable prices.

1961 – IKEA began quality testing its products using Swedish standards; ÖGLA chair launched.

1968 – particleboard makes its mark; inexpensive, hard-wearing and easy-to-process material.

1980 – LACK table; LACK range extended in 1982.

1997 – Children's IKEA is launched.

2001 – IKEA becomes one of the first to use a print-on-board technique.

2005 – Complete and coordinated collection of bedroom furnishings is launched.

2010 – IKEA celebrates 30 years in KLIPPAN product range.

In 2013, the Scandinavian furniture giant IKEA re-launched its first piece of flatpack furniture; the 1956 Lövet table. The table was redeveloped and re-issued by IKEA as the Lövbacken side table (see Appendix D, p.272); enabling everyone to own a piece of design history. The three-legged, leaf-shaped side table has returned over 60 years after its original design (IKEA: Facts and Figures, 2010). Starting a 'flatpack revolution' in self-assembly furniture, the concept enabled cutting down the expense of stocking and delivering; hence the consumer. IKEA UK and Ireland country sales manager, Emily Birkin, explains that customers are increasingly interested in buying furniture with a story attached to it; "We decided to bring back a popular piece that not only comes steeped in history but combines retro styling with modern convenience. We wanted to pay tribute to the timeless appeal of the original Lövet whilst retaining its simple and practical assembly", Birkin added (Dezeen, 2013, para. 3).

Birkin highlights a significant point towards the focus of this study; the customers increasing interest in traditional or culturally iconic furniture, or style, as well as the incorporation of current development's needs and wants. Henceforth, at later stages of this research study, the iconic IKEA LACK side table furniture piece (Figure 2.10) is used as a case study in order to incorporate a prototype of cultural style and identity into its existing product range. Successfully, the cultural and contemporary engagement of styles benefits both design backgrounds; the revival and preservation of cultural arts, as well as flexibility of style and cultural inclusivity within global contemporary design.

Figure 2.10 IKEA LACK Side Table and Coffee Table (www.ikea.com., B.V., 2016).

The LACK table arrived in the IKEA furniture line in 1980 when one of the product developers toured a door factory and decided to create a table using a sandwich technique (normally used for interior doors), making the table very strong and light, functional and low-priced. This technique uses board-on-frame construction in which sheets of wood would be laying over a honeycomb core (Figure 2.11) that gives a strong lightweight structure with minimal wood content; a natural fit for IKEA. Efficient, cost-effective and environmentally friendly, this type of construction is used in many IKEA products in years to come.

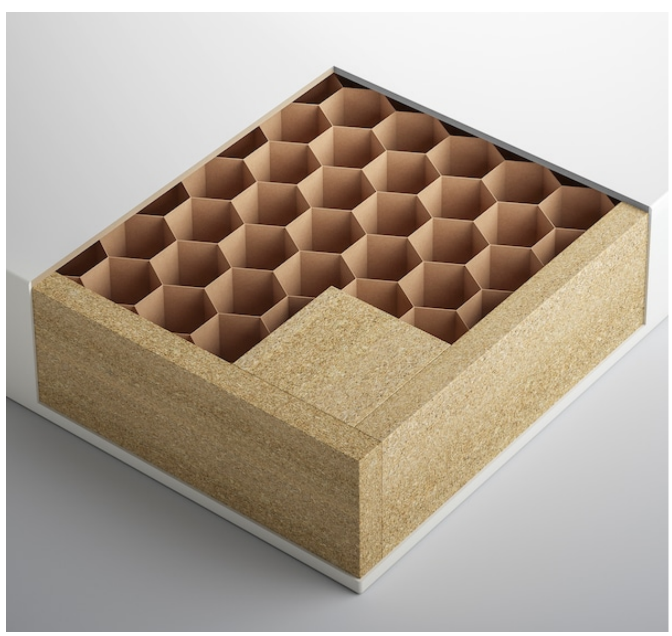


Figure 2.11 IKEA LACK Table Honeycomb Structure (www.ikea.com., B.V., 2016).

In 1982, the IKEA LACK range is extended to complement the LACK table. Figure 2.12 is an example of the range showcasing LACK side-table, TV bench, and different shelving units.

Figure 2.12 Simple and Smart Furniture: LACK Series (www.ikea.com., 2016).

By providing a variety of styles coordinated with other IKEA products with given choices of size, colour and shape, a sense of individuality in self-expression and personal choice or preference is reached. With design values of form and function at an affordable price, the IKEA product range focuses on good design, developing methods that are both cost-efficient and innovative. Designers at IKEA study concepts and experiment with multiple issues of design, function and aesthetic, quality and cost as they are constantly looking for smart solutions to meet customer needs and the environment (IKEA Concept, 2015).

2.3.4 Production Processes and Product Material

Following IKEA's vision 'to create a better everyday life for the many people' (Ch. 2.3), IKEA designers, product developers and technicians must consider safety, quality and environmental impact in the development of product throughout its design stages and life cycle. IKEA uses the 'e-wheel' as a tool to understand and evaluate the environmental impact of its products. The e-Wheel helps IKEA to analyse the four stages within the life of a product: raw material, manufacturing, product use and lifespan. Defined as a 'lifestyle' furniture store, IKEA is known for selling disassembled furniture worldwide (IKEA: Products and Materials, 2017). Affordability is one of the main factors that IKEA considers in producing well designed, sustainable, functional home furnishings available to everyone.

IKEA works to ensure that adapted products and materials minimize any negative impact on the environment and are safe for consumers. As part of the business idea, IKEA insists on keeping costs low and use resources wisely when designing products. IKEA strives to use renewable and recyclable materials in its products. At the design stage, IKEA checks that products meet strict requirements for function, efficient distribution, quality and impact on the environment (IKEA: Products and Materials, 2017).

Moving ideas forward into physical production processing, IKEA's Democratic Design Centre runs full efficiency tests before and after production (IKEA: Democratic Design, 2017). Before products reach the customer, they must move from being raw materials through a variety of stages to become finished products suitable for sale. This is known as the supply chain. The supply chain at IKEA (Radu Acalfoaie, 2016), involves a flow of production and processes through three industrial sectors: Primary, Secondary, and Tertiary Sectors.

Primary Sector: Involves the development of the raw materials such as timber, agriculture, oil or mineral. IKEA creates design solutions to minimize the use of materials, making the best possible products without effecting form, function or appeal. "The main raw materials used in IKEA products are wood, cotton, metal, plastic, glass and rattan and we work towards using as many renewable and recyclable materials as possible." (IKEA: Products and Materials, 2017).

Since IKEA's main product is timber furniture, wood is its most important non-labour input. Behind Home Depot and Lowe's, IKEA is the third-largest purchaser of wood in the world (Deloitte, 2010). The Swedish conglomerate is likely the world's largest single consumer of timber. This material is sustainable, renewable, and a recyclable resource.

Secondary Sector: Make use of extracted materials from Primary Sector to build, manufacture or develop finished goods. The process of value-added takes place as products move through the supply chain (Radu Acalfoaie, 2016). IKEA designs its products so that the least number of resources can make the best products; such as using hollow legs in furniture, or by using a honeycomb-paper filling material (Figure 2.11) instead of solid wood for the inside of table tops (IKEA: LACK Collection, 2017). An example of such design is the IKEA LACK series; a simple and smart furniture that uses a unique construction that makes it lightweight – permitting prices as low as possible; and is provided in a wide variety of colours and finishes (Figure 2.13).

Before going to manufacturing process, nearly half of all IKEA products are 3D printed. 3D printer technologies have allowed for whole chairs to be prototyped (Radu Acalfoaie, 2016); making the design process more efficient. As manufacturers or suppliers add value to products, the IWAY code of conduct (IKEA: Code of Conduct, 2017), identifies minimum IKEA requirements. IWAY complies with international regulations, of minimum rules and guidelines, for manufacturers to reduce the environmental impact. Furthermore, "Once a product is approved for production, any proposed changes to the product or to the production method are reviewed by IKEA to decide whether additional risk assessment testing is required" (IKEA: Product Testing, 2017).

Tertiary Sector: Provide the services needed to meet the customer needs such as retailing, distribution, and customer services. The IKEA store engages the customer in creating their purchase from preference in selection of product range to the assemblage of the furniture at home. Each IKEA store holds more than 9,500 products providing numerous product choice for the customer (The Official Board, 2015).

Figure 2.13 LACK Side Table Colours and Finishes.

Within each store, display rooms provide realistic room settings that enable customers to view the products in a room layout with other complimenting furniture IKEA products (Betty Yiu, 2017). Display rooms are designed to offer customers a visual understanding of how their products work, features and benefits, and help demonstrate how IKEA can help the customer create a more sustainable life at home. In that sense, IKEA's customers do not have to choose between sustainability, style, function or affordability; and can visualize what the products would look like in their own homes.

Showroom displays of IKEA are inspirational for customers to gain ideas for their interior design creations (Betty Yiu, 2017). As an example, Figure 2.14 shows a small display room of unique colour and furniture selection from the IKEA range. With affordable parts that come together in one setting, this display is of organized IKEA range furniture products; EXPEDIT TV storage unit, KLIPPAN loveseat, LACK storage unit, and LACK side table; intended to inspire its visitors.

Figure 2.14 IKEA Showroom Display (Yiu, B., 2010).

IKEA's manufacturing process was described as a sophisticated and efficient supply chain (The Official Board, 2015). The main challenge with manufacturing is simple, the ability to be flat packed, transported, assembled, and disassembled again (IKEA, 2010). Hallmarks of the IKEA distribution are a global distribution network, large volumes of flat packages self-assembled by customers, and low costs. The fact that IKEA products are sold flat packed means that more products can be transported at a time benefiting both IKEA and the customer (Deloitte, 2010).

IKEA offers customers inspiring solutions for their homes at affordable prices. The customer is the creator – the customer also takes part in 'creating' their own self assembled furniture, and furniture components, which also generates added value to the customer in preference and creativity (IKEA: Products and Materials, 2017). IKEA has chosen to undertake a leadership role, as a global organization, in creating a sustainable way of life. With accelerating speeds of expansion, IKEA is gradually understanding their global markets more than before (Radu Acalfoaie, 2016).

For the purpose of this study, understanding both cultural and contemporary production processes and product material of the IG and IKEA furniture design is necessary for their integration. For instance, while IKEA uses the least amount of material such as hollow wood as in the LACK table design structure (Figure 2.11), an IG table design structure (Figure 3.4) is of heavy and solid wood material. And, while the IKEA LACK table structural parts are flat packed to be assembled by the consumer into a furniture object that can also be disassembling, the IG table structural parts are already assembled into one fixed object. In addition, while the LACK table furniture uses mass-production techniques to produce its structural parts, the IG table furniture is a tailor-made artifact construction using traditional craftsmanship techniques and detailing (Figure 2.3). This is significant in attempting to recreate an integrated style furniture prototype, holding qualities of both cultural and contemporary design structural languages, within IKEA's standards and production processes. Showroom display strategy was also adopted into this study at later stages of this research as the proposed cultural-contemporary table-panel prototype designs – in-line with IKEA's production processes and furniture design style and standards – are displayed and tested within IKEA stores for customer evaluation and feedback.

2.4 Bridging Cultural Identity into Contemporary Global Style

Evidently IKEA mastered retailing universally, selling high volumes of stock at a constantly low price in vastly different marketplaces, languages, and cultures. IKEA's head of research, Mikael Ydholm, explains how research is at the heart of IKEA's growth; "The more far away we go from our culture, the more we need to understand, learn, and adapt" (Kowitt, B. 2015, p.168). Rather than focus on differences between cultures, his job is to figure out where they intersect.

As IKEA's consideration of other cultural designs take place through research, focusing on its own design culture intersecting with other cultural backgrounds and diversities makes for IKEA to be the ideal platform for this research. Head of IKEA design team Marcus Engman identifies a gap of cultural diversity and sensibility in their product designs (Mia Shanley, 2014). This internationally unified products supply is an advantage for this ages' global society. Yet, when it comes to globalization in design style, IKEA acknowledges its lack in cultural arts incorporation. IKEA's need to understand peoples living environment involved the company to carry a wide range of studies aiming to observe cultural differences within the home (Koniorczyk, G. 2015). The beauty of IKEA is that it has made design independent of race, culture and ethnicity, and in course of that has created a design language that has no boundaries or barriers. By attaching culture or heritage to its design language, IKEA creates dimensions.

IKEA is now looking for more diversity and has decided to 'redesign' itself. From multi-cultural backgrounds, customers are now global citizens with sophisticated tastes.

> "That means we have to change. . . If you have an extremely elaborate pattern out of Asia, for instance, could we mix that with a very straight forward, functionalist view from us?" wondered Engman (Mia Shanley, 2014, para. 11).

The search for the incorporation of cultures within IKEA directly relates to the investigative study of this research. As cultural aesthetics are increasingly diminishing from the fabric of the Middle Eastern society, it is proposed that the design approach and methodology for this study will embrace the essence of the cultural arts of IG within IKEA's vision. Living in a global-society era, IKEA is the vehicle by which this can be achieved – reviving cultural arts. To enable the engagement with multicultural design styles, IKEA is looking for change, creativity and innovative design; styles that can adapt into its contemporary design language. This challenges what tomorrows' products are going to be about: blended styles – highlighting the need for preserving cultural identity through the arts (Mia Shanley, 2014).

IKEA is reaching to adopt cultural arts within its vocabulary; done successfully, the revival of the IG into contemporary design can be achieved. As the IGs reflect an interplay of maths and art that derived from basic geometries, the IKEA forms and shapes of its furniture designs also are based on basic geometries. Yet, unlike the IGs, IKEA only uses simple basic geometries for its designs. In comparison to the IGs, IKEA's approach to design is simple and functional for purposes of mass-production, machine cut assemblies, practicality, packaging and cost efficiency. The arts of the IGs came before technological developments, so all crafts of that era were unique hand-made carvings and creations of local artist's, using local and imported materials of that time. Nevertheless, the evolution of time bringing technological developments and advancements can only enhance the art of IG due to their precise calculated precisions. With today's technological advances and 'global' society, cultural identity is in a continuing risk of its diminishing existence. This dilemma is evident, as discussed previously, in the Middle East and particularly the State of Kuwait. The importance of cultural identity preservation is a global concern, because today's society is a blended multicultural society. Thus, reviving the cultural arts in today's contemporary style is the integral drive for this research.

A stark distinction between contemporary and cultural product design is in production processes. While IKEA applies mass-production techniques of its design creations (see Appendix B, p.268), the IG embellishes in traditional craftsmanship of the Middle Eastern region (see Appendix A, p.265). This is one other significant aspect that must be addressed for bridging cultural arts into contemporary style. Real, traditional craftsmanship has an energy spirit that contains humility and humanity – same goes with the Art as an artifact, compared to art as an image. Therefore, this study is profound from the perspective of Design being recognized as both art and science, which is a philosophical conundrum.

Frank Gehry and Zaha Hadid are examples of two architects that work in an artistic trail. Under the umbrella of both art and science, Hadid explores spatial concepts through art, while Gehry approaches buildings as sculptural artworks. Their unprecedented architectural forms are realized using both construction technologies and sophisticated design. Incorporating technology does not make them any more scientists than they are artists; rather, to both Gehry and Hadid, technology is a means of design execution, without the art, there would not be a rich encultured functional design – which is what Minimalism is about (Ned Cramer, 2011). Their work is an example of how the art challenges technology, and how technology inspires the art. Both Gehry and Hadid combined science with art through scientific geometries. The use of art, organic nature of fractal geometry and parametric design, in conjunction with computer-aided algorithms to create curvilinear geometric forms, enabled construction of complex mathematical artwork creations.

Central to her work was both technology and innovation; yet, as an artist with drawing at the very heart of her work, Hadid used calligraphy as the main method for visualizing her architectural ideas. For her, painting is a design tool of investigation form that structures architectural conceptualization and its relationship to its surrounding (Serpentine, 2013). Her preliminary paintings are the root to her technologically advanced creations.

Great design is about art, as well as science and technology; art that reveals its form (such as sculpture), and science that advances and opens new possibilities. "To Gehry, the physical form of architecture isn't really about a physical structure at all, but rather the manifestation of all disciplines of art, design, and technology coming together to solve a problem" (Christian Saylor, 2011, para. 3). Frank Gehry's Guggenheim reveals a play of art and construction in an architectural synchrony (Figure 2.15). The use of technology and the support of advanced computer software helped Gehry realize, refine, and detail his vision.

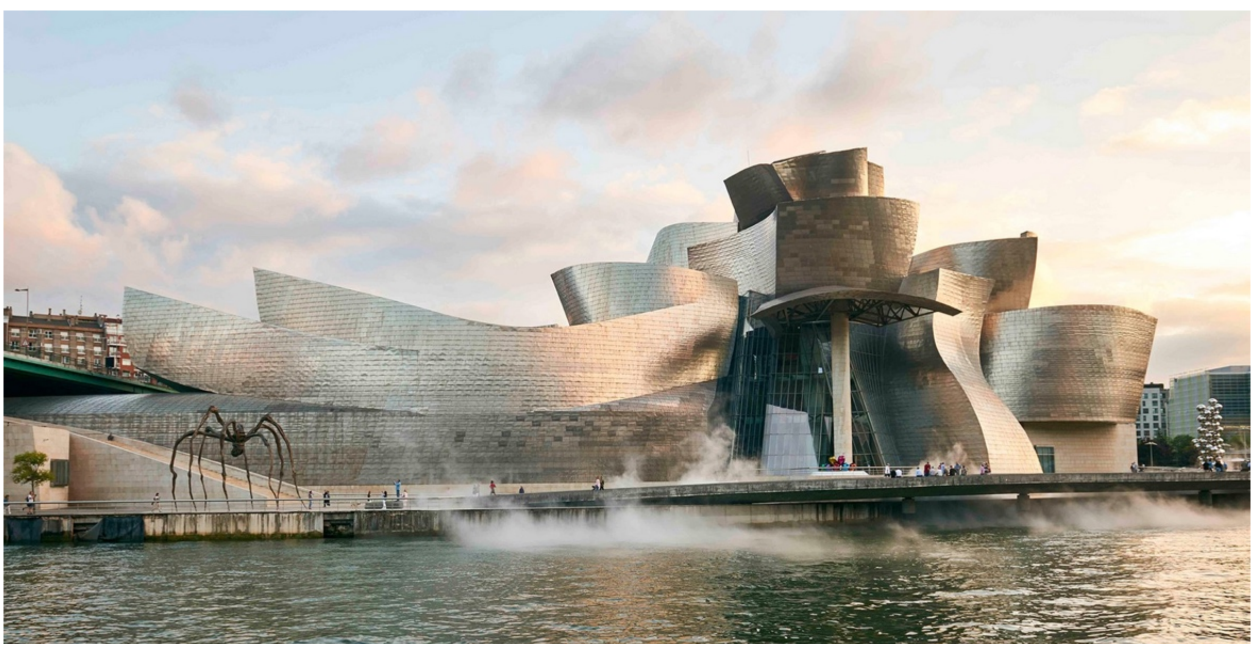


Figure 2.15 Guggenheim Museum, Bilbao, Spain, by Frank Gehry. (Butelski, K., 2000).

The Guggenheim Museum in Bilbao, 1997, is a monument to modernism. At the end of the 20^{th} century, new forms of technological advancements were brought through with the rise of the modernism movement. Displaying new ways of creating architecture, the Guggenheim conveys how new forms are made possible by geometry and computer modeling (CAD, Computer Aided Design) technology through the construction of its architecturally curved shapes (Butelski, K., 2000). A true example of architecture as an art. Involving scientific and technological advancements in a collaboration with the arts provides vast possibilities for scientific creativity. With efficient implementation, collaboration and execution, science enhances the arts in a display of design creations.

This research is a combination of art and science, incorporating scientific research methods in order to influence artistic style in design, from both an analytical and creative perspective. The study integrates Art and Science in a third position – Design; (and people connecting with it). In a society of visually unique aesthetic language, reviving its art identity is attainable and essential for current and future developments. Design has the efficiency and validity to captivate and evolve cultural art identity, through art and science, into contemporary design.

With IKEA's international presence, attentiveness to people needs and its cost-efficient productions, the quest now is to provide furniture that constitutes cultural arts as well. The wide selection IKEA presents holds a certain vocabulary that is not yet sensitive to other cultures, inclusive of their arts. Even though IKEA has major international presence in retailing and furnishings, publishing country-specific catalogues with local-currency prices and languages (Kowitt, B 2015), yet there are no modifications toward regional artistic sensibility when it comes to style. IKEA's online website, for instance, displays identical products from region to region, country to country, and even continents. IKEA Australia online products are identical to that of IKEA Kuwait, Saudi Arabia, and Canada. There is no furniture differentiation based on store location. The company's investment in comprehensive strategy, reflecting and communicating to local customers and customs, is now looking to include cultural art in its global involvement and incorporation (Mia Shanley, 2014).

As a global society, there is an intimate connection between cultural art language and day-to-day life. The exploitative condition under which product design reinvents these fundamental relations is precise and creative. Realized, this allows people's need or desire into a matter of 'choice' and ‘preference’. In addition to cultural arts preservation, this also will provide awareness when meeting and enriching social needs (Designing Class: Ikea and Democracy as Furniture. 2015). Due to its international success, IKEA is ideal as a foundation in reviving, preserving, and spreading the cultural arts within our contemporary world. IKEA’s need for ‘change’ in order to meet the needs of all society, its sensitivities and understanding towards today’s multicultural society, solidifies this research intent.

IKEA’s need of gaining cultural knowledge is not to tweak its products for each market; rather, to show how its products can mesh with different regional habitats. For instance, showroom displays in Japan and Amsterdam could feature the same beds and cabinets, yet in different cultural settings. The Japanese version might incorporate tatami mats, while the Dutch room would be featured with slanted ceilings reflecting its local architecture. These showroom sample displays serve a similar purpose as the catalogues and are an important part of the IKEA concept. Overall, few goods are offered in just one country; however, although the showroom displays of product arrangements may communicate to its local customer, preference and lifestyle (Kowitt, B 2015), yet the IKEA product line itself does not tend to cultural collaborations. Nonetheless, IKEA recognizes this gap and aims to induce cultural arts into its functional contemporary style (Mia Shanley, 2014). In this recognition, it can be said that the power to absorb, blend and fuse with the surrounding style lends itself to cultural identity, globalization, blended style and integration, and the evolving style.

Falling in-line with IKEA’s search of incorporating diverse cultural arts within its product design, the inclusion of the IG style into IKEA’s design language adds cultural significance. While IKEA was founded under Scandinavian design philosophy and methodology, that of Minimalism and Modernism (Ch. 2.3), the IGs are deep rooted in Arab cultural values, honest to an Arabian style, that of meditative qualities reflecting ‘perfection in nature’ (Dabbour, 2012).

The art of IG is a display of mathematical proportions, configurations and symmetry with an agility to fold and unfold pattern structures of infinite creations (Ch. 2.2.1). This flexibility of pattern intensity, geometric proportions, design creations, and applications within the IG, enables this cultural art to align with IKEA’s minimalistic style by using its simplest pattern elements and geometric formations. With both the IG and IKEA styles having the same principles at core, albeit different process manifestations, both can be combined readily while maintaining their identity.

Being that IKEA is the vessel in which the art of the IG is to be introduced to, transformed and revived, the amalgamation is to develop within IKEA's contemporary style, vision, ideology and values. Nonetheless, for both design styles to integrate successfully, they each must maintain their core identity and style. Having that both design languages are based on basic geometry, the merging of the styles will take a form using geometric measures (Ch. 3.4) which inherently embody both art and science within design.

In essence, IKEA strives for bridging cultural arts within its design line, and Kuwait is in need of the revival of its artistic heritage (Ch. 1.1.1); fulfilling both is to have a design language that maintains and evolves cultural identity into contemporary global style.

2.4.1 Commercial Design Potential

Retailing world-wide, IKEA provides affordable furniture that combines function, quality, design and value - always with sustainability in mind. IKEA acknowledged that it must consider the fact that its customers are now global citizens with sophisticated tastes; and, that it is catering to a far wider audience than when it first launched in 1943. "Everybody has a bigger view than what they had in the fifties" (Mia Shanley, 2014, para. 5) IKEA's design chief Marcus Engman stated in 2014 to IKEA's design centre; "That means we have to change" (Mia Shanley, 2014, para. 6). Engman's design team currently spends 30 to 40 percent of the time traveling to source new ideas and material inviting cultural integration as IKEA is seeking blended styles (Kowitt, B 2015).

With mass-production aiding in global distribution to provide furniture supplies, it also raises a concern of uniqueness. Part of the challenge, in a world where people want more than ever to be seen as unique, Engman resolves this concern by addressing customer's choice and preference within the furniture lines of provided selections; to gratify and cater to their individual tastes (Kowitt, B 2015); (see Ch. 2.4.2). Engman's determination explains that providing customers with colour options, shape and size choices, and mix-and-match furniture lines and products is a way for them to make their selection unique to their wants and needs (Kowitt, B 2015).

Although the cultural integration of this study is not focused on a colour, texture, or in creating a new furniture item, identifying the design language of both the cultural art of IG and the contemporary style of IKEA, and synthesizing their grammar, provides a more dynamic and tangible method of incorporation and implementation. Investigating the style's geometric configurations allow for a synthesized composition of illustrative patterns and structural forms that hold true to both design styles and identities. A style integration (IKEA-IG), or evolving style, is therefore capable of reviving the cultural arts of IG within contemporary design, as well as take part in IKEA's search for cultural integration within their designs. Effectively, the IKEA-IG style can be adopted into the IKEA furniture design style and aesthetics, serving both – the revival of the IG art, and providing IKEA a culturally infused design for its global customer.

Commercial design potential in contemporary interior design is affected by several elements that compose its developed style. Designing a contemporary product requires multi-factors, such as product assembly, safety, durability, and quality among others. The contentious technological developments and advancements create higher customer expectation (Koniorczyk, G 2015). With a proposed IKEA-IG style integration of calculated pattern form and symmetrical flexibility, the engagement of a product artifact (compliant with IKEA's product design) is highly achievable.

Whether the integrated design language is successful, desirable or identifiable, the proposed integrated style is measured and analysed through mixed methods research investigations in order to reach an *Ideal* IKEA-IG style. Identifying the intellectual content of the amalgamation so the integrated style can then be translated and developed into actual prototype production (Ch. 3.6.2) under IKEA's production processes - the *Real*, which then is also further examined and tested in an evaluative study - *Reflective* - in order to gain final feedback on the styles' incorporation into IKEA's existing furniture design style. This for the purpose of the IG cultural art revival within contemporary design.

2.4.2 Consumer Choice and Preference

Understanding consumer needs and preference of home furniture is essential to retailers and manufacturers; providing them with this understanding offers a competitive advantage within the industry (Maleki G. M. et al 2014). Accordingly, industries, government agencies and lobbyists conducted much research on preference. Nevertheless, not much academic research has been carried-out on factors effecting consumer preferences or choices of home furniture (Burnsed and Hodges, 2014). The importance of consumer preference to home furniture is hence addressed to recognize the significance and influence of style and design language.

The importance of home furniture exceeds retailers and manufacturers as they also affect the economy. For example, Standard and Poor's (2008) argued that two-thirds of the US economy is driven by consumer and customer demand for goods and services. The home furnishing industry alone contributed \$115.3 billion in 2007 and \$143.4 billion in 2008, indicating a 19.5% increase in growing demand (US Bureau of the Census, 2010). Growth in demand for accent furniture was also on the rise. According to York, J. (2015), for the last eight years accent furniture was on the rise with nearly \$16 billion in retail sales; a noticeable growth for home decor manufacturers. William White, the president of 'Gabby', stated that about 70% of his companies' sales are accent furniture. Similarly, 75% of 'Furniture Classics' business sales are accent furniture (York, 2015).

As marketing strategies revolve around the consumer, it is imperative to identify and understand the consumer in order to meet needs and wants. Cagan and Vogel (2002) argue that the core to a successful brand is not left to the marketing individuals, but also to the engineers and designers as they play a crucial and active part of the brands creation. They argue that a strong brand cannot be created by good advertisement of a weak product; adding, that although a great product may benefit from a good advertising campaign, the emerging or continuing brand will only succeed if the product meets consumer needs, wants and desires (Cagan and Vogel 2002).

In their research, Khattri, V. and Prakash, O. (2016) realized two important factors about the consumer; taste and preference continuously change with time, and, in today's increasingly growing market, the consumer is global and of different backgrounds. Accordingly, as the consumer preference of style evolves, style itself also needs to evolve constantly along with its patrons and prospects. This evolution could be to meet changing consumer needs or to address changing consumer perception and desires (Khattri, V. and Prakash, O. 2016).

Encouraging ground-breaking research across a range of disciplines including retail,

> "Semiotics is the study of signs and symbols and their social meaning. And once understood, semiotics can quickly come to be a powerful tool in one's marketing toolbox." (Khattri, V. and Prakash, O. 2016, p.67).

Being that style is a form of visual communication, semiotics becomes a vital ingredient of the marketing toolkit; it explains how meaning is derived from a form of communication. As has been used by marketers historically, this study explores the power of semiotics in design (Ch. 2.5). Style evolution and progression of style (or brand) stresses the role of semiotics as it demands a renewed and culturally relevant progression in its communication to the consumer (Khattri, V. and Prakash, O. 2016). The key in its progression, is to not lose its core style identity.

The purpose of the study is to establish a framework to explore the use of semiotics in meeting changing consumer needs and preferences which are the drivers of the evolving style scenario. Therefore, this study also focuses on understanding consumers' preference; specifically, towards an amalgamation of cultural style within contemporary home interiors. For the contemporary style investigation part of this study, IKEA is selected not only because is it looking for cultural art integrations, but also focuses on the end user satisfaction; a leading factor to IKEA's world-wide success in the home furniture industry (section 2.3.2). And, for the cultural art style, the IG is from which this study takes place for the need of reviving cultural identity through the arts (Ch. 2.2).

As the attempt to mesh different era styles for the revival of the cultural art identity within contemporary home interiors unfolds in a semiotic investigation (Ch. 3.2), consumer choice and preference is a determinant factor of its success. Acquiring consumer choice and preference is essential for this study, and interior design in general. It provides the means to evaluate the extent of which the developed cultural-contemporary design maintains its core identities – that of cultural and contemporary style within its evolved engagement, as well as preference of the integrated style itself. Therefore, for this study, participant preference and identification to style is examined and analysed towards the integrated semiotic configuration of the IKEA-IG style.

2.4.3 Identifying the Style

In marketing, a brand has elements that consumers identify with within the product style and design language. Composed of signs, symbols, figures, and any form of communication, design language forms its basis on the principle of symbolic relativity and creativity. Symbolic relativity can be viewed as a language of symbols and symbolic reference (aesthetic) that serves as the basis for all science of language, including design language. The meaning of a design style or brand identity must be summoned from the analysis of its function and with knowledge of cultural identity. Described by Aaker (1996), brand identity is a distinctive display of brand element associations that the brand seeks to maintain and create. These associations represent the brand as they generate a proposition that involves functional and expressive benefits, as well as offer designers a guaranteed way of maintaining its identity for their customers (Aaker, D. A. 1996).

At the forefront of consumer culture is design aesthetics. Preference of visual identity sets grounds for intuitive and creative commercial design and style aesthetic. A product design rooted and enriched in the awareness of brand and style DNA allows for creative prospective. A style identity holds specific aesthetic components such as shape, colour and texture that maintains distinct character and expression in a variety of design forms. Style has diverse yet specific forms due to its flexible qualities of creativity. Flexibility in design is critical; for a design style to last or be 'revived', its ability to evolve and adapt into new or different environments is not by imposing the design, but rather to synthesizing and integrating creatively and harmoniously. 'While style DNA provides a business with a distinguished experience for the consumer, principles and values which resonate with their consumers generally provide the drive for the DNA. This extremely effective tool can help increase sales as well as create diversity within a style' (Eves, B. and Hewitt, J. 2008).

Specializing in design, visual identity, branding, advertising, social and digital marketing, the privately held commercial organization named *Heavenly*, founded in 2003, was assigned to create the logo for Francis Crick Institute (Weareheavenly, 2011). In honour to the man recognized with the discovery of the structure of the DNA molecule, in 2011 Heavenly branding design agency was appointed by the Francis Crick Institute to create a logo (Figure 2.16) that carries a visual identity of the Institute (Brandingsource: Francis Crick Institute, 2011).

Figure 2.16 New Logo: Visual Identity (Brandingsource: Francis Crick Institute, 2011).

Reflecting the collaboration of research variety within the centre and its scientific contributions, Heavenly oversaw adopting a new visual representation and identity for its core proposition – '*The more we connect the more we create*'. Capturing the creative and innovative principle at the Francis Crick Institute, the new logo is of a black square representing the institute and building, while individual triangles of different colours projecting behind the black square reflect the different organizations, individuals and skills coming together at the Institute. (Heavenly, 2011).

Heavenly successfully created the logo design from the combined understanding of the Institute's vision and what it offers. The institutes communications director John Davidson added, "Heavenly have delivered a visual identity that reflects the Institute's vision for its scientists" (Heavenly, 2011, para. 6). The understanding of the structures of its organization created grounds to construct a logo that reflects its brand identity. In retrospect, Francis Crick's DNA analysis can be viewed as the logo that is the reflection of the sum of its structural components, or genetic coding.

In line with the understanding of identifying a style and its design language (or DNA), core design elements and components of the two styles of this study are defined and synchronized creating different yet similar design outcomes of the developed IKEA-IG style. Diversity of design within a certain style maintains that style's identity, these designs hold the same style elements, or components, therefore are of the same 'family group'. In terms of commercial design potential, diversity within a style provides customers the choice to select their preference of design from within brand, or style identity. Also, in creating a product prototype that is *ideal*, *real*, and *reflective* of the styles' integration (IKEA-IG style), provides commercial design potential amongst other contributions - further discussed in proceeding chapters - such as to the design field and designers, interior design and to knowledge.

2.5 Semiotics in Design

Semiotics is the derived understanding of meaning of any form of language expression being communicated. The role of semiotics explains how we understand meaning from any form of communication (Khattri, V. and Prakash, O. 2016). These forms vary from written text to body or aesthetic design language. In other words, semiotics is the understanding of meaning from communication; while communication is any form of language expression that conveys meaning. To fully grasp the intended meaning of a communicated language, one must also have an understanding of the connotations embedded within its context (Wordpress: Semiotics, 2012).

Founded by Ferdinand de Saussure, semiotics became a popular approach to cultural studies in the late 1960's. Its contributions are significant to design and designers as it facilitates the understanding of relationships, what they stand for, and the people who interpret them. As one of the founders of modern linguistics, inaugurated semiology, structuralism and deconstruction, Saussure (1857-1913) made possible the work of Jacques Derrida (among many others) to develop the understanding of meaning derived from language, or form of language (De Saussure, F., 2011). Although, while Saussure stated that meaning is more significant than the sign itself, Jacques Derrida (1930 - 2004) developer of '*Différance'* (which became a fundamental tool and concept in his lifelong work; deconstruction) argued that the sign is more important than the meaning it carries. Associated with the post-structuralism movement, Deridda explained that this is because the sign is a fixed element, yet its meaning is not (Cobley, P. and Jansz, L. 1998).

Approaches by Deridda emerged from the semiology advanced by Saussure and his notion of signifier and signified, tracing a broader form of Saussure's semantic path in semiotics. Deridda's emphasis was on sign (*signifying element*) and its relations. He pointed that these relations with other signs not only express meaning but also values; a theoretical operation and a practical option; deconstruction. Deconstruction, therefore, is structurally necessary to produce sense (cf. Jacques Derrida, 1981). Instead of focusing his theory on the origins of language and its historical aspects, Saussure concentrated on the patterns and functions of language itself (De Saussure, F., 2011).

The 'semiology' of Saussure largely overlaps in function and meaning with the 'semiotics' of Charles Sanders Peirce (1839 - 1914), the founder of pragmatism (Peirce, Charles Sanders, 1965). Each system is concerned with signs, and the way in which signs are decoded, or interpreted for meaning. While Saussurean semiology concerned itself only with intentional communication acts, such as speaking and writing, or other related forms such as gesture and Morse code; Peircean semiotics included all sensory stimuli that could create another idea in the receiver's mind (Daylight, R. 2012). This established semiology as a limited subset to the infinite possibilities of semiotics. Nevertheless, both are theories of sign that maintain the phenomenon of meaning. The understanding of semiotics is not limited to the meaning of language, as they delve into new domains including relationships between humans and their environment. In general, it is the study of signs, symbols and signification.

Semiotics became the main study amongst other fields of scientific, philosophical, and artistic endeavours until present time. Ogden and Richards' *The Meaning of Meaning* (1923) discusses the 'science of signs' and goes to explain that meaning might incorporate and account for specific settings of complex interrelationships between culture, social structure, language use and interpretation, stressing the importance of the 'context' in understanding the meaning of language in use. Understanding cultural and social connotations embedded within the identity of any form of language is key to understand its true meaning. Moreover, meaning is derived through signs, or is acquired through personal interpretation (Ogden and Richards, 1923).

Ogden and Richards set a model explaining the relations of sign, thought, and object (or phenomenon) to show how meaning is created. The Semiotic Triangle (Figure 2.17), also known as The Triangle of Meaning, shows how meaning is created. It is a system of thought (reference) demonstrating a mediation between a sign (symbol) and its perception in consciousness that connects it to the object (referent). The model shows a direct relationship between symbol and reference, reference and referent, but not between symbol and referent. This is because the referent requires prior reference (knowledge or experience) to the symbol (word or sign) to be comprehensive. Without reference, or point of thought interpretation, the relation between symbol and referent does not exist. As a symbol maintains its own meaning, and reference to symbol is the understanding of that meaning (which may differ from person to person based on individual perception and context of situation), the process of reference to symbol and what it in-turn refers to (the referent) is called the meaning of meaning. Therefore, meaning is not implied by the sign (or symbol), it emerges by the person experiencing it, relating to it, and ultimately arriving at meaning (Ogden and Richards, 1923).

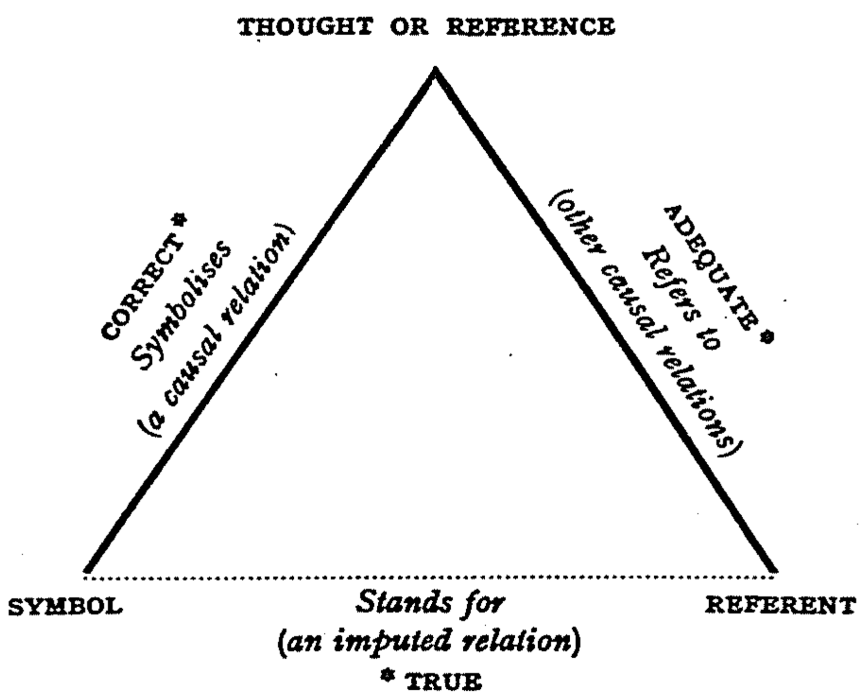


Figure 2.17 The Semiotic Triangle (Ogden and Richards, 1923, p.11).

The Semiotic Triangle, also known as The Triangle of Meaning, shows how meaning is created. It is a system of thought (reference) demonstrating a mediation between a sign (symbol) and its perception in consciousness that connects it to the object (referent). The model shows a direct relationship between symbol and reference, reference and referent, but not between symbol and referent. This is because the referent requires prior reference (knowledge or experience) to the symbol (word or sign) to be comprehensive. Without reference, or point of thought interpretation, the relation between symbol and referent does not exist. As a symbol maintains its own meaning, and reference to symbol is the understanding of that meaning (which may differ from person to person based on individual perception and context of situation), the process of reference to symbol and what it in-turn refers to (the referent) is called the meaning of meaning. Therefore, meaning is not implied by the sign (or symbol), it emerges by the person experiencing it, relating to it, and ultimately arriving at meaning (Ogden and Richards, 1923).

Both verbal and nonverbal, communication embraces a large body of study and knowledge. In the design realm, cultural identity is a visual form of communication expressed through a language of design. The nature of language and its use is interactive and culturally contextualized. Recently, Khattri, V. and Prakash, O. (2016) stressed the importance of communication as a main function of management in any organization. Focusing on brand, a research was conducted to understand how semiotics was used by various markets to meet their changing customer expectations. The brand message must filter through the culture of the intended target before it reaches them. The target's interpretation of the communicating brand will depend on what the communication codes personally mean to them (Khattri, V. and Prakash, O. 2016).

Understanding, investigating and interpretating a design style is critical towards engaging and gaining customer and commercial acceptance across a product brand. "The structures of semiotics provide a practical basis for analytical and creative thinking of a complex design issue" (Eves, B. and Hewitt, J. 2008, p.3). Semiotics has the power to enable the analysis of style and synthesis of design language. Consequently, semiotics and design language can enhance design character (Crow, D. 2003), which can also be oriented towards a specific demographic and direction. The more emphasis on the targeted direction, the stronger the visual language (Hewitt, J. 2008).

Chandler (2017) explains that contemporary semiotics have moved away from the classification of sign systems to study how meanings are made; not only being concerned with communication but also with the construction and maintenance of identity. Studying semiotics can bring awareness to the construction of style identity, as well as to the roles of taken by designers constructing it; semiotics can assist in understanding the meaning that is not conveyed, but that is of complex relational phenomenon actively being created (Eves, B. and Hewitt, J. 2008).

2.5.1 Style DNA and Design Language

Style maintains a specific design language and DNA components providing each brand its unique cultural identity. However, identity is not a fixed entity, but an ongoing evolution of unique characteristics connected through genetic coding's of its DNA (Crick, F. and Koch, C., 1998). Products that carry a set of core values of a style maintain a linked thread of DNA. Analysing a products design language, the DNA structure is the unfolding of its genetic coding (Crick, 2011).

The intensity of DNA components and application, as well as their predefined principles, can generate a variety of products within the same range, or design language, as they still maintain their core set of values of aesthetic style (Hewitt, J. 2009). In design, semiotics is readily used for analysing style to investigate its DNA. Providing the structural analysis and synthesis of its style DNA, semiotic associations reveal and facilitate translation, expression and further expansions of the developed design language. (Eves, B. and Hewitt, J. 2009).

In a study by Pugliese and Cagan (2002), the Harley-Davidson brand identity was captured through a semiotic design investigation of its style DNA. Critical visual elements that hold the brands legendary image and character were identified to establish the core brand (Figure 2.18). Within a grammar used to analyse shapes in the vocabulary of the design language, the brand identity was coded by incorporating the visual elements into constraints of rules and parameters; broken down into forms and their inter-relations, the brand's functional features were defined.

Each of the visual elements that characterizes the brand (or style DNA) were derived to set as an anchor from which a grammar can take place to generate different representations holding the core brand identity features (Figure 2.18). The brand was attained, and limitations were applied to a grammar from which new motorcycle concepts within the brands identity were generated. The brand features were then investigated for their extent of manifestation within the grammar to understand how far the design creation can deviate from its origin before it starts losing its core identity.

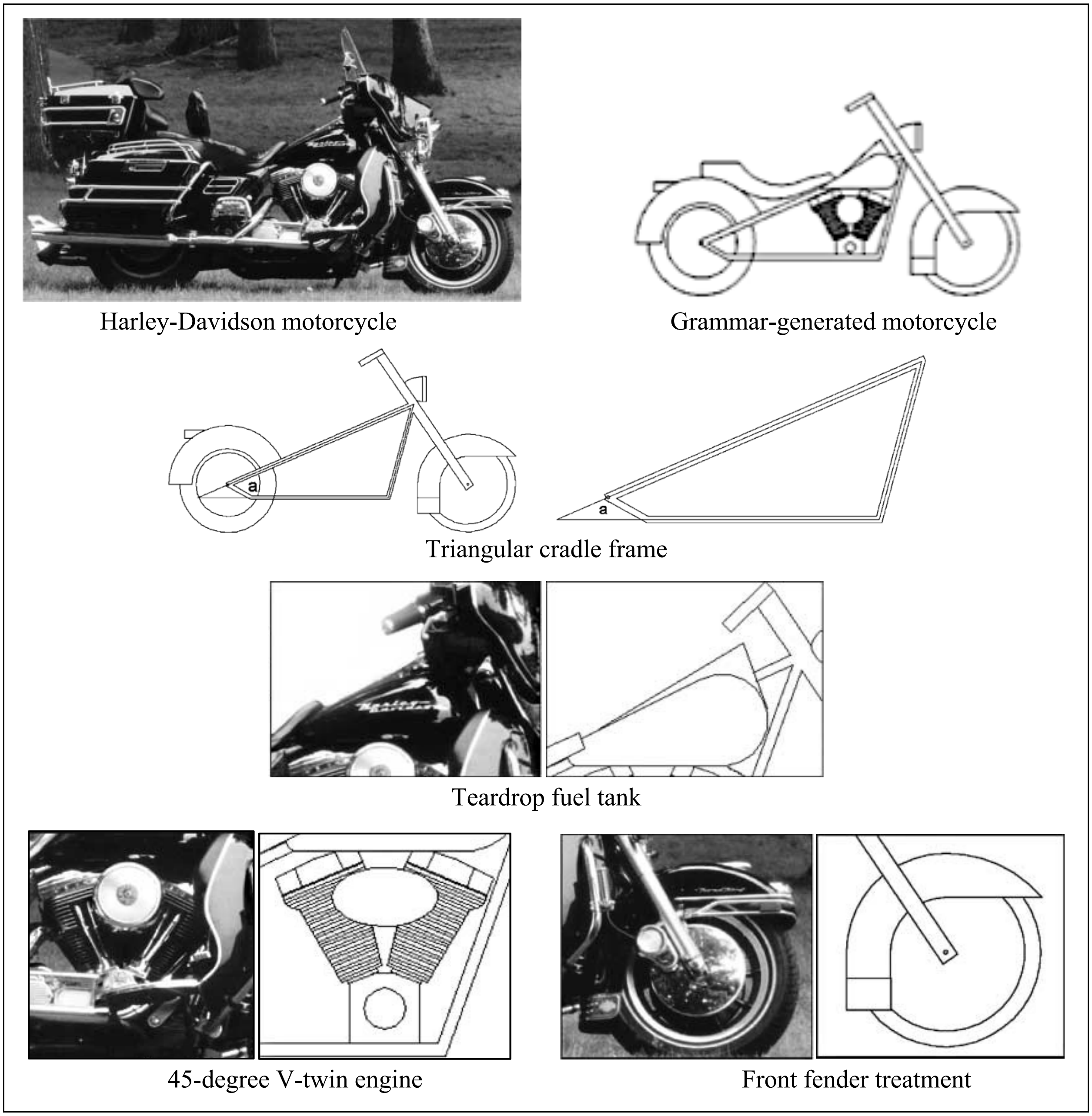


Figure 2.18 Harley-Davidson brand visual elements (Pugliese and Cagan, 2002).

The study on the Harley-Davidson brand demonstrates that capturing a brand identity and investigating its style DNA to create design variations can be accomplished with the applications of shape grammar (further discussed in section 2.6). These grammars can serve as a tool that satisfy structural, functional, aesthetic, and manufacturing requirements; generating design compositions that grasp brand identity. Harley-Davidson's unique brand was explored, developed, applied, and tested against the perception of customers to its brand. The motorcycle grammar was capable of creating a broad yet restricted set of motorcycles that are able to maintain a high level of abstraction

(Pugliese and Cagan, 2002). The study results prove the accuracy of the representation, as well as the powerful ability that shape grammar maintains in exploring and capturing a brands DNA and language of design to enable developing and evolving its identity.

Similarly, this study uses a semiotic design methodology to analyse and identify DNA components of both the IG and IKEA styles to obtain the genetic coding of the making of their structure. To recognize the IG and IKEA style identity, the style DNA and its 'genetic coding' was investigated and analysed to compile a structure that encompasses characteristics and cultural values of both languages within its design. The synthesis of the cultural and contemporary styles is to maintain and reflect both style identities for both to exist in synchrony. The found genetic coding, of both design languages and cultural identities, forms the basis for a style identity of a contemporary-cultural aesthetic language of design. Ultimately this research addresses each of the styles DNA, their integration, and the unique genetic coding and rule parameters of their design language.

While DNA components are the elements of a brand (or style), design language is the elements and their unique composition that identify and represent the brand. Design language includes ideation and visualization tools and techniques, as well as design process; it enables organizations to transform emergent ideas into viable streams of development (Hernandez et al., 2018).

In one study on 'a cognitive theory of style' (Chan, 1995), style was described as being generated with repeated common features identifiable or recognizable in a design. Style carries a set of common variables (or elements) used repeatedly and systematically in a design group. Variables that present specific characteristics or elements are used to implement, create and illustrate a design. These variables (of a style DNA) construct a distinguished design language that each style embodies. The structural features of style are denoted as a set of rules; repeatedly using certain rules and applying them in a consistent rhythm, or manner, throughout the production process can generate a strong sense of style. Moreover, style formation consists of a process that explores the designers' method of practice, and the final design measures of perception (Chan, 1995).

In another study on the 'Role of Semiotics in Interpreting Brand Elements' (Khattri, V. and Prakash, O. 2016), style is defined as the consistency and reliability of variables embedded and recognized in a sequence of designs through reoccurring similarities and repetition. As an aesthetic form of visual communication, style is the constant expression of elements or fixed variables recognizable in a sequence of design contexts. The consistent application of these defined elements in the design process generates common features that categorize the created designs as a style that holds its unique style DNA, design language, and cultural identity.

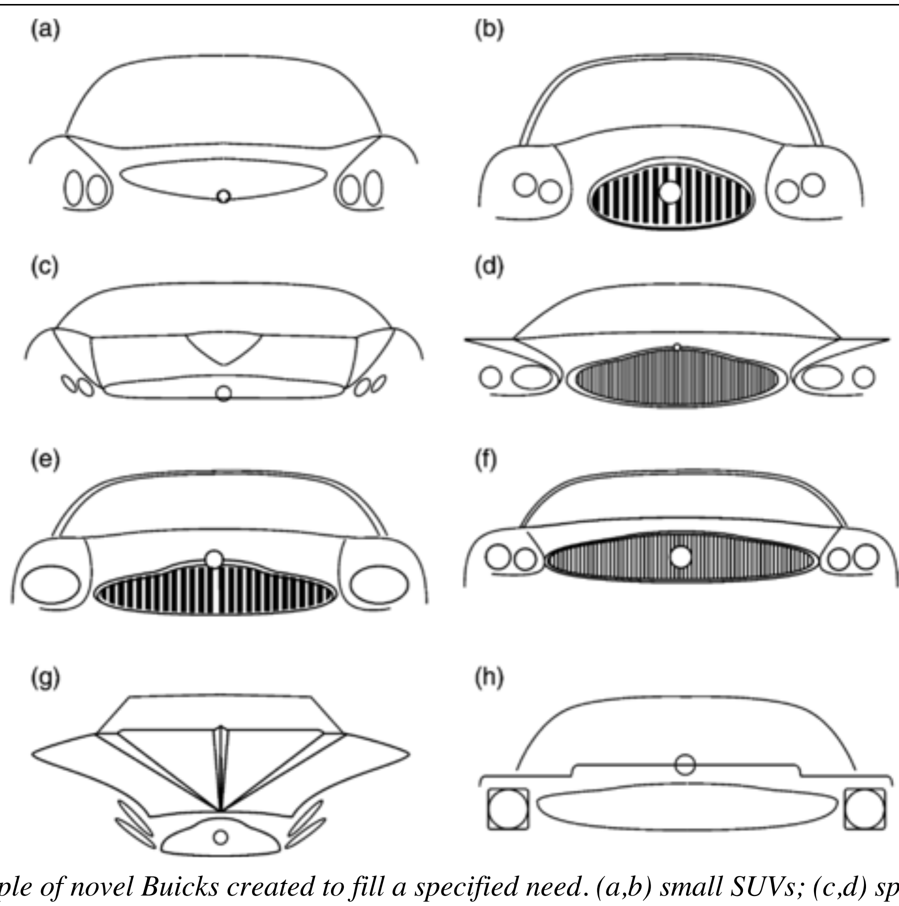
Emphasis on more variable applications within a design allows for more detectable style recognition. Style generating and formation is the process in which a unique or specific line of designs holding fixed variables is mass-produced and recognized for its identifiable forms and features. The fixed variables in design are the fundamental units of measuring and identifying a design language within a style. Style DNA recognition and identification of its design language is crucial for the purpose of this thesis to investigate both design styles of the IG and IKEA. Measurements of design, testing, analysis and results (in regards with consumer preference) to a new cultural-contemporary IKEA-IG style, will enable the research to further proceed in embracing the cultural arts of IG with the contemporary style of IKEA. Design language has "effectively become the language of innovation" (Hernandez et al., 2018, p.266).

2.5.2 Style Deconstruction and Reconstruction

Eves and Hewitt (2008) conducted a study that was involved in the deconstruction of past design icons and the reconstruction of new designs through semiotics. The study explains that though art is a form of communication, yet there is the extra semiotic value component lying within the observer. It is that extra value that designers aim to unfold and grasp to create designs of deeper semiotic connection within the consumer (Eves, B. and Hewitt, J. 2008). The unfolding of a design is the unfolding of the principles of a science. Products are impressions communicated; they can be seen as an extension of the self as they suggest an association to lifestyle and values we carry or aspire (Hewitt, J. 2008). The findings of the study prove that semiotics provide a structured yet flexible arena for creative aesthetic design.

Semiotic deconstruction of style can extract a design language, while reconstruction regenerates the style into a new design concept. The engagement of semiotics and design provides a profound level of understanding that can be developed into a powerful new design creation of any given style, or styles. While semiotics is involved in the deconstruction and reconstruction of style, shape grammar is used as a tool to extract the design elements of style and to create new concepts of that style. A model example in new design concept is the work of McCormack and Cagan who studied the shape grammar of the Buick car brand identity. While in the Harley-Davidson motorcycle grammar "brand was captured through constraints applied to a grammar that generated motorcycles… the essence of Buick is captured within the shapes that define the rules of the grammar" (McCormack et al., 2004, p.4). By defining the Buick brand through representative shapes, a more thorough understanding of shape computation and composition is gained enabling more grammar production (McCormack et al., 2004).

In order to identify, classify, and represent the brand, the Buick evolution was reviewed. Features that identified the brand were then extracted and their relations established. By examining features throughout its evolution, repeated shapes were found in multiple versions that represent the brand - from which are then used in the shape grammar rules. Once the key elements of the Buick brand were determined and represented with shapes, the DNA was encoded by a shape grammar (McCormack et al., 2004). With deconstruction of style, key elemental features of the Buick car's topology were extracted and defined within a shape grammar to generate a range of new concepts (Figure 2.19) through reconstruction of style.



A sample of novel Buicks created to fill a specified need. (a,b) small SUVs; (c,d) sporty Buicks and exploration with the hood flow line; (e,f) large luxury vehicles; (g,h) angular designs using Bill Mitchell era shapes.

Figure 2.19 Buick brand grammar-generated designs (McCormack et al., 2004, p.26).

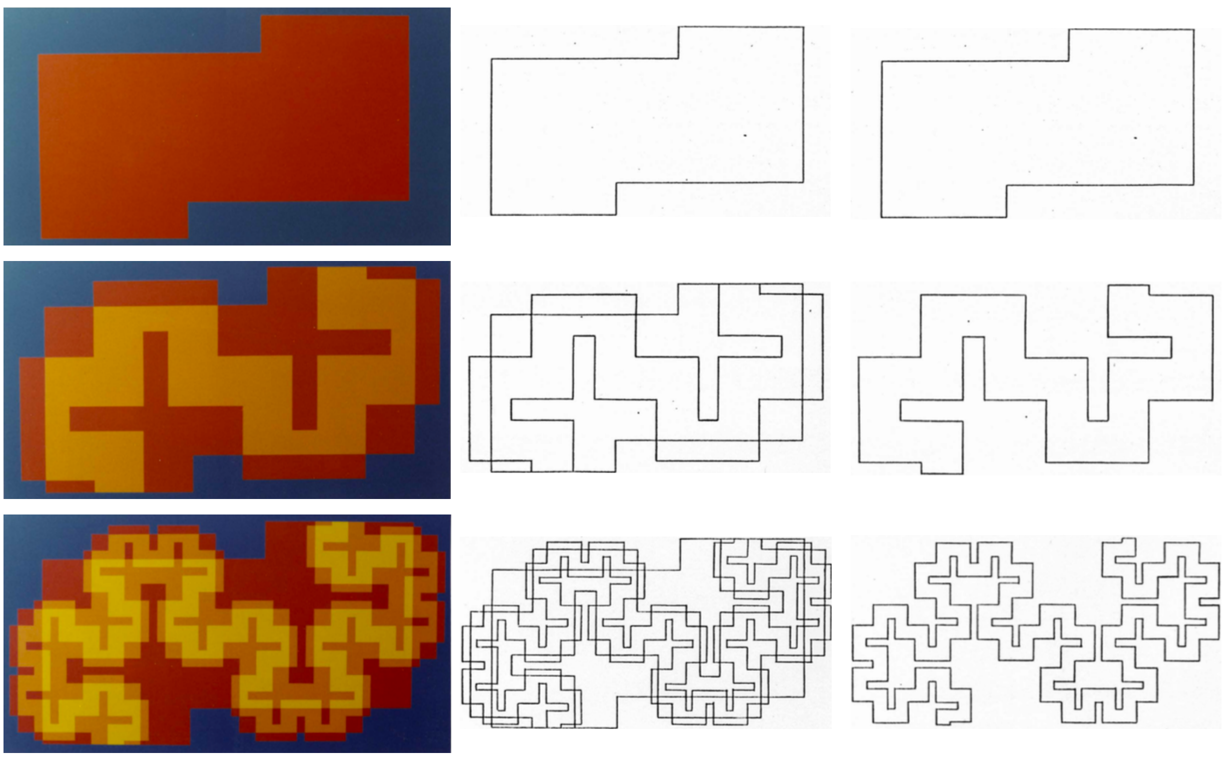
Form carries the essence of a brand's identity; success is achieved when brand can connect to the user and maintain its identity through its style evolution. A shape grammar tool can help both build and maintain a strong brand; once established, a shape grammar can create consistent style identity of the brand. For Buick not to lose brand identity as the grammars extend, limitations are set to each parametric feature. Discovering features that identify a brand, shape grammars that maintain and extend the brand, and their limitations, are what defines the brand (McCormack et al., 2004).

Using simple geometrical shapes, shape grammar has proven to enable designers to analyse and recreate complex designs; it can help in understanding a designs structure, composition and principles. McCormack et al. (2004) also discussed shape grammar as it relates to the design industry, style, and its ability to bridge historical reference with contemporary exploration within a style context. This relates significantly to this PhD design research especially that the attempt is to synthesize a cultural art within a contemporary style, and that the two design languages to be explored are both based on basic geometries.

In essence, by adapting a design research methodology, this research explores ways for an evolved language of design to develop, in which the IG and IKEA styles are both present. A semiotic design methodology explores, investigates, and analyses aesthetic components, structures and forms of each of the design languages applied. To initiate the fusion of the IG and IKEA styles, semiotic deconstruction identifies each styles' elements using shape grammar as a tool. A well-defined shape grammar is one that captures a styles essence and encode it into a language of shapes and shape-rules (deconstruction). Then, to combine the styles, shape grammar synthesis is applied to merge both style DNAs for them to integrate (reconstruction) forming the evolved contemporary-cultural design language and style of IKEA-IG. Therefore, the developed design study outcome is of geometric pattern designs that embrace the essence of both the IG and IKEA styles. The semiotic study is further addressed in the design chapter (Ch. 3) of this thesis. The following (section 2.6) presents examples and reviews how shape grammar can aid in dissecting, analysing, and synthesizing design language through its application method.

2.6 Shape Grammar

While design language is a vocabulary of shapes within the style, shape grammar is based on analysing shapes in the vocabulary within a design language. Characterized by a set of shape-rules imposed on an initial shape, shape grammar explores pattern formations as an interplay between shapes and their spatial relations. Defined, "a shape grammar is a set of rules based on shape that is used to generate designs through a series of rule applications beginning with an initial shape" (McCormack et al., 2004, p. 3). A shape grammar is a form of algorithmic system (Stiny and Gips, 1980; Agarwal and Cagan, 2000) that develops and generates designs from sequential iterative application of shape rules to initial shape; this creates transformation from which the shape evolves (Stiny 1980, 1991). Introduced by Stiny and Gips in the early 1970s as a way of describing and generating paintings and sculptures, Figure 2.20 is a sample of their work (Stiny and Gips 1971).



Acrylic on canvas	*Language defined by grammar*	*Grammar generated shapes defined*

Figure 2.20 Generative art pattern formation (Stiny, 1970).

The display of geometric art and pattern formations (Figure 2.20) is a design based on generative specifications determined by algorithmic processes. Beginning with an initial shape and successively applying shape rules, pattern is generated via a shape grammar. The language is defined by the set of shapes generated by the grammar (Stiny, 1970). These generative specifications can be used to analysise and evaluate structural relations from which algorithmic works of art are produced. Generative specifications provide a defined pattern grammar of shapes and their organization in a representation of geometric art design.

Defining spatial relations, shape grammars structures and compositions of rules obtain a pedagogical value; it explores and discovers the principles behind the design (Moon, 2007).

> "The inventors of shape grammars showed that existing designs can be analyzed and the logics behind them can be identified in terms of simple grammatical shape rules. These shape rules, once extracted, capture the visual style of the original design. Hence, shape grammars can be thought of as a way of encapsulating styles. The understandings of relationships of shapes can explain and deconstruct design processes." (Moon, 2007, p. 5).

In obtaining and understanding design principles, it is possible to generate new designs that maintain the defined standard style investigated (Trescak et al., 2009, p. 236). Shape grammars can be used to both deconstruct a style and reconstruct new design of that same style.

Overtime, shape grammars have been widely used in various artworks and design fields. In design, the shape grammar tool can explore an existing style, extend design within the style, or create a new and original style. Shape grammar can also capture the essence of a cultural art or style identity while adapting to contemporary preferences and advancements. As a visual language of communication, cultural arts evoke a sense of time and place; an expression which must be captured to maintain its essence. Therefore, for this research study, shape grammar is used to analyse and synthesize both the cultural and contemporary styles of IG and IKEA to produce a new design that encapsulates both languages. Shape grammars enables the process to identify, extract, and examine relations between the variables while establishing a hierarchy for their interaction. "A shape grammar can provide a common language that supports all facets of the design" (McCormack et al., 2004, p. 3). This language supports the design process in the preservation of brand identity; and is also known as 'brand DNA'.

In keeping with the 'evolving customer preference' that had significantly shaped product design (Pugliese and Cagan, 2002), shape grammar has proven to be the tool to determine and evolve brand, ensuring to meet brand characteristics that define specific brands from others. Developing a style's DNA by identifying unique rule and parameter coding that maintains the core shape grammar, balances the evolving brand (Abidin, S. Z. et al., and Benros, D. et al., 2014; Burnap, A. et al., 2016).

2.6.1 Shapes and Spatial Relations

Used to analyse and generate design styles, shape grammars focus on shapes and their spatial relations. The work of McCormack et al. (2004) is another example on pattern generation, in terms of shape grammars, where he used a set of rules and an initial shape to generate designs through a series of shape-rule applications defined by their spatial relations (Figure 2.21).

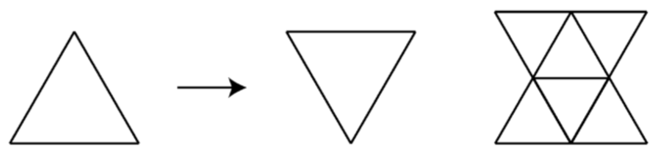
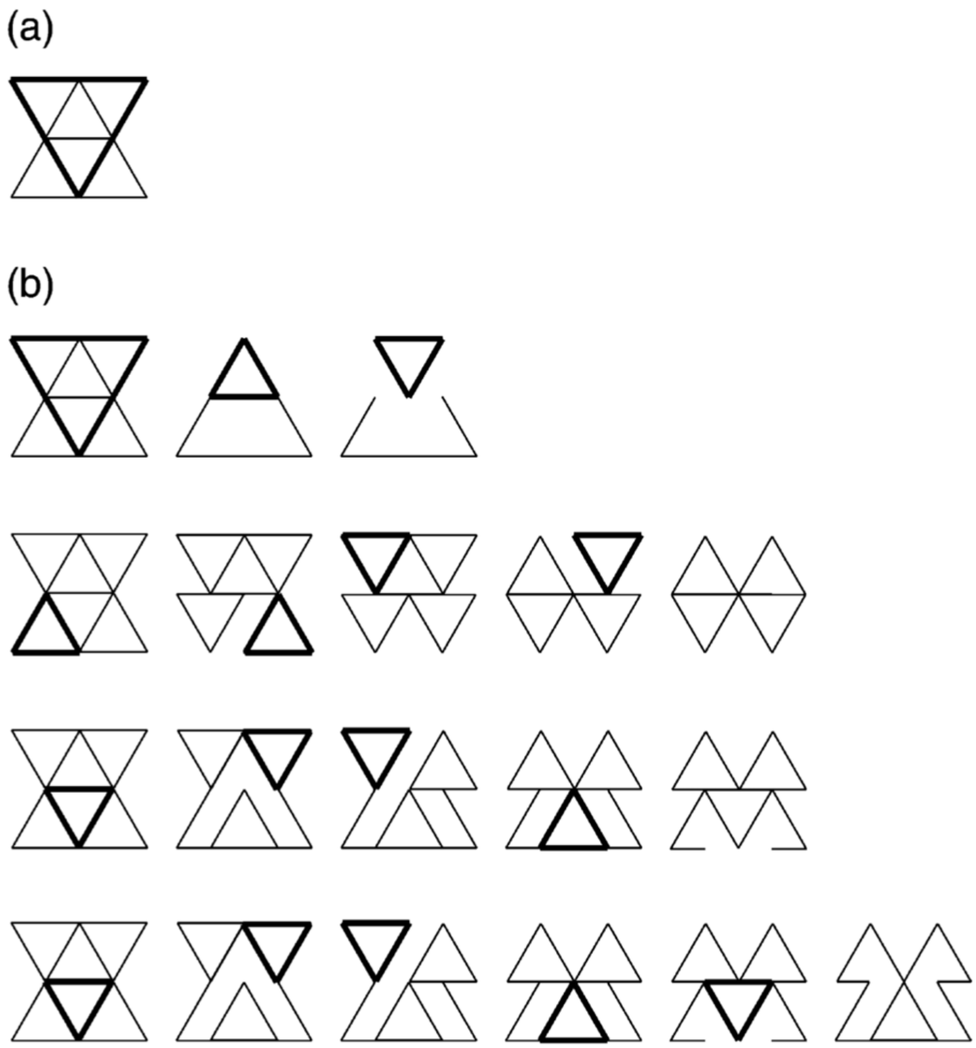
	*Initial shape and shape rule.*
	*Designs in the language defined by the initial shape and shape rule.*

Figure 2.21 Generative designs using shape-rule applications (McCormack et al., 2004, p.5).

Starting with initial shape, rule is applied with the shape's transformation documented. In a similar approach to Stiny and Gips (1971) generative art formations (Figure 2.21), McCormack's grammar illustration and language demonstrates the shape grammar process in creating a variety of pattern design formations. The grammars provide the flexibility yet the structure from which the shapes evolve in order to maintain core identity for the generated design creations. Identifying initial shape and their spatial rule engagements, shape rule applications can further develop and generate more designs of the same style. Knight (1993) defines shape grammar, "a vocabulary of shapes and a set of spatial relations that correspond to different arrangements of shapes in the vocabulary. A set of shape rules defined in terms of these spatial relations, together with an initial shape, comprise a shape grammar" (Knight, 1993, p.117).

In the analysis of a design style, the first step is to obtain the vocabulary of shapes and their spatial relations. The dynamics of spatial relations among shape arrangements identify the shape rules within a style. With a defined initial shape from which design generation begins, an established grammar of the design style language is determined; one of specific shapes and shape rules set by their spatial relations. These measures of shape and shape rules are the basis for the interpretation of a design style construction; and can also be used to generate a revived form of the style using shape grammar applications through semiotic deconstruction and reconstruction of style.

Furthermore, Stiny explains that the composition of a design language is a five-stage construction: a vocabulary of shapes, spatial relations, shape rules, initial shapes, and shape grammars. Stiny elaborated that: a vocabulary of shapes is a limited set of shapes different to one another; spatial relations are the recognizable form in which shapes are organized in a certain layout; shape rules are the constructive mechanism by which spatial relations are measured, fixed, and recur; initial shapes are formed by integrating the vocabulary of shapes; and that shape grammar is specified in terms of initial shapes and shape rules. He added that an outcome in one stage may lead to several outcomes in the next. For instance, a single vocabulary can carry multiple spatial relations, and a single spatial relation can carry diverse configurations of shape rules (Stiny, 1980). Hence, the sequential application of shape rules to an initial shape creates grounds from which shape evolves; various combinations of these variables is therefore the formation of shape grammar.

2.6.2 Shapes Grammar Applications

This research investigates semiotics of brand style DNA to establish a shape grammar. Then, using the found grammars, shape grammar applications formulate and produce a prototype for generating new aesthetic design concepts to fit the brand style. As an extension of the style, the recognition and application of its repetitive sequential quality maintains the origin of brand signature and its aesthetic DNA. Allowing emphasis on a specific grammar or reconstruction approach offers an inquisitively creative advantage to the process.

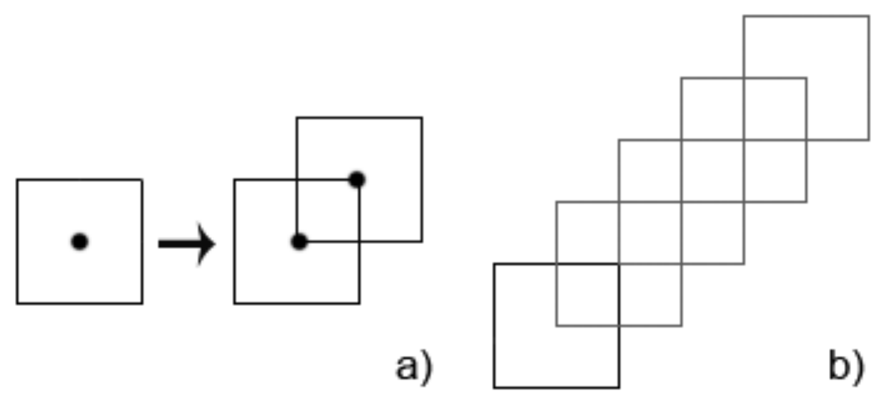
In a different design study that involved semiotic analysis of aesthetic brand DNA and creative design methods, Eves and Hewitt (2009) conduct a paper from which a model for style-branding was developed. With relevance and significance for a commercial society, the model consists of three main stages. The first stage is to establish the style grammar where deconstruction of style takes place through semiotic analysis. The second stage involves categorizing the style grammar; and the third stage is to generate a new concept by the reconstruction of the brand DNA through semiotic synthesis (Eves, B. and Hewitt, J. 2009).

It is in the semiotic synthesis that shape grammar applications take part in formulating a systematic generative technique that maintains style identity within innovative design creations. Capturing style identity and progressing its design language can be achieved via shape grammar interpretations and applications. “Defining a shape grammar in terms of the revived style is certainly the easiest and the most profitable means for exploring all possible variation within this style” (Knight, 1981, p. 216). Thus, shape grammar offers designers the capability to investigate and generate style in an operative method of shape and shape rule applications.

The use of shape grammars exceeded the artistic field to scientific, industrial and architectural fields (Trescak et al, 2009). Agarwal and Cagan (1998) presented a study of a coffeemaker design displaying the first use of shape grammar in designing consumer products; their grammar study allowed the translation of functional requirements into design parameters. The coffeemaker is made up of three main units: the filter, water storage, and base – each of which were investigated separately. Because all three of these units are arranged to encompass a coffee pot, it was considered as the initial shape for the grammar (Agarwal and Cagan, 1998). Their grammar investigation study explored how in the understanding of the designer choice of shapes, rules, and parameters provide the characteristics of the language of design, and style identity of the product.

By identifying the grammar, the generation of numerous coffeemakers using the same shape grammar applications was enabled.

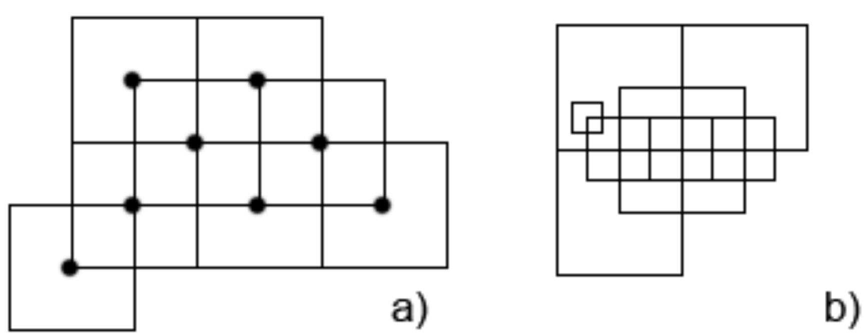
Shape grammar was also used in computing, generating new designs or geometric shapes (Knight, 1999; Stiny and Gips, 1971), which simplify the generation of prototypes. Shape Grammar Interpreter (SGI), for example, is an important computer tool that can generate designs complying with both the functionality and form of a design product. SGI is an intelligent design generator that analyses existing designs and generates new designs (Trescak et al, 2009; Chen, X.L. and Li, X., 2014). Defined, “Shape grammar is a method of generating designs by using primitive shapes and the rules of interaction between them” (Trescak et al, 2009, p. 235). With simple geometric shape, shape rules, their parametric spatial relation, implementation, and the generation of emergent shapes from sub-shape detection mechanism, SGI is a production system that creates and modifies shape grammars (Trescak et al, 2009). The following presents an example of the generation of designs using SGI (Figure 2.22).



SGI: Set 1.

a) Definition of Rule

b) Generated design



SGI: Set 2.

Generated designs using rule from (SGI set 1a.) with activated subshape detection.

a) With markers

b) Without markers

Figure 2.22 Shape Grammar Interpreter (Trescak et al, 2009, p.239).

The shape grammar framework resulted with generated designs (Figure 2.22) where shape progression took a structured transformational path under the defined rule (Set 1.), and an optimized algorithm of sub-shape detection created more generative design possibilities and formations of emergent geometrical designs under the same shape-rule principle (Set 2.).

To the context of reviving cultural identity within contemporary style, both design languages of IG and IKEA are analysed and deciphered into a set of elements and rules. The consistent rhythmic features of both styles signify unique elements of geometry (shapes) and rules of symmetry (shape rules). For the IG, all patterns derive from basic geometries that multiply into intricate designs based on simple shape-rule applications; and as for IKEA, their simple functional approach maintains the basic geometries of their aesthetic style identity. Geometric elements and rules frame each of the IG and IKEA identities; and, for them to integrate, the geometric shapes and symmetry rule must undergo shape grammar applications.

Following the path of semiotic studies, this research presents a geometric formula for the shapes derived from both the IKEA and IG design language. Defining the specifications of their grammars provided a framework in which algorithmic design was developed. Using a semiotic design methodology entails a systematic generative technique to produce innovative design. The design outcome was rhythmic pattern creations to an integrated cultural-contemporary style (IKEA-IG). Explored as representations of shapes, the integrated pattern outcomes were generated using shape grammar applications. This effort not only provided the developed understanding of the underlying geometries, but also explored the embodiment of the cultural arts within contemporary design.

2.7 Summary

This review formed the underlying foundation from which the study developed. The literature was considered and presented for the various topics in relation to this research study. Reviewing research explorations and developments identify methods and concepts that can support the structuring and development of this research. Main topics covered were: cultural and contemporary identities; style; semiotics in design; and shape grammar.

Culture refers to customs, views, values and languages that define social groups; some of which are nationality, ethnicity, beliefs, or common interests. The importance of cultural identity also pertains to a sense of belonging to or of a certain culture, therefore identity. In a multicultural era, it defines one's sense of self and how one relates to others (Molina, 2006). Therefore, this research is in effort to revive cultural art identity within contemporary living environment.

In Kuwait, loss of cultural arts was brought about with the discovery of oil. This newfound wealth led to developmental changes that dramatically effected the social structure of its built environment, leading to loss of cultural identity. In the revival of cultural art identity, the embodiment of its essence is as necessary as its design form and characteristics. Knowledge on background, purpose, vision and ideology is essential in order to grasp identity and style; and, in the case of the arts of IG, meditative quality within its patterns.

With global success and expansions as a furniture retailer, IKEA's search for cultural art incorporations creates grounds for the possibility to revive and unfold different cultural arts globally within today's multi-cultural society. Therefore, IKEA is exemplary as the vehicle by which reviving the cultural art of IG within contemporary design can be achieved. Background on both the cultural arts of IG and the contemporary design of IKEA was addressed. While the IG style is tied to its Arabian cultural identity, IKEA's style is tied to its Scandinavian cultural identity. This is evident in both design styles, from architectural structures to interior design, furniture, and artifacts. The Scandinavian design empire, IKEA, takes a minimalist approach in its furniture design style, and is modernist in its mass-productivity. As for the IG, it is not of a minimalism nor modern design style as it embraces cultural significance and ornamentation. Yet, both maintain simple geometric forms and repetitive pattern. Bridging both design styles by having the IG integrated into IKEA's design language is a way for evolving the cultural art of IG into contemporary design; therefore, reviving the arts.

Contemporary design is current and is ever evolving with time. It is more of an ever-changing trend than a style. For the purpose of this study, the two style identities are integrated via semiotic methodology and shape grammar applications. This design strategy allows both styles to be embraced as one, encompassing both identities. For both styles of design to be investigated, analysed and synthesized, this research undergoes a semiotic study. Conducted to identify elements of style in the design language of the IG and IKEA styles, a semiotic deconstruction of style takes place. The elements are to be defined and analysed in order to ultimately find grounds for both styles to synthesize. By recognizing the link honest to each of the cultural and contemporary styles, a semiotic reconstruction of an integrated design language of style is enabled.

A series of papers on the study of style were presented focusing on design language, design process, and designers as well. Style is defined and reviewed for its diversity, variety and flexibility within design. Chan (1995) defines and discusses style as a construct consisting of common features and specific factors; applied in a constant sequential manner, the process is that of generating new design (Chan, 1995). A design range is possible within a style, one that is of the same design language. Distinctive and recognizable common features across a product design group is the measure of style. As Chan explains, in his study of style, how style can be analysed and generated; thus, reaching the understanding of the science of style. Common features are discussed as aspects of a design language that entail factors of style, such as meaning or identity, pattern, and physical form characteristics (Chan, 2000). In the maintaining of common features and factors, style progression is facilitated.

Understanding cultural identity, style and design language help unfold the steps taken to revive cultural arts by allowing them to intertwine with, and be part of, contemporary design. Style deconstruction and reconstruction was also discussed with clarifying concepts pertaining to design and the language of design. To identify design language, shape grammar provides a rule-based system of defining and generating style. Thus, in shape grammar, style is considered a language of design where style elements are represented as shapes and rules of their special relations.

Style is encoded and generated with a certain set of shapes and rules that are applied repeatedly and consistently. To help designers in practice, shape grammar approaches are a tool that can be utilized in the understanding of style, its design language, and to modify or revive its identity within a scope of style. As shapes and shape rules are defined within a style, using the same language or grammar generates designs of the same design range. The structuring of the design creations is formed of the same style elements, and therefore, of the same style.

Similarly, to measure the IKEA and IG styles, both languages of design must be investigated. As design language and its measures are further discussed and presented (Ch. 3), an identity of a cultural art form of geometrical proportions embraced within the universally known contemporary design style of IKEA emerges. The interface that merges between IKEA and IG design languages unifies the two styles, creating the evolved and integrated IKEA-IG style holding both traditional and contemporary design elements.

The parametric study further investigates the IKEA-IG style elements composed of style DNA components, holding geometric shapes and rules of symmetry, into physical form prototype manifestations. In light of IKEA's mass-production processes, developing the cultural-contemporary style into practical prototype outcomes enriches the research in attaining the style in physical form to be incorporated into contemporary interior design; in an effort to revive the cultural art of the Islamic geometries into contemporary design manufacturing. Although the cultural arts of IG are traditionally hand crafted, the cultural-contemporary IKEA-IG integration follow IKEA's production processes (that of mass-production) in its evolution within contemporary design. This also creates precision of the geometrical amalgamations and configurations, in addition to benefiting from a reduced cost of production due to machine aided manufacturing.

With a semiotic design methodology approach using shape grammar applications as a tool to form an encompassing structure that maintains both the IG and IKEA style identities, the fusion of the IKEA-IG design language into the production processes of IKEA make for a tangible defined and identified style and structural form. This is because design semiotics is effective in global product design (Zingale, S. et al 2014; Ventura, J. and Shvo, G., 2016) and can initiate a semiotic theory of form (Vihma, S. 2007). Semiotics as an approach method for design strategy in product design informs industrial design practice (Hjelm, S. I. 2002; Figueiredo, J. F. D. and Coelho, D.A. 2010; Jeong, B., 2014). Providing a prototype that unfolds feasible shape-grammars of the IKEA-IG style hybrid, allows for the cultural identity of the IG to 'evolve' within the contemporary design of IKEA in efforts for its revival.

The generated prototypes are to be examined for style recognition, preference and acceptance within contemporary design in proceeding chapters of this thesis. Recognizing and understanding people preferences is key to the success and lasting evolution of the design style outcome and for identifying and adapting any adequate adjustments if required. The following chapters further explore emerging themes in relation to the literature and the design methodology to form the foundation of this research and design proposal.

Chapter 3: Design Study Investigation and Analysis

3.1 Introduction

In this chapter, design investigation methods took place to explore the arts of IG and IKEA to attain the research objectives. As the aim of this research is to revive the cultural arts of IG within the contemporary design style of IKEA, a semiotic design methodology is pursued. Carrying a semiotic design study, the arts of IG and IKEA style are explored in relation to their cultural and social context, design aesthetic, and language of design. The design investigation carried explorations of defining and merging the two styles for the revival of the cultural art of IG within the contemporary design style of IKEA.

The design processes uncover a sequential path of style identification and formulization through methodical and creative advancements; enabling designers to understand its practical application in order to recreate the integrated IKEA-IG style. A semiotic investigation of style enables design analysis and deconstruction of style in order to define the design language and identity of the IG and IKEA styles. Identifying the design elements of both styles will enable the researcher in obtaining and analysing connections between the two styles. For both styles to maintain their core identity, the style integration must embrace the essence of the IG cultural art identity as well as IKEA's contemporary design language. To find the design link in uniting the styles, critical investigation of brand identity and aesthetic DNA is required. The semiotic study requires an iterative design process to formulate a design language of a combined style using shape grammar.

To aid in exploring each of the styles, shape grammar is used as a tool to identify, analyse and synthesize a developed IKEA-IG design language. Critical investigation of style analysis reveals and identifies essential design elements that are embedded in the style DNA and design language of each of the cultural and contemporary styles; and thus, must be embedded in the development of the style's integration to maintain their core identities as they evolve.

With the initial shapes identified, a shape grammar process then takes each variable, (or shape), through shape-rule applications derived from rules of symmetry, (or shape-rule), within both the IG and IKEA's design languages; to derive the intended integration of the styles (IKEA-IG). Variable identification and coded spatial relations of elements within the styles enables design language integration.

Having identified and established the prevalent design elements of each of the styles, design language correlation and synthesis is systematically applied following shape-rule applications derived from both the IG and IKEA shape grammar identification, analysis and synthesis of design language. Using semiotics, design deconstruction of style DNA can be derived and analysed, then reconstructed back into a design that includes both the IG and IKEA style identities.

Identifying the common shape grammars of each of the IG and IKEA design elements supports associations between the styles. This semiotic design methodology indicates a compromise between traditional and current design. The investigative process performs comparison, relation, then the merging of the styles to develop an 'up-to-date' interpretation of the IG style. To revive the art of IG, IKEA was optimized to fuse cultural art identity into a contemporary design language. Harmonizing the art of IG within IKEA's design language is beneficial for the revival of the cultural art of IG into contemporary context; and serves IKEA's search of cultural diversity integration within its product design furniture line as well.

As the geometric forms of both styles are at play (IKEA being of simple geometries and IG of complex), their composition maintains both styles aesthetic features. And, because IG is the design language being introduced into the IKEA style design range, their developed integration is in-line with the Scandinavian design movement and principles, which is also IKEA's. Focusing on the revival of the IG art form, this research will eventually produce an artifact prototype following the IKEA standards of material, colour and texture of furniture design production. Therefore, in order for both identities to develop, a structural framework of both design languages is identified to enable both styles amalgamation.

This study encourages the revival of cultural art identities within contemporary design. Using shape grammar as a tool, this semiotic design methodology unfolds the cultural art of the IG, as well as the contemporary design style of IKEA, to enable their engagement. The design study analysis and methodology lead to a geometric pattern of the developed IKEA-IG style. The following sections of this chapter highlight the design processes to accomplish the IKEA-IG style and its commercial design potential.

3.2 Semiotic Investigation of Style

This semiotic design study is proposed to discuss some aspects of style integration, within a design language. The term 'semiotic' here is taken to refer to a type of investigation which strives to incorporate the cultural art of IG in the contemporary design of IKEA. To capture the essence within each style, deep analysis of its design structure, principles, and values embedded in its design creation are addressed. The principal task of this semiotic investigation is accordingly consistent in detecting and analysing the possible structural elements lying inside the IG and IKEA style identity.

Implementing the semiotic design methodology constitutes a deep level of design language categorized and defined by shape grammars (composed of shapes and shape-rules) within each style's DNA (Figure 3.1). The identification of primitive structures was defined following semiotic deconstruction of style, only to carry an integrative design process for the two styles reconstruction. With each style holding its unique design language, semiotics enables obtaining both the IKEA and IG style DNA, and their embodiment, resulting in the accumulation of initial elements that shape style identity. Design affiliations and modifications aid in the synthesis of the IG and IKEA style within the proposed semiotic investigation.

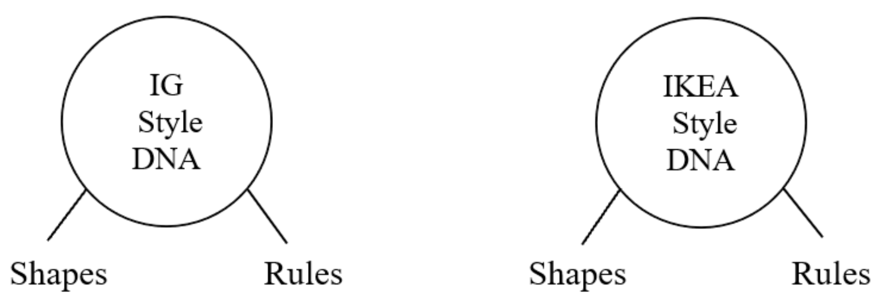


Figure 3.1 IG and IKEA style DNA.

The design methodology unfolds a scientific structured approach to deconstruct both the IG and IKEA styles, then brings them together by reconstructing their combined language. As both styles maintain a geometric nature of design, this study serves as a way to reviving a unique integrated geometric language of design under the Scandinavian design philosophy. This is because the cultural art of IG is introduced into IKEA's style, therefore under the contemporary art's design context. IKEA's simple geometry style furniture along with the Islamic geometric designs make for an ideal fit for style integration; one that harnesses cultural and contemporary identities. The semiotic design investigation reveals mathematical proportions in the design styles of IG and IKEA. Its design path informs and revives culture to the development of its cultural-contemporary art identity; the IKEA-IG style.

3.2.1 IKEA Style Semiotic Investigation

Semiotics, as described by Eves and Hewitt (2008), have the potential to instil an aesthetic character in a design. Semiotic theories include the arrangement of aesthetic design methods and compositions; this includes "colour, texture, shape and form to create expressive character. The principles embody both analysis and deconstruction, along with synthesis and reconstruction" (Eves, B. and Hewitt, J. 2008, p. 1). They argued that semiotics and design language investigation, and understanding, can enrich the depth and resulting effect on aesthetic character that forms an experience, or design identity. Hence, through semiotics, the analysis and synthesis (deconstruction and reconstruction) of aesthetic design character can be enabled (Crow, D. 2003).

Defined by the object DNA, key characteristics run through all areas that signify the object a specific identity; these characteristics can be specific to form, proportion, colour and material amongst other specifications that pertain to an object's DNA. In creating objects of the same DNA (or design language), yet are of evolving characters, forms a family that shares consistent core attributes and common values (Hewitt, J. 2008). Itten (1973) described design language, in reference to colour, in three categories: Impression, Expression and Construction. Impression being the effect visually; expression being the effect emotionally; and construction being the symbolic reference. Additionally, Morris (1971) in his theory of signs divided semiotics into three interrelated sciences: Syntactic, Semantic and Pragmatic. Syntactic being the relations that signs have to one another; semantic being the relations that signs have to objects they signify; and pragmatic being the relations that signs have to their origins, uses and effects.

The IKEA furniture designs (see Appendix B, p.268) were investigated through application of the established design semiotics methodology. Table 3.1 demonstrates a synopsis of design semiotic deconstruction of the IKEA style summarizing its design language.

• Colour	- logo: blue and yellow (native to heritage and culture –Swedish flag). - product: mix-and-match (basic primary colours or natural material; colour selection mainly focused on children's furniture and accent pieces). - wood (neutral for flexibility to paint desired colour).
• Furniture	- mass-produced, machine cut, flat-pack for easy assemblage and distribution, affordable/cost efficient, mix and match. - ex. iconic LACK table (Figure 2.10).
• Material	- sustainable, recycled and recyclable material. - flax, water hyacinth, recycled PET plastic, cotton, wood, plastic, composite wood, jute, bamboo.
• Texture	- smooth finishes and surfaces.
• Shape	- simple geometries.
• Form	- Functionalist, stackable furniture. - Variety of strict scale and proportions, practical, structural, simple, and contemporary.
• Pattern	- simple basic geometry.

• Impression (visual)	- simple, clean geometry, natural form and colour.
• Expression (emotional)	- neutral for self-expression - connection with nature
• Construction (symbolic)	- Scandinavian/ Nordic design - natural, sustainable form, functional, quality, value.

• Syntactics –	• Semantics –	• Pragmatics –
- Simple geometry - Simple colour scheme - Multi-functional - Vibrant colours	- Practical - Different shapes and proportions	- Easy assemblage - Matching / mix and match furniture - Affordable to all

Table 3.1 Semiotic Investigation of Style: IKEA.

The table summarized the IKEA design language establishing a formed basis to its style grammar, from which the shape grammars are derived (Ch. 3.3) for later reconstruction of style procedures of the design methodology (Ch. 3.4); and later tested in the research methodology (Ch. 4).

3.2.2 IG Style Semiotic Investigation

IG furniture designs (see Appendix A, p.265) were investigated for their style using design semiotics methodology. The IG design language was also deconstructed as presented in Table 3.2.

• Colour	- calligraphy: gold, black. - tile: reds, oranges, yellows, browns, white, blues, aqua blue, greens. - furniture: natural material.
• Furniture	- rich natural wood & wood carvings. - tailor made by local craftsmen (Figure 3.4). - 3, 4, and 5-point geometric structures (ex. 8-leg table; legs come from corners of geometry table-top piece).
• Material	- carvings on natural wood. - local to Kuwait, seashells for decorative input on furniture (Figure 3.4).
• Texture	- smooth finish, wood carvings, decorative design.
• Shape	- simple and complex geometric pattern compositions - 3, 4, and 5-point geometries of pattern initiations
• Form	- geometries derived from a circle. - calculated precisions; perfection of geometry. - symmetry, unity and complexity. - structural, flexibility in scale and proportion.
• Pattern	- 3, 4, and 5-point geometric formations. - symmetric transformation (glide, mirror/reflect, rotate, overlap). - expand, multiply. - multiplicity and simplicity, repetitive, infinite.

• Impression (visual)	- circular form using straight line geometries.
• Expression (emotional)	- unity, multiplicity and simplicity.
• Construction (symbolic)	- creation, infinite, pathfinding ‘star’, contemplative.

• Syntactics –	• Semantics –	• Pragmatics –
- Straight lines - Natural wood - Simplicity & multiplicity	- Scales variations - Pattern arrangement - Calculated precisions	- In-tune with creation - Nature and perfection - Infinite

Table 3.2 Semiotic Investigation of Style: IG.

The table summarized the IG design language establishing a formed basis to its style grammar, from which the shape grammars are derived (Ch. 3.3) for later reconstruction of style procedures of the design methodology (Ch. 3.4); and later tested in the research methodology (Ch. 4).

3.2.3 Comparing IKEA and IG Semiotic Processes

While Scandinavian design (IKEA) is influenced by modernism and minimalism, it lends itself to a 'form-following-function' approach in its design language. IG on the other end, is a traditional art form that is glorified within its mathematically calculated and structured design language.

<u>Similarities</u>

- both benefit from symmetry, basic geometries, simplicity, structural forms and wood material.

<u>Differences</u>

- IKEA's vision	- *'to create a better everyday life for the many people.'*
- IGs vision	- contemplation, unity, and infinite design, perfection in creation.
- IKEA style and furniture	- contemporary - more colour contrast/selection - multiple mix and match parts - simple structure, machine cut, mass-produced - flat-packed (easy of transportation and self-assemblage)
- IG style and furniture	- cultural, traditional - pattern geometries, hand-made (one of a kind) - multiplicity/complexity and simplicity - multiple yet fixed parts

In the design semiotic deconstruction of the style elements investigation of IG and IKEA, colour, texture and materials were not used in the research study methodologies, as this research focuses specifically upon shape grammars. Nevertheless, other elements of the semiotic deconstruction of the styles are addressed in the conclusion chapter as recommendations to further this study. The following sections will clarify and demonstrate the steps from which the design study is developed to incorporate both the IKEA and the IG design languages.

3.3 Identifying IKEA and IG Shape Grammars

Focusing on shape, form, pattern and symmetry, a shape grammar (SG) tool is used to identify the IKEA and IG elements within its design language. Design language is a design created with variables (or initial shapes - IS) that follow a specific set of rules (shape rules - SR) of composition, repetition, and creative processes. To identify a design language of a style is to identify its elements, or DNA coding, and the unique formations that hold its identity.

A Shape Grammar methodology enables the analysis and synthesis of design language by deconstruction and reconstruction of style (Eves, B. and Hewitt, J. 2009). In essence, an extension of, carrying the same coded DNA, therefore maintaining its identity. Derived from new-found shape grammars (IS, SR, and shape-rule application - SRA) adopted from both style analysis (deconstruction), and subsequent synthesis (reconstruction) of the analysis, an integrated style of contemporary Islamic form arises.

To identify the design language of IKEA and the IGs, a shape grammar approach is taken to extract core 'brand' elements of the styles. With symmetry as an established coded similarity within both styles (Ch 3.2), it is taken into the IKEA-IG correlation of SRA processes. Laying within the symmetry are set SR structures and limitations that guide pattern formations. Identifying, comparing and integrating the IKEA and IG shape grammars, entail these scientific and creative methods to generate a new design holding a cultural-contemporary style synthesis.

3.3.1 IKEA Shape Grammar

IKEA's 'form-following-functional' style lends itself to a simple structural conformity of the modernism design movement. With its fast mass-production furniture supply industry, IKEA maintains its principles of the Scandinavian movement – that of modernism and minimalism (Ch. 2.3.1) and sustains simple functional design productions. With mass-produced machine-cut products, IKEA is known for its flat-packed stackable furniture. Through the wide variety of selection in its furniture collection, simple geometric structures of matching (of the same line of design) or mix-and-match options of products are provided to the customer. The variety offers the customer a choice of preference within their selection. Different specifics, such as size/scale and product colour, provide the opportunity for the customer to have an input in the creation of the combined whole furniture item. This applies to shelving and units, cabinets as well as many other types of furniture, including tables.

LACK side table (Figure 2.10), is iconic to IKEA's functional design style. Basic geometric forms and simple straight lines exemplify the Scandinavian design principles. IKEA's LACK series (Figure 2.10) for instance, is one range of furniture design of IKEA's product lines; sustaining symmetry, basic geometry, and smooth finishes. From the semiotic study of IKEA design language, it is concluded that the identified IKEA 'shapes' are of basic geometries derived from forms that configure and structure the path of their creative design process. The identified IKEA 'shapes' are – circle, square, triangle, and rectangle.

3.3.2 IG Shape Grammar

Geometry is an essential design generator in the Islamic arts. Islamic arts are distinct for using the art of geometry in their creative designs. Geometry represents order, harmony and beauty in calculations, scale and proportion. Their structural forms embellish a geometric configuration of pattern design. The IGs range from simple to complex pattern compositions. All the patterns derived from basic geometric shapes undergo a design process following rules of symmetry. Symmetry is embedded in the structural language of the IGs, in which simple elements (or shapes) are geometrically configured, based on arithmetic consistencies in a symmetry-rule construction foundation (shape-rule), into infinite, complex yet calculated patterns (shape-rule application) that exuberates the essence of its cultural and aesthetic identity. These shapes multiply mathematically and rhythmically to create a visual impression of the arts of the IG.

IG patterns all came from the same origin – a circle; the essence of all geometric forms symbolizing unity, multiplicity and the infinite. Mathematical, and symmetrical, compositions formulate patterns in family group formations. Most common pattern compositions are derived from family origins that are multiples of three, four, and five-point geometries (Figure 3.2).

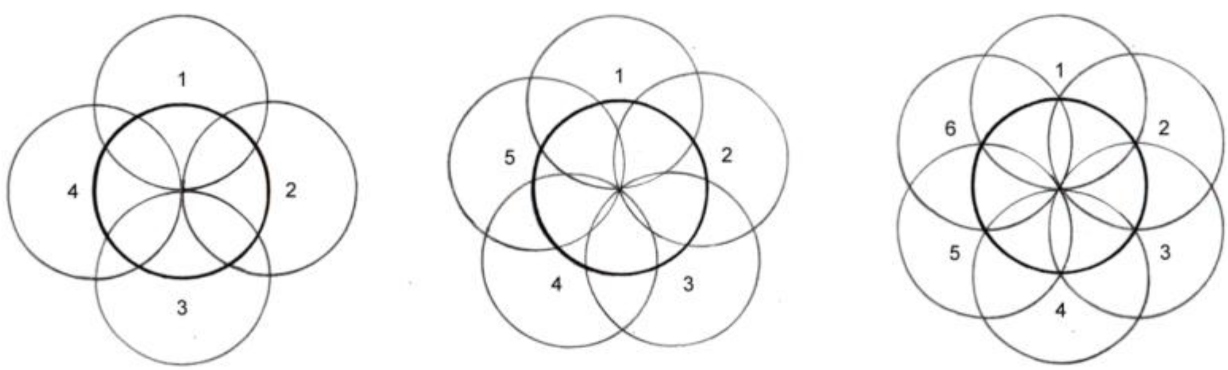
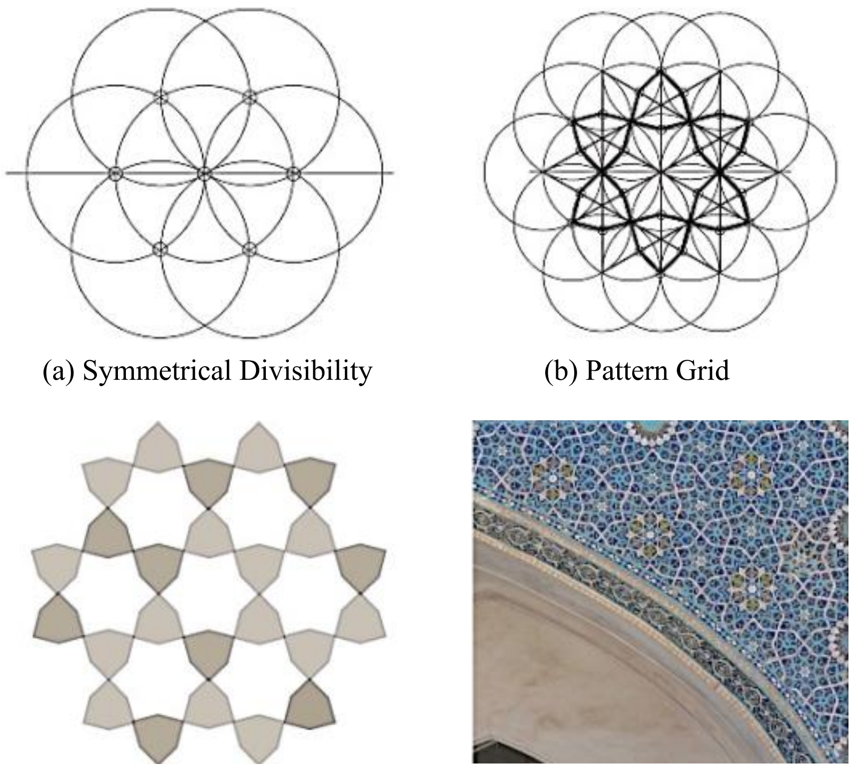


Figure 3.2 Origins of the Islamic Geometries.

A very strong link between art and mathematics is evident as the interplay of math and design create infinite patterns of perfection holding a meditative quality – an experience of art and science in unity. As the IGs formulate, math and symmetry take part in a creative and systematic process of multiplicity and unity (Figure 3.3). Evolving, and expanding into intricate infinite pattern creations, the IG represents a culture and identity in the arts.



(a) Symmetrical Divisibility (b) Pattern Grid

(c) Shape Extraction (d) IG in the Fabric of Society

Figure 3.3 IG Calculated Precisions (Henry, R., 2008).

The complex, yet calculated precisions are based upon symmetrical divisions, within a circle, connecting straight lines to form basic shape geometries. Most shapes used in the underlying patterns of the IG are 3-point geometries forming a triangle, and 4-point a square, and 5-point a pentagon. IG uses symmetrical divisions of a circle to ‘connect the dots’ (Figure 3.3a), as a grid and starting point from which, the basic shapes initial pattern formation takes its shape (Figure 3.3b). With consistency and repetition under rules of symmetry, the IG patterns reveal their form (Figure 3.3c). The IGs infinite pattern forms are flexible within their mathematical nature. Of various scales and proportions, simple to complex, the rich design language of the IGs speaks of a Middle Eastern art cultural identity (Figure 3.3d).

The Islamic arts take form in a variety of application procedures and on different design 'canvases' or settings (Ch. 2.2). Varying from embellishments of architectural elements (such as in Figure 3.3d) to interiors and furniture, the following image (Figure 3.4) presents the arts on a traditional table design furniture item. The table presents more than the IG pattern ornamentation, but also displaying the traditional structural form, aesthetic, and construction material of the IG table.

Figure 3.4 Traditional IG Table.

The heavy wood construction is decorated with carvings of IG and arabesque pattern designs (which also follows an IG trail), while the table-top structure takes its form from an IG basic shape multiple. This 8-cornered octagon table-top form (deriving from a 4-point geometry), also influences the legs of the table. With '8-legs' to its 8-corners, IG tables are a distinguished piece of interior design furniture. In its 'uniqueness', the table 'legs' are actual panels on each side of the table, instead of legs on each corner. An octagonal table-top and rectangular panels for table-legs, the form of its structures also derives from basic geometric shapes. Also, adding to its highly decorative appeal, the panels are decorated with Islamic art forms. This local Islamic table, to Kuwait, also includes the use of seashell embellishment inlays on the table-top and panels. The table structure is a fixed hand-made traditional piece, made-up of table-top and panels, maintaining its IG symmetrical proportions in decorative aesthetics and structural design creation.

Basic geometric shapes from which the IGs evolve, expand and multiply are the basis of this styles' design language. By extracting 'shapes' from the geometries, the identified IG 'shapes' are circle (from which all shape derived); diamond (or square); pentagon; hexagon (or triangle); and octagon (also a multiple of the 4-point geometries).

3.4 Comparing and Synthesizing IKEA and IG Grammars

To understand the design language of style, shape grammar was used for this study to identify geometric shapes, shape-rules (SRs), and shape-rule applications (SRAs). In reviving the cultural art of the IG style within contemporary design, the design language of both the IG and IKEA styles is derived, identified and synthesized through semiotic deconstruction and reconstruction using shape grammars.

Basic geometries are embedded and present in both the IKEA and IG style. From the shape grammar study, the identified shapes are compared and related in order to integrate the two styles (Figure 3.1). Using a shape grammar approach, the IKEA and the IG shapes are identified:

- IKEA shapes: circle, square, triangle and rectangle.
- IG shapes: circle, diamond, pentagon, hexagon, and octagon.

The following sections of this semiotic design chapter cover the IG and IKEA style shape grammar investigation (semiotic analysis) to identify the styles (deconstruction), and integration (semiotic synthesis) to evolve the styles (reconstruction) using shape, shape-rules, and shape-rule applications. This ultimately is in effort to revive the cultural art of the Islamic geometries into the context of contemporary design.

3.4.1 Shape Rules

There are common shapes among the IG and the IKEA shape grammars; IG having the majority of shapes and pattern designs as multiplicity in its language, while IKEA sustains basic geometries. In both design styles, shape ‘circle’, the centre of all symmetrical alignments, is identified. IKEA’s ‘rectangle’ shape can also be found in the IG shape grammar based on the cultural arts’ repetitive nature, or shape-rules, that guides its path.

For example, IKEA’s rectangle is two ‘square’ shapes side by side (Glide), making the rectangle shape applicable towards the IG shape grammars. In that understanding, IKEA’s square shape also equates to the diamond shape of IG (Rotate), as well as to the octagon (Rotate and Overlap); and IKEA’s triangle to IGs hexagon (Mirror and Overlap). Shapes in the 5-point geometries are not included in this study due to symmetrical technicalities and no familiarity to IKEA's design language.

All the shapes from IKEA are basic geometries, and, embedded in all IG patterns are basic geometries; in other words, IKEA is already embedded within the IGs simplest form of shape that initiates the creation of the generated patterns. This flexibility in shape transformation lends itself to basic rules of symmetry found in both IKEA and IG design language, from which the shape-rules derive: Glide, Mirror, Rotate and Overlap. Clarifying these shape-rules, Figure 3.5 displays a 'square shape' and how it behaves under the symmetry shape-rules discussed; as well as a 'demo shape' transformation under the same symmetry shape-rules discussed providing a more tangible demonstration of their applications. These four main shape-rules (glide, mirror, rotate, and overlap) are the first layer of the symmetry shape-rule applications.

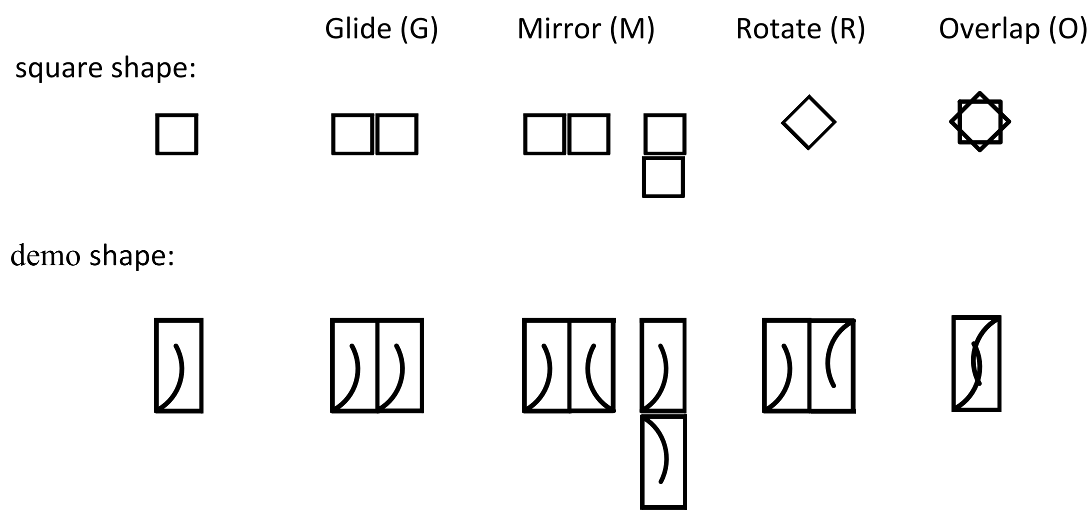
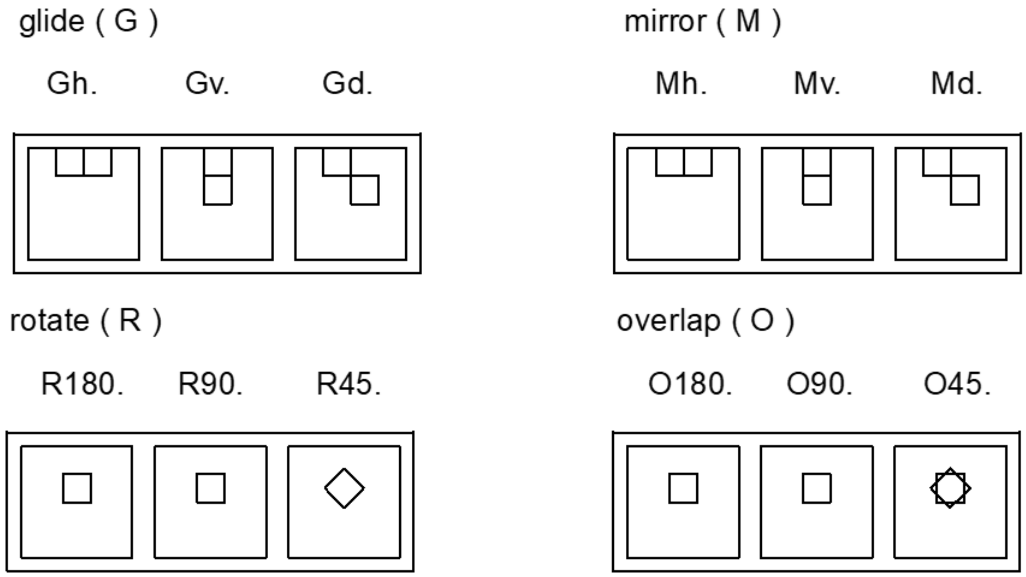


Figure 3.5 Shape-Rules and Application.

3.4.2 Sub Rules

Within each of the shape-rule combinations, deeper analysis reveals sub-rules which are directional in nature (Figure 3.6). Sub-rules direct, giving a specific directional description of the shape-rules to be applied. Sub-rules address: horizontal transformation (h), vertically (v), or diagonally (d). This flexibility and quality of transformation lends itself to IGs design language of unity and multiplicity within the symmetry.

square shape:



demo shape:

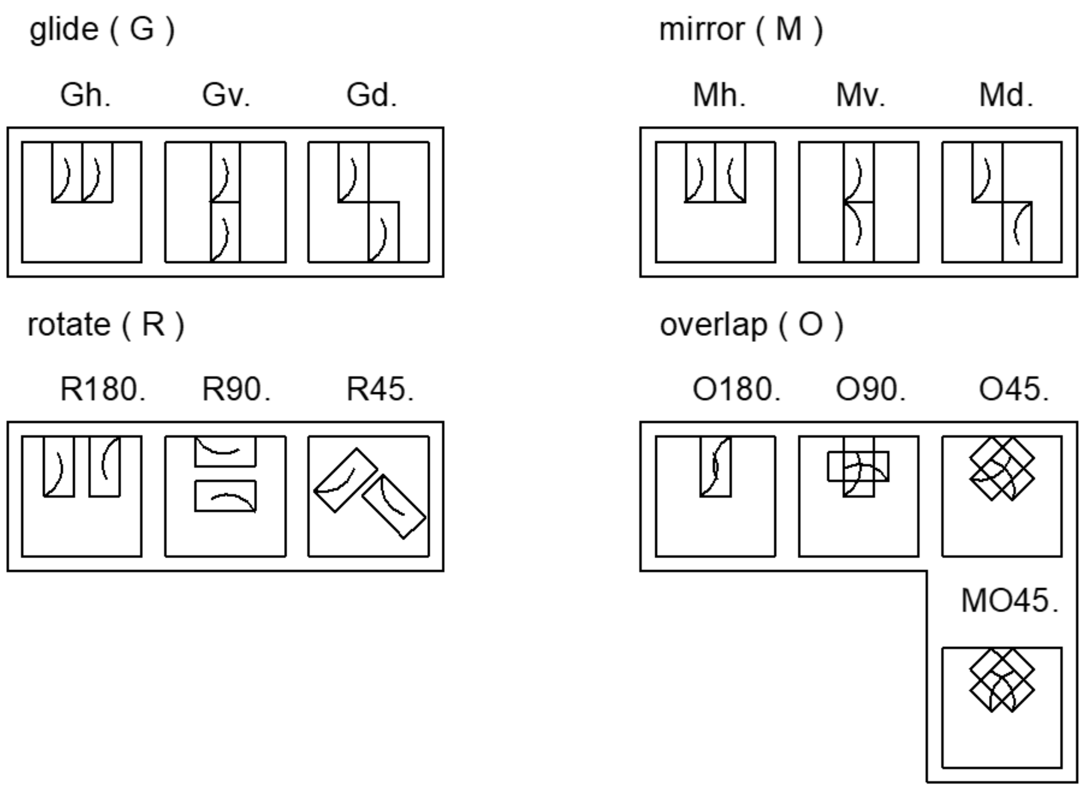


Figure 3.6 Shape-Rule and Sub-Rule Application.

Clarifying their application, Figure 3.6 displays a square shape transformation under shape-rule applications – directed by sub-rule specifications. The 'demo shape' transformation provides a more detailed illustration of their functions. Within the sub-rules, a more descriptive directional detail can also be implied as to the angle of the sub-rule application: 180°, 90° or 45° angles.

Symmetry plays a fundamental role in the cultural art of IG, and also takes part in IKEA's design language as its style is based on simple, functional and practical design. As IGs design language is embedded with basic geometries that evolve and multiply (by exercising symmetry) to create its pattern formations, IKEA's design language is of basic geometric forms aligned in symmetry. Therefore, similar shapes of basic geometries are also found within both design styles. From IKEA's basic geometric form and IGs basic geometries found in its patterns, common geometric shapes are derived and identified; as well as a selective combination of the found common identified geometric shapes.

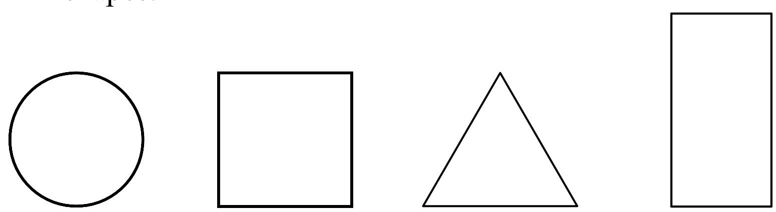
3.4.3 Shape Grammar Integration

In addition to the seven identified shapes of both IKEA and IG shape grammars, a combination of their common primary found shapes are merged producing more initial shapes to work with for the new IKEA-IG proposed design language. Combined IKEA and IG identified shapes are: circle ∩ square = arched-square, circle ∩ diamond = arched-diamond, circle ∩ triangle = arched-triangle (Figure 3.7).

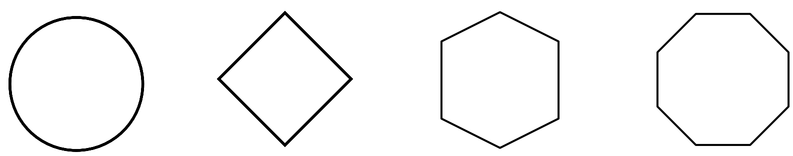
Of the seven identified shapes of the IKEA and IG design language, 'circle' is the common shape found in both style's shape grammars. Therefore, shape 'circle' is combined with the other selected shapes to be merged. Shape 'circle' combined with 'square' (found in IKEA and also common and equal to 'diamond' found in the IG under SR and sub-rule R45°; Figure 3.6) produces shape 'arched-square'. In retrospect, 'circle' combined with shape 'diamond' (found in IG, also common and equal to IKEA's square shape under shape-rule and sub-rule R45°; refer to Figure 3.6) produces 'arched-diamond'. And lastly, combining the primary shapes 'circle' and 'triangle' (found in IKEA, also the derivative of IGs 'hexagon' of three-point geometries) produces 'arched-triangle' (Figure 3.7).

In doing so, notice that the shape 'circle' influences the straight-edged shapes of 'square', 'diamond' and 'triangle', by adding curvature. These derived shapes from both IG and IKEA total up to ten initial shapes to be studied (Figure 3.7). Not directly included in the shape combination is ‘rectangle’ (being more inclined with the IKEA style); yet is still within the design language of the applied symmetry shape rule (Gh or Gv) to shape ‘square’. Also not directly included are shapes ‘hexagon’ and ‘octagon’ associated with the IG style as they are not primary shapes; yet are still multiples of the basic three-point and four-point geometries.

- Identified IKEA shapes:



- Identified IG shapes:



- Combined IKEA-IG shapes:

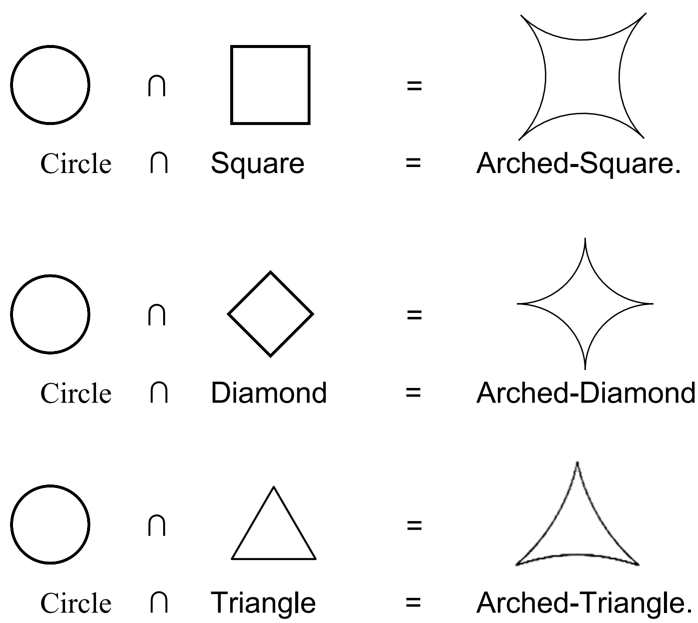


Figure 3.7 Identified IKEA, IG, and IKEA-IG Shapes.

Although the IKEA and IG grammar has limited choice or decision points, it does define a design language of both styles and, through constraints of symmetry, sets the precedence for grammars of a more abstract form-related identity.

These new grammars take advantage of the powerful property of emergence, which is fundamental to SG. For application, computer implementation ensures accuracy of this parametric study's transformations, further motivating robust grammar interpreters able to recognize emergent shapes and support the processes in the prototype production stage of this research.

3.5 IKEA-IG Style Pattern Design Formation

Combining the IKEA and IG grammars results with a variety of possibilities and outcomes from which their integrated language develops. The IKEA-IG DNA, or shape grammar (SG), range of concepts (Figure 3.8) is where deeper explorations of the intersection of the style synthesis takes place. Exploring the range of concepts reveals the best-balanced compromise, holding parameters from both IKEA and IG design styles, revealing an integration of the IKEA-IG SG and design language.

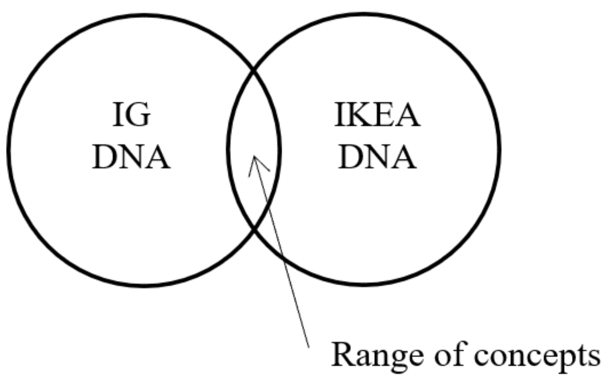


Figure 3.8 IG and IKEA Range of Concepts.

Identified shapes from the IKEA and IG style and their combinations (Figure 3.7), are taken through the symmetry SRs of this study: glide (G), mirror (M), rotate (R) and overlap (O); as a preliminary exploration of an integrated IKEA-IG style pattern generation (Figure 3.9). To generate pattern, each initial shape 'corner' is put through the SRAs to start pattern formation. Focusing only on the shape's corner – based on symmetrical divisibility of the shape – the following figure illustrates initial shape, shape-symmetry, shape-corner, the symmetry SRs (not highlighting sub-rules) and the pattern outcome of the SRAs.

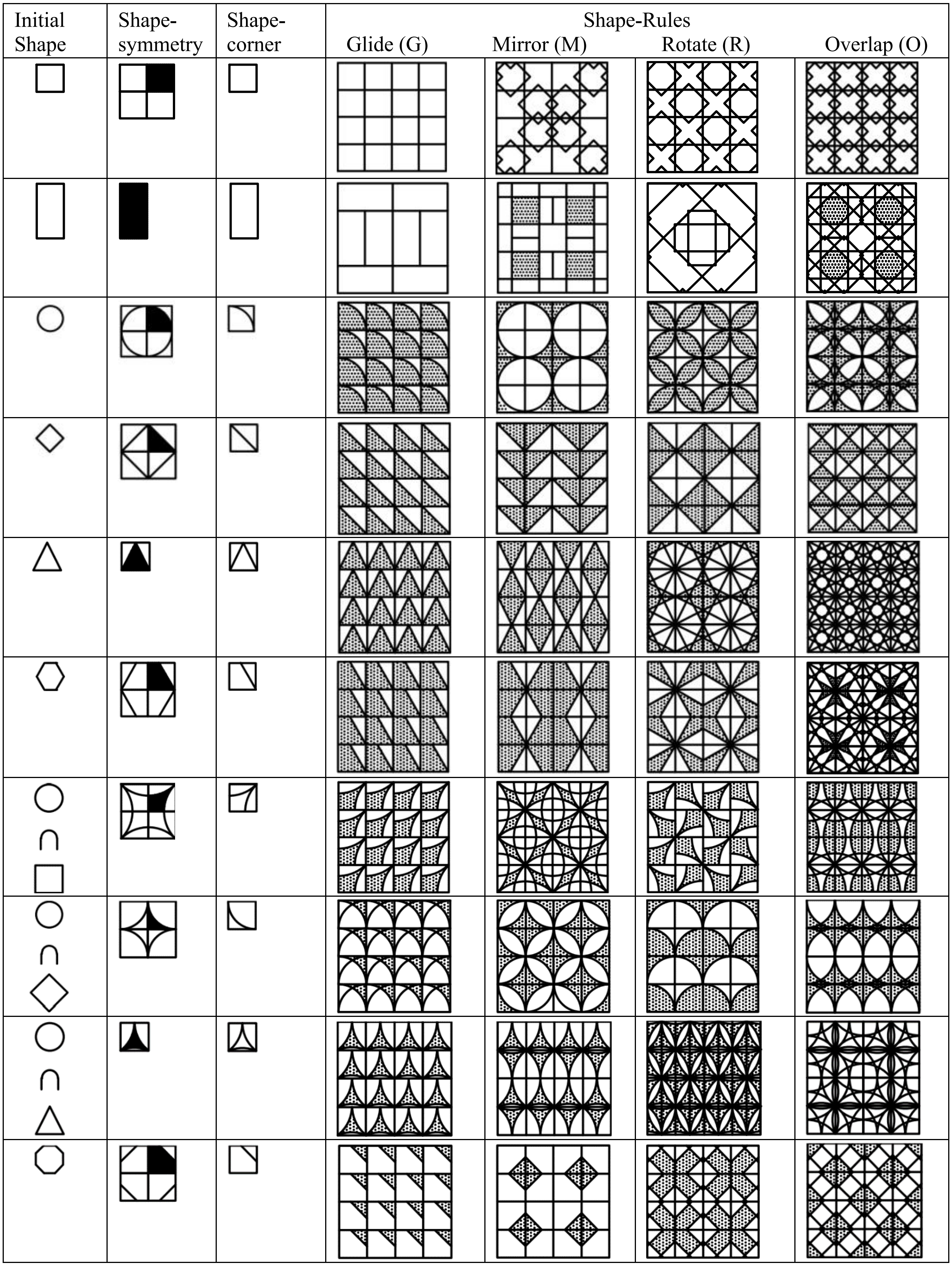


Figure 3.9 Preliminary IKEA-IG SRA Pattern Outcome.

3.5.1 Pattern and Shape Grammar Observation

Notice, some pattern outcomes hold more than one rule-application but still is primarily of the shape-rule category it is illustrated under. For instance, the illustrated pattern under shape-rule 'rotate' (R) applied to initial shape 'square' (Figure 3.9) obtains three codes of symmetry, or shape-rules: 'rotate' (R), 'mirror' (M) and 'overlap' (O). This interchanging flexibility in transformation lends itself to the IG design language and the symmetry rule qualities creating infinite contemplative pattern formations allowing for a wide variety and diversity of pattern concepts that hold an identical and unique shape grammar aesthetic DNA.

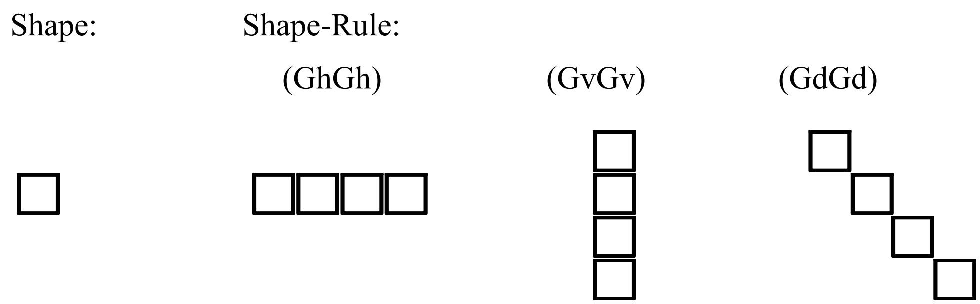
In both shape and shape-rule, each of the IKEA and IG grammars have shared commonalities as well as individual influences pertaining to each specific cultural identity. A visual observation of the preliminary IKEA-IG style pattern designs (Figure 3.9) reveals a combination of simple and complex pattern outcomes as both styles of this design study integration are of simplicity (the IKEA style) and multiplicity of intricate pattern formations (the IG style). Pattern compositions emerge from repetitive and sequential shape and shape-rule applications, engaging both IG and IKEA elements as both style DNAs are encompassed.

Due to the evolving and repetitive nature of the grammars (found in the IGs), limitations must be addressed to the number of transitional advances within a repetition sequence (composed of shape-rules and sub-rules); to maintain simplicity in pattern formation (following IKEA's minimalist design criteria) as well as the definitive SG for the IKEA-IG style design language integration. This interrelation allows each of the IKEA and IG design language to imprint their style into the creation of the IKEA-IG style, maintaining their design languages while reviving the cultural arts into contemporary design creations. Further explorations and investigations are to take place in order to grasp core aspects of both styles in a definitive and structured design language of the IKEA and IG style synthesis and integration.

3.5.2 Pattern Formation

Both shape-rules and sub-rules evolve transformational qualities of pattern formations. Their pattern varieties relay on the shape, shape-rule, sub-rule and the sequential order of their appropriation and implementation. A deeper look into pattern formation using SGAs is presented in Figure 3.10 exploring generative design processes of structured shape-rule and sub-rule applications. Focusing on successive rule and sub-rule applications, an initial shape 'square' is carried through a sequential transformational path of single and multiple unit combinations for precise and calculated generative pattern outcomes as presented below:

- Single sub-rule category applications to shape ‘square’, using shape-rule (G):



- Multiple sub-rule category applications to shape ‘square’, using shape-rule (G):

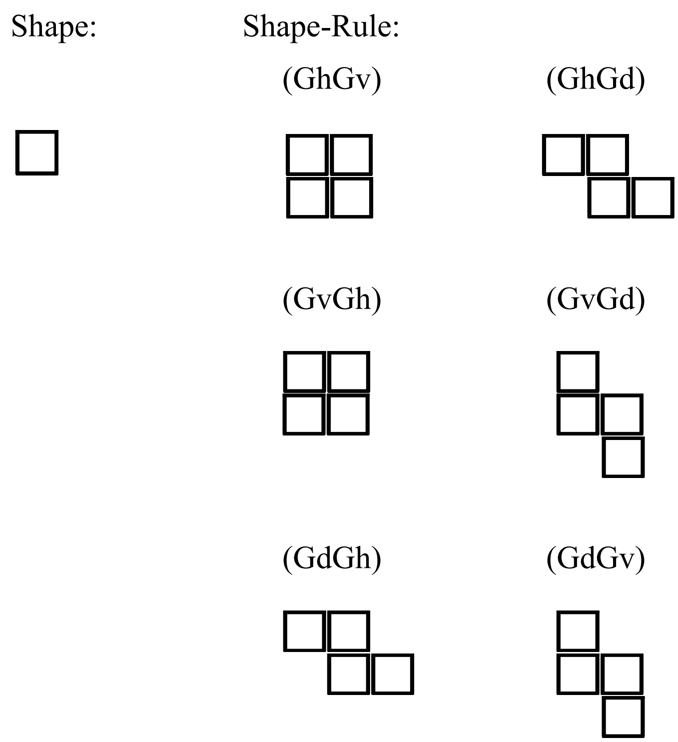


Figure 3.10 Single and Multiple Sub-Rule Transformations: Level 1.

Both shape-rules and sub-rules can be applied as a single unit of rule repetition or multiple consecutive functional rules to shape transformational and pattern formation (Figure 3.10). The directional nature of the sub-rules (v, h, d and 180°, 90° or 45° angles), only adds another layer of informed structure to its shape-rule grammars. Having that the SR applied to IS 'square' was 'glide' (G), only sub-rules 'vertical' (v), 'horizontal' (h), and 'diagonal' (d) were applied as the angle sub-rules of 180°, 90° and 45° only apply to SRs 'rotate' (R) and 'overlap' (O), while sub-rules (v), (h) and (d) apply to SRs (G) and (M).

The interchangeable, sequential combinations of transformational processes apply not only to sub-rules, but to the shape-rules as well. Shape-rules can be applied as a single set as presented in the previous example (Figure 3.10) of sub-rules using shape-rule (G); or as a set of multiple shape-rules, of successive and repetitive applications as demonstrated below (Figure 3.11a.). The 'demo' shape is presented to demonstrate a deeper understanding of two-rule applications (Figure 3.11b.). Two-rule input is applied, as well as its sequential inverse, clarifying shape-rule processes of shape transformation and progression and the effects they imply.

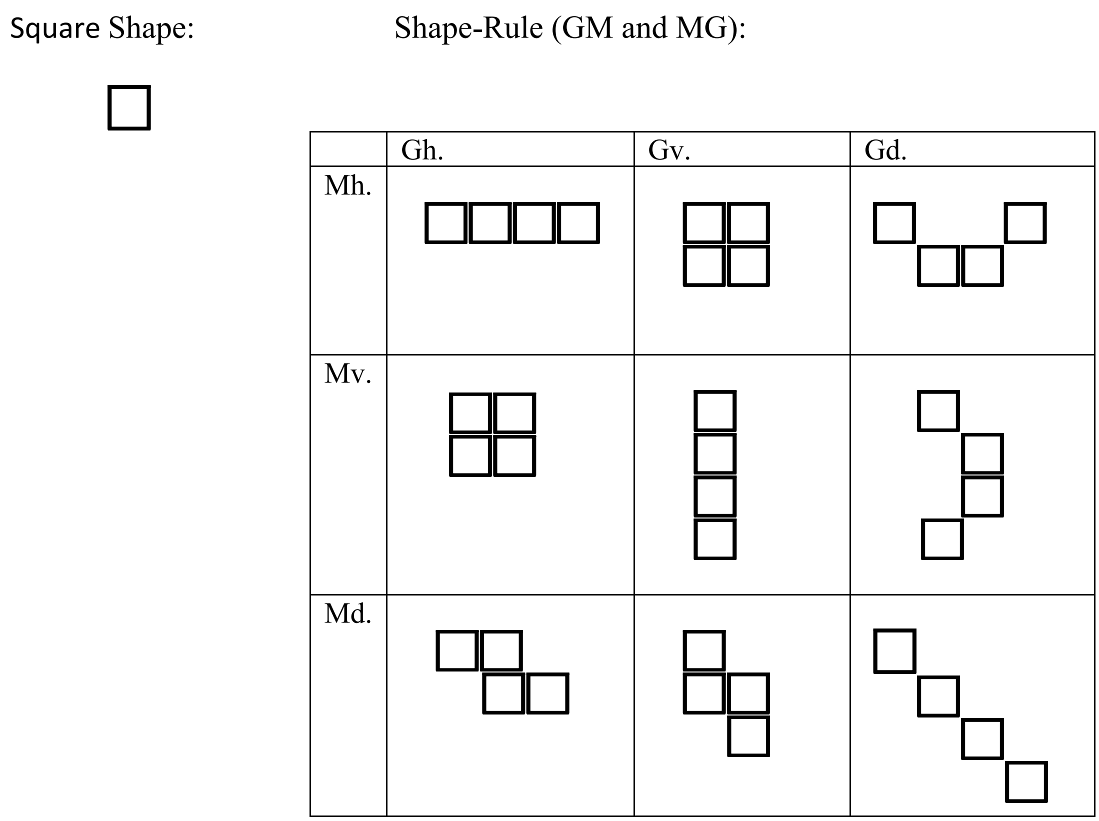


Figure 3.11(a) Two Shape-Rule Applications with Sub-Rules: Level 2 (Shape Square).

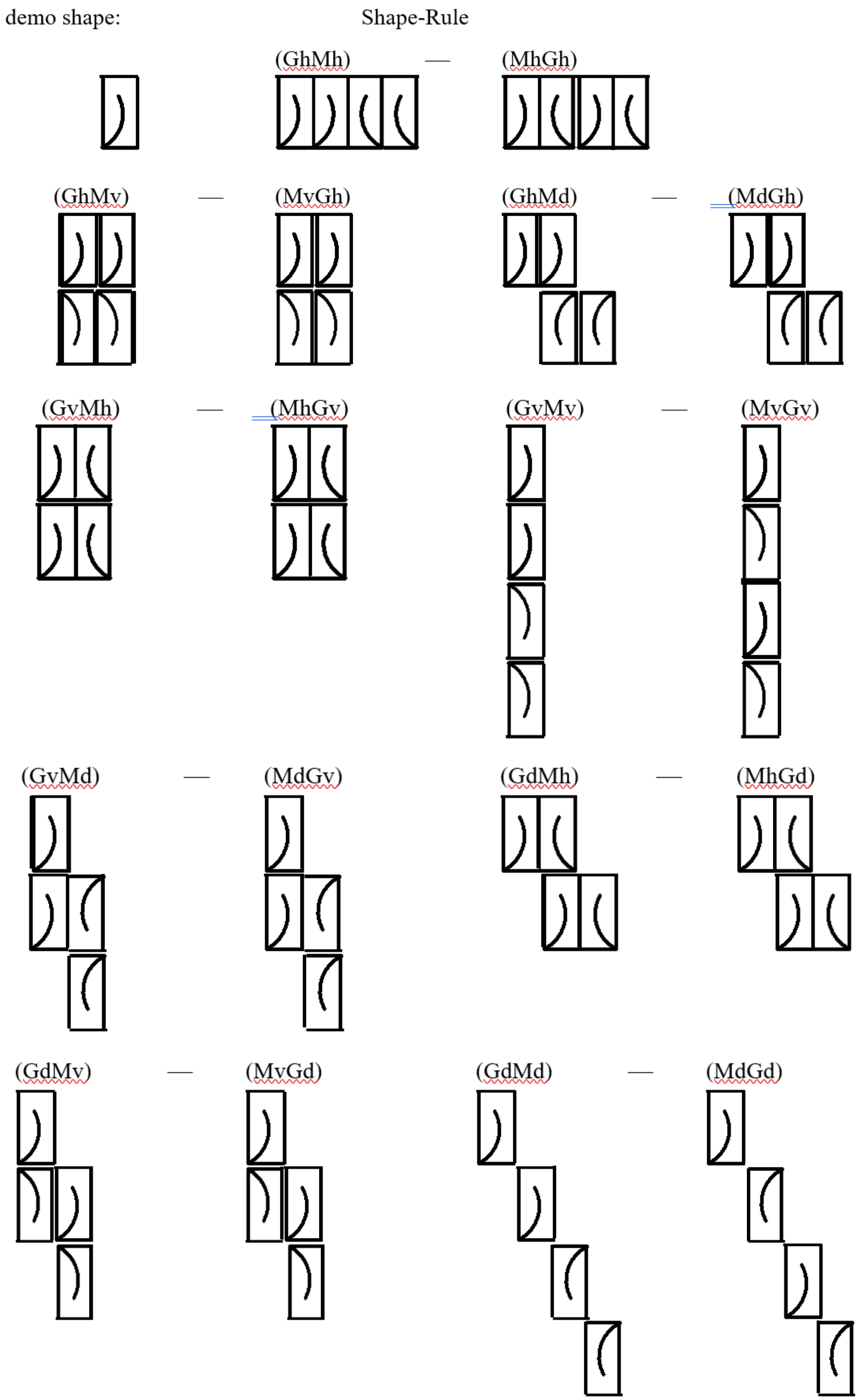


Figure 3.11(b) Two Shape-Rule Applications with Sub-Rules: Level 2 (Shape Demo).

In the shape grammar analysis, it is found that applying shape-rules, and their sub-rules, to shapes may result in different or identical visual patterns output under different shape-rules and sub-rule applications. For instance, from the application of the two shape-rules (GhMh) and its inverse (MhGh) onto shape 'demo', the pattern outcomes are different yet similar due to the shared symmetrical properties within the identified shape and shape-rules; whereas (GhMv) and (MvGh) maintain identical visual outcomes using different shape-rule applications. From this observation, it is derived that shape-rules that are directed with different sub-rules, result in the identical pattern outcome of the reversed 'shape-rule sub-rule' combination.

In effect, identical outcomes of a shape-rule with two sub-rule applications (Figure 3.11) are:

(GhMv) and its reverse of shape-rule order of application (MvGh);

(GvMh) and its reverse (MhGv); (GhMd) – (MdGh); (GvMd) – (MdGv);

(GdMh) – (MhGd); and (GdMv) – (MvGd).

Different outcomes of the two-rule application demonstrations (Figure 3.11) are:

(GhMh) – (MhGh); (GvMv) – (MvGv); and (GdMd) – (MdGd).

- Only when sub-rules are identical within shape rule is when pattern formation results in different outcome.

In essence, identical outcomes of a grammar using one shape-rule with multiple sub-rule applications (Figure 3.10) are:

(GhGv) – (GvGh); (GhGd) – (GdGh); and (GvGd) – (GdGv).

- Identical outcome of its reversed 'shape-rule sub-rule' combination.

Different outcomes of a shape-rule holding a single sub-rule application (Figure 3.10) are:

(GhGh); (GvGv); and (GdGd).

Therefore, it can be concluded, from Figure 3.10 and Figure 3.11, that different patterns can have the same rules, and the same patterns can have different rules, depending upon the sequential order.

3.5.4 Pattern Formation Matrix

The pattern formation outcome is dependent on the sequential order of shape-rule or sub-rule applications. To structure the input of shape-rules and their combinations, a shape-rule matrix is developed (Figure 3.12). The shape-rule matrix is categorized into four levels of shape-rule combinations due to the number of identified symmetry rules (G, M, R, O). Used in a repetitive manner, shape-rules and their sub-rules are applied to 'shape' in order to instigate and create pattern formations. Applied to formulate sequential design of emerging patterns, Level 1 holds one shape-rule application, where only one of the four shape-rules identified is applied to shape. Level 2 includes two shape-rule applications. Level 3 is of a three shape-rules, and Level 4 is a combination of all four shape-rules.

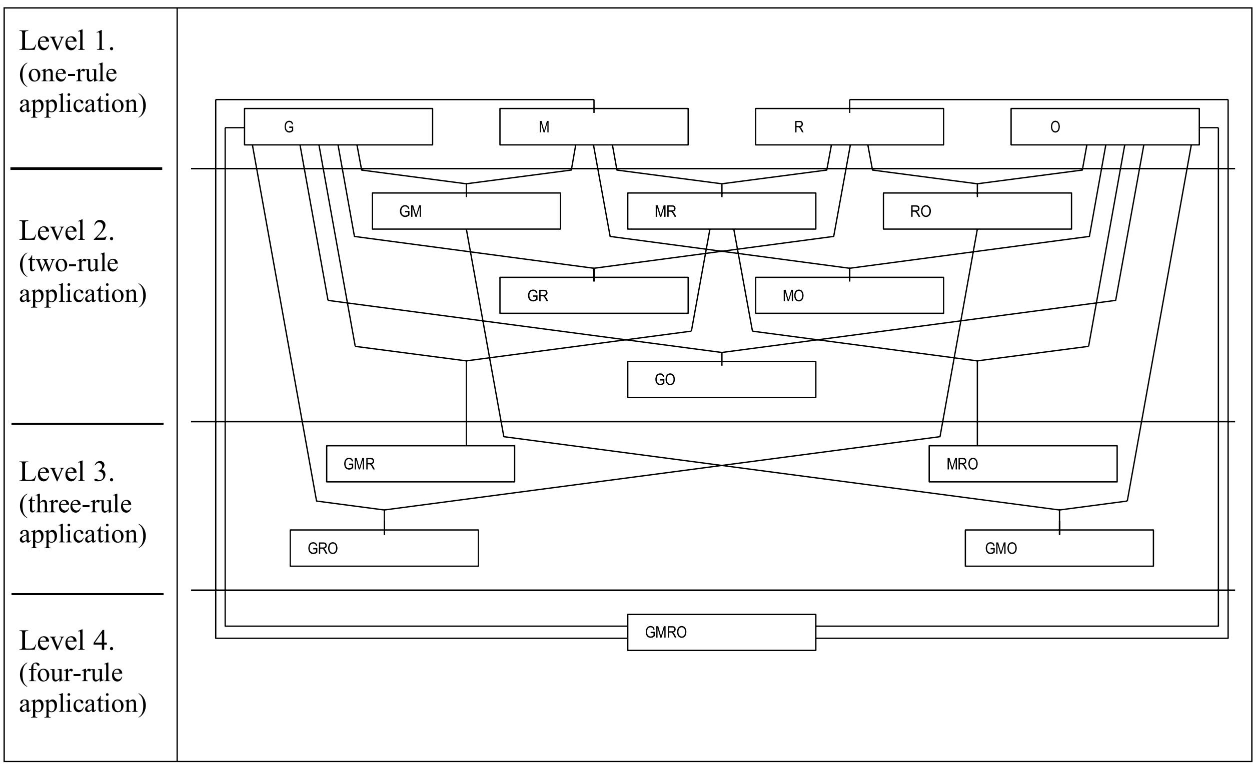


Figure 3.12 Shape-Rule Matrix.

The shape-rule matrix (Figure 3.12) provides the shape-rule combinations in each Level. In the Levels, each shape-rule carries sub-rules within the shape-rule matrix. Shape-rules and sub-rules are used interchangeably, within their own criteria of shape-rules or sub-rules, and each other's; in a sub-rule following shape-rule organizational manner. All shape-rules, and sub-rules, are applied to shape in a repetitive manner to create pattern formations.

As an example of pattern formations that fall under the shape-rule matrix levels is the demonstration of a one shape-rule transformation (Level 1.) of initial shape (IS) 'square' under SR 'glide' (G) presented in Figure 3.10, and a two shape-rule transformation (Level 2.) of IS 'square' in Figure 3.11(a) and IS 'demo' in Figure 3.11(b) under SRs 'glide' (G) and 'mirror' (M) interchangeably. Both the one-rule transformations of Figure 3.10 and the two-rule transformations of Figure 3.11 carry directional sub-rules 'horizontal' (h), 'vertical' (v), and 'diagonal' (d) in an organized sequential and structured application.

3.5.5 Pattern Scale and Symmetry

In addition to the flexibility in shape-rules and their applications that produce these pattern geometries, they also obtain a flexibility in scale. Scale, as discussed in the literature earlier, is related to framing limitations. Scale can be applied to a pattern geometry outcome of the SRA process. Flexibility in scale is addressed following the IG grammars of its style and pattern framing, while maintaining the simplicity and structural frame of IKEA's style. Scale in both the IG and IKEA shape grammars (SG) hold geometric and symmetrical principles; IG in the structures of its style and the framing of its patterns (see Ch. 2.2.4), and IKEA in its functional minimalist yet mass variety of brand-lines within its furniture style (see Ch. 2.3.1). With the ability to intensify or simplify the pattern design with the applied shape-rules, as well as the pattern scale, the IKEA-IG is born using the shape grammar method and the identified shapes, shape-rules and sub-rules, and principles of symmetry and scale.

As Figure 3.9 displayed preliminary examples of pattern design outcomes of symmetry SRs applied to IS, the following (Figure 3.13) displays preliminary examples of shape and pattern design scale variations. Focusing on scale, the initial shapes are presented in different scale variations, in addition to the pattern outcomes under SR (O), (R), or both (also not highlighting sub-rules). Scale fluctuation, following the codes of symmetry and geometries within a pattern design, reveals how scale effects the pattern density and visual detail. Different scales of pattern and shape can also be observed within the patterns as they reveal infinite designs, ranging from simple to complex geometries.

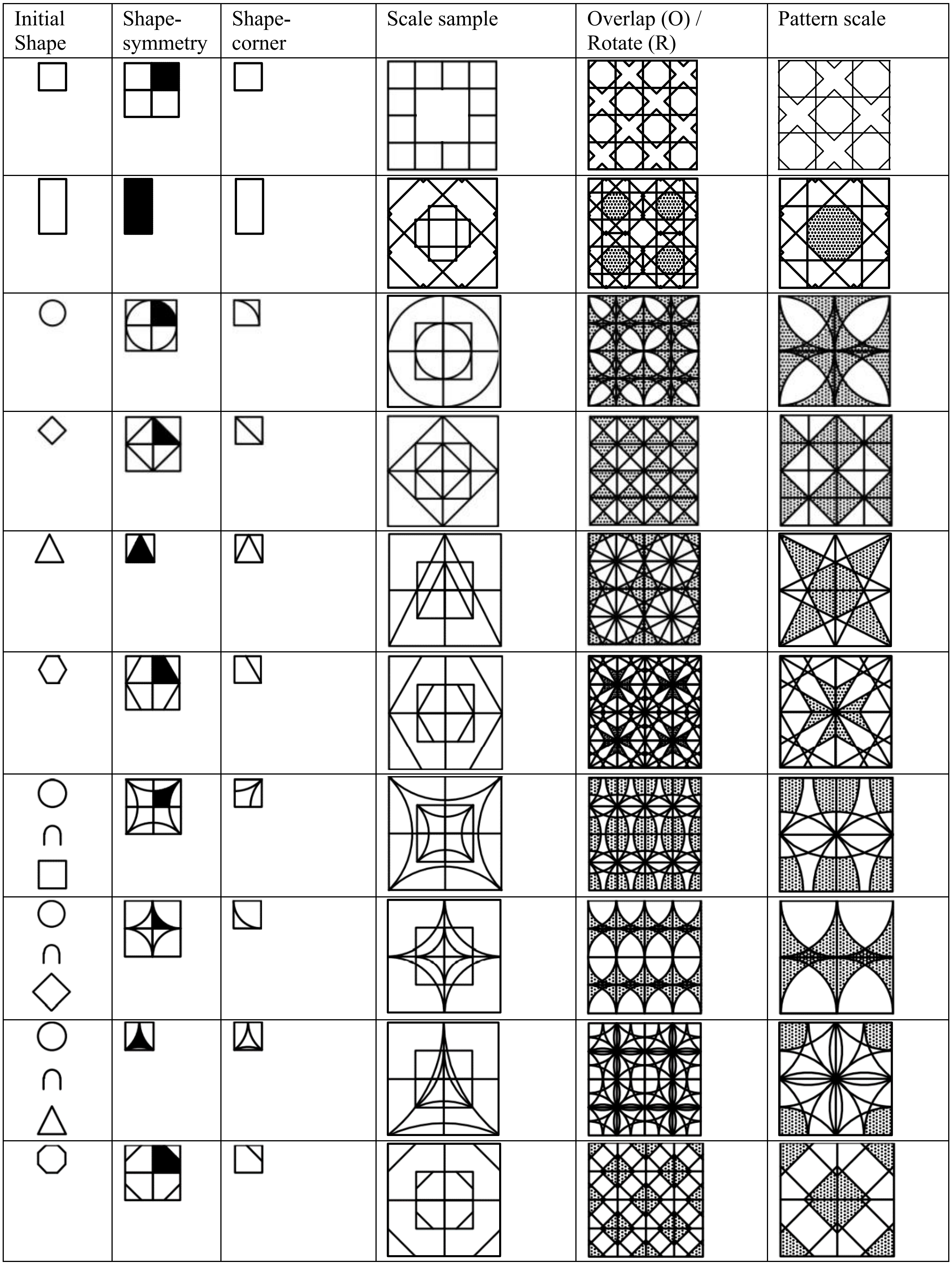


Figure 3.13 Preliminary IKEA-IG Shape and Pattern Scale Variation.

Generated pattern is a structural construction of shape, coded with rules of symmetry and guided by shape-rule applications and directional sub-rule transformation, formulating and forming intricate yet simple generative design implementations. Its quality of structured flexibility is demonstrated through pattern and scale variations within the calculated precisions of its shape grammars of shape, shape-rule and pattern formation.

3.6 IKEA-IG Style Prototypes

The IKEA-IG style obtains the flexibility that allows it to be unique by embracing and revealing a balanced compromise and modification of the two styles engagement. Out of the ten geometric shapes of both the IG and IKEA style semiotic deconstruction, reconstruction, and shape grammar (SG) investigation, three patterns per-shape were developed in two scale sizes each, producing 60 illustrations of the IKEA-IG style pattern designs (PDs) taken to be measured in a pilot test study (Ch. 4.7; see Appendix F, p.276). The PDs were measured for style identification, integration, and preference from which they were also analysed and refined down to 26 PDs to be investigated in the Main Study of this research (see Appendix J, p.353). After thorough data analysis and shape grammar investigation of the main study outcome, 12 PDs were found to be the top IKEA-IG style outcomes (Ch. 5.4.2) that were then taken into physical form production prototypes to be further evaluated in two Evaluative Study Questionnaires – ESQ (see Appendix U, p.411).

Constructing the IKEA-IG style patterns, using the shapes and rules identified from the design investigation and methodology, then testing for style identification, integration, and preference (Ch. 4) is in efforts to refine and define the IKEA-IG style. This process results in finding the *ideal* IKEA-IG style shape grammars composed of shapes, SRs and SRAs. The IKEA-IG patterns are then also translated from design illustrations into physical manifestations under the production processes of IKEA – the *real*, in order to produce an IKEA-IG style prototype artifact – the *reflective*.

Through semiotic design investigations, a range of concepts (Figure 3.8) emerge from which the *ideal* IKEA-IG practical outcome is obtained. A third factor comes into play by adding refinements to production feasibility and limitations (Figure 3.14) also resulting in a range of concepts. Of the *ideal* IKEA-IG style outcome, *real* applications will carry out a functional practical integration that is *reflective* of a cultural-contemporary identity housing both the IG and IKEA design languages; an *ideal*, *real* and *reflective* IKEA-IG design style prototype.

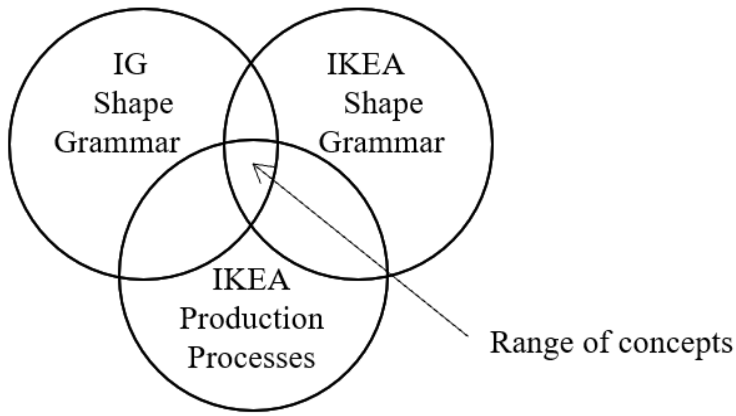


Figure 3.14 IKEA-IG Production Integration.

3.6.1 The Implementation of Practical and Functional Outcomes

This study's processes of translating the cultural arts of IG, into the contemporary interior furniture design of IKEA, is in effort to revive cultural arts by enabling it to coincide within actual contemporary interiors. In order for this research to satisfy the *ideal*, *real*, and the *reflective*, three practical and functional outcome stages proceeded (Table 3.3):

Practical Outcome 1 = *Ideal* IKEA-IG style - The intersection of the two sets, IKEA and IG grammars, creating an ideal IKEA-IG style; the development of (Figure 3.8). Practical Outcome 2 = *Real* Commercial Production Feasibility - based on IKEA's production processes, which makes it real; the integration of the third set (Figure 3.14). Practical Outcome 3 = *Reflective* Artifact Design - Artifact production to provide a reflective product sample prototype to be evaluated by potential consumers to put this study into context.

Table 3.3 Practical and Functional Outcomes.

The *ideal* IKEA-IG style is taken into the *real* as IKEA is further investigated for its manufacturing processes to find a filter to ideal feasible structures for a *reflective* IKEA-IG style architype (Table 3.3). The production processes of the IKEA-IG pattern designs are of IKEA's because initially, for the cultural art of the IG to evolve within contemporary design, the IG design language was integrated into IKEA's' to form the IKEA-IG style. And, for the IKEA-IG to be introduced into IKEA's contemporary design, it must follow IKEA's production processes. Therefore, to attain the *real* and *reflective*, a deeper investigation for IKEA production purposes (Ch. 2.3.4) is necessary to produce an *ideal* IKEA-IG style prototype.

3.6.2 Developing the IKEA-IG Prototype for an IKEA Case Study

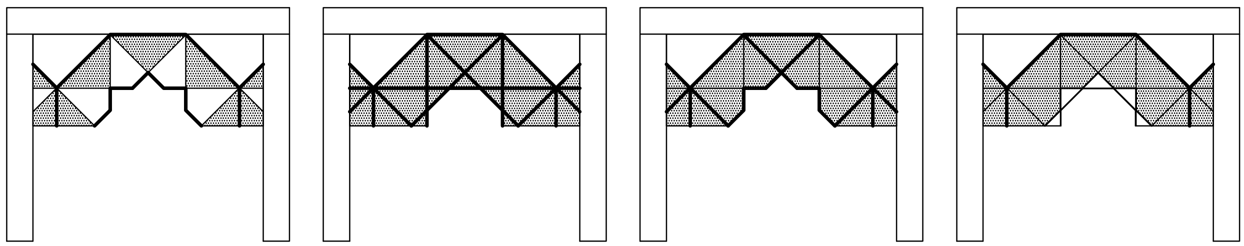
From the pattern design outcome of the integrated IKEA-IG style illustrations (Ch. 3.5) and the main study results and analysis (Ch. 5.4), this research explored developing the two style's shape grammar fusion through physical implementation under IKEA's production processes. For prototype development of the integrated design language, considerations included practicality, feasibility of implementation and production, production limitations, and design detail. In that, production processes were investigated to obtain the IKEA-IG style production parameters. The prototype development exploration revealed limitations of taking the design illustrations into the production practicality of IKEA and its product specifications. The developed prototype artifact was measured for critical appraisal, assessment and analysis. The IKEA-IG shape grammar and production processes revealed an *ideal*, *real* and *reflective* cultural-contemporary art identity.

The IKEA-IG shape grammar outcome of the IKEA and IG style synthesis will be adopted into IKEA's line of furniture, (IKEA's vision, ideology and business strategy of its production processes); an effort for the revival of cultural arts within contemporary interior design. Following IKEA's production processes, the IKEA-IG style was explored and modelled in the form of a table-panel prototype for this study by applying the styles' shape grammar into physical production. This process required workshop planning, as well as evaluating and testing production limitations. As an attachment, an IKEA-IG pattern style was manufactured into a prototype of physical modelling for an existing IKEA item product (table). This way, the IKEA-IG style is not taking its own form as a furniture product but is introduced as an attachment item artifact (table-panel) to the IKEA line of furniture production; with the potential to be ubiquitous.

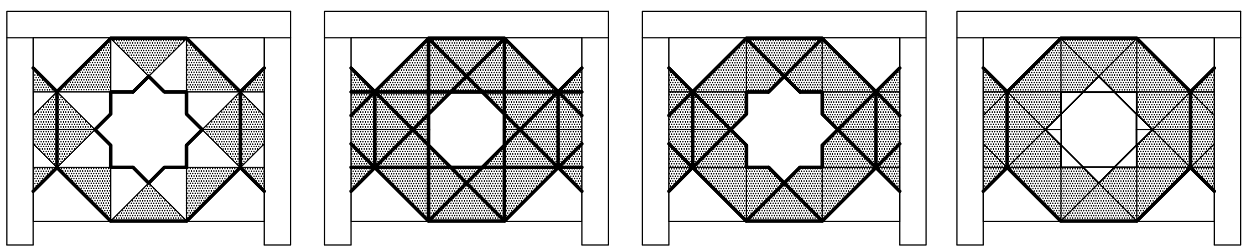
A standard iconic IKEA table was selected as a case study for the application of an IKEA-IG table-panel design prototype. Successfully, the IKEA-IG style could apply to other furniture items such as shelving units, frames, or even room-dividers (native to Middle Eastern interior furniture artifact) as a production and practical item, aiming to re-establish cultural identity into the Middle Eastern home. The researcher chose a 'table' product type as a case study for the development of this research due to its universal generic presence, significance and value as an essential home-furniture product. This research will take practical approaches for the intended application.

The IKEA table furniture piece chosen for the IKEA-IG style table-panel prototype to fit into is the IKEA LACK side table (Figure 2.10). In respect to its dimensional measurements (Figure

3.16), the IKEA-IG pattern designs also took measure to the framing dimensions of the table-panel size fitting to IKEA's LACK table. Initial prototype production investigations took place in the form of design illustrations exploring PD line-weight, engraving and cut-outs; this in addition to one-panel and two-panel attachments (Figure 3.15) as demonstrated below:



- Single Table-Panel Series.



- Double Table-Panel Series.

Figure 3.15 Initial Table-Panel Design Explorations.

The exploratory illustrations (Figure 3.15) were conducted in efforts to find a practical design implementation for production purposes; one that investigates design limitations in order to define set parameters of the IKEA-IG style table-panel prototype. The investigation also included preliminary design models for prototype production exploring table-panel size, attachment mechanism and PD implementation onto the table-panel which led to a first-generation production stage exploration (Appendix AA, p.478). In effect, adjustments to pattern design scale, thickness of pattern configurations for machine cut applications to maintain durability and pattern detail with its structural form, and to the divisibility of pattern formation within the frame – including frame size – were addressed (section 3.6.3). Following IKEA's production processes and product material (IKEA: Products and Materials, 2017), considerations to design application were also applied to support mass-production parameters, material selection, and to methods of assemblage.

Scandinavian style, thus IKEA's, promotes simplicity in form that provides high functionality and unpretentious style. IKEA furniture products maintain commonality of design and form, therefore style. Iconic to IKEA, the LACK side table's simple and structural lightweight form is ideal to fit any interior design setting. So, for the inclusion of a cultural-contemporary proposed design prototype, IKEA's LACK side table is selected as a case study for the IKEA-IG table-panel design development and application. The prototype artifact maintains IKEA's production qualities of flat-pack design, providing structural units for optional attachment to IKEA's LACK table, offering cultural identity to its contemporary design style.

In line with IKEA's mix and match furniture selection within its brand, this research proposes a product design prototype, under IKEA's production processes, that adapts with and to the iconic IKEA LACK table (Figure 2.10). A prototype that is developed to be part-of the IKEA product line and compliments it. For a table-panel prototype artifact to be specifically custom designed to fit the IKEA LACK table, further specifications of the product must be attained. Dimensional measurements of the LACK table are presented in Figure 3.16 as follow.

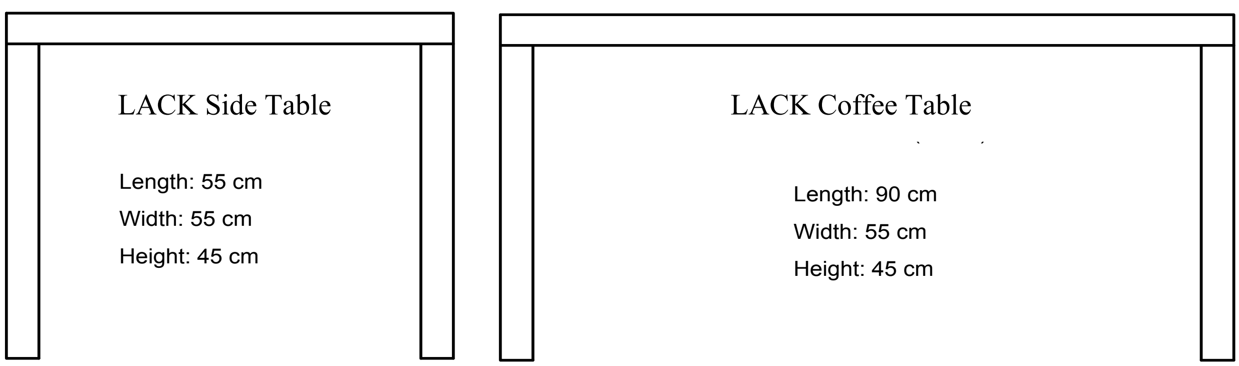


Figure 3.16 IKEA LACK Table Dimensions.

The table was also selected due to its simple geometric shape, form and symmetrical proportions; found in both the IKEA-IG and IKEA design styles. Table measurements (Figure 3.16) are reviewed for dimensional requirements in the creation of the IKEA-IG table-panel prototypes. From a business perspective of commercial design potential (Ch. 2.4.1), LACK table maintains IKEA's standard furniture dimension; therefore, the possibility to apply the IKEA-IG artifact to other similar IKEA products if desired by the customer – such as the LACK coffee table (Figure 2.10). Notice that both the IKEA LACK side table and coffee table dimensions are of identical height and width (Figure 3.16); therefore, the table-panel prototypes are fitting for both furniture items. Also, similarly to the furniture verity within the IKEA LACK collection (Figure 2.12), the design strategy for the inclusion of the IKEA-IG design style can also be applied to fit other product types – such as the LACK shelves – of similar proportions, or other IKEA line collections as an attachment to IKEA's existing products. The flexibility of the IKEA-IG geometrical shapes, forms and proportions also allows its style to be adopted into IKEA's existing product line as an attachment (such as to shelves, chairs and frames), or as a singular furniture item such as a wall shelf or room partition – under scale adjustment applications – within the parameters of IKEA's furniture design and production processes; an additional product line (of cultural-contemporary identity) to IKEA's family group of furniture product lines.

Most of IKEA furniture products follow specific company product design measurements, as the 'one-size-fits-all' technique is one of IKEA's business model solutions in order to minimize costs of production and to the consumer (Baxter, M and Landry, A 2017). This research design development also aligns with IKEA's business model and design strategy in order to provide feasible and ideal prototype for IKEA's need for cultural diversity, the IKEA-IG integration within IKEA's contemporary style, and the revival of the IG cultural arts and identity.

IKEA's variety of furniture and designs allows its consumers to customize their furniture product selection to suit their preference (Ch. 2.4.2). The collaboration and creativity in creating objects that can form part of a family, provide longevity to manufactured products or brand (Eves, B. and Hewitt, J. 2008). Constant design values communicate to the customer; even if the evolved generations of style are full of different or new characters, constant design values maintain a consistent familial identity. Levi-Strauss defined semiotic structures based upon *kinship* and the *relations* between terms and their associations (Cobley, P. and Jansz, L. 1998). Companies producing numerous and various products, such as IKEA, aim to apply these ideals across all product lines, consistently. In doing so, consumers have an idea of what to expect, and on this basis of brand familiarity and trust, the customer will repeat purchase (Hewitt, J. 2008). Product philosophy and experience are inherently linked; Eves and Hewitt (2008) explained:

> "When designing multiple propositions in multiple tiers, experience can be used to help define and emphasize character. It is important to note that each product needs its own character whilst maintaining position as a family member." (Eves and Hewitt, 2008, p. 3).

3.6.3 IKEA-IG Panel Size and Pattern Scale

For the progression of this study, different scales of pattern illustrations are explored to find the *ideal* IKEA-IG design scale proportion and divisibility for the table-panel (TP) prototype as demonstrated in Figure 3.17. Pattern scale flexibility is a quality from within the cultural art of IG; flexibility guided by the symmetry rules of its shape grammar. In that, the IKEA-IG pattern scale influences the TP size, and the TP size is bound by the IKEA LACK table parameters.

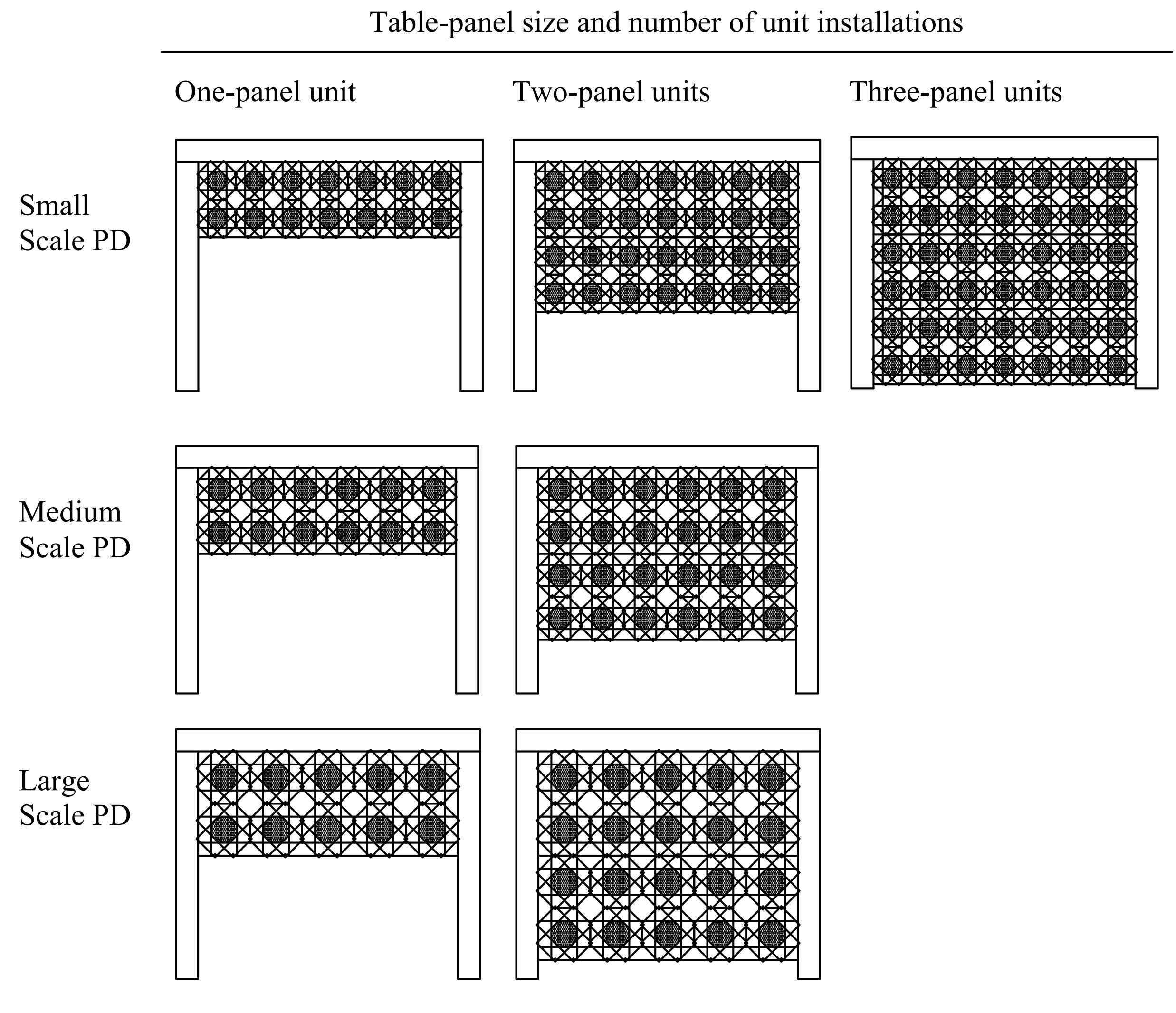


Figure 3.17 Table-Panel Size and Pattern Design Scale.

Few limitations are obtained from the attempt of fitting the IKEA-IG pattern as well as the TP dimensions into the LACK table structural form (Figure 3.17), in small and medium-scale. The small-scale has both pattern and panel size limitations as visual assessment of pattern scale is very dense in detail for physical implementation (using a laser-cutter tool following IKEA's mass-production processes), and, with a three-panel unit installation, the TP spans very low with not much floor space, or gap, remaining. As for the medium-scale, scale limitations are found in TP size: two-panel unit installations, the floor to panel gap is not proportionally fitting to the LACK table height dimension therefore setting another limitation. But in the large-scale pattern and TP, there is no visual scale limitations to neither the pattern scale nor the TP size and floor gap height. Based on the symmetric divisibility of the LACK table dimensions, the large IKEA-IG pattern scale – which also is governed by the TP dimensions – is fitting for prototype application approach.

Further explorations of pattern limitations, scale and divisibility within the IKEA LACK table configurations arise at later stage of this thesis and are investigated and addressed (Ch. 5.3.3) to reach the optimum integrated style prototype fitting for a contemporary interior design setting. The explorations led to an established workable PD to TP size of an 8 by 3 PD Unit divisibility per TP. Figure 3.18 is an example of an IKEA-IG PD illustration of the found 8 by 3 unit divisibility, its line-weight adjustment (also further addressed in Ch. 5.3.3) to be taken into IKEA's production processes, and its developed TP prototype of the attachment fitting for an IKEA LACK table.

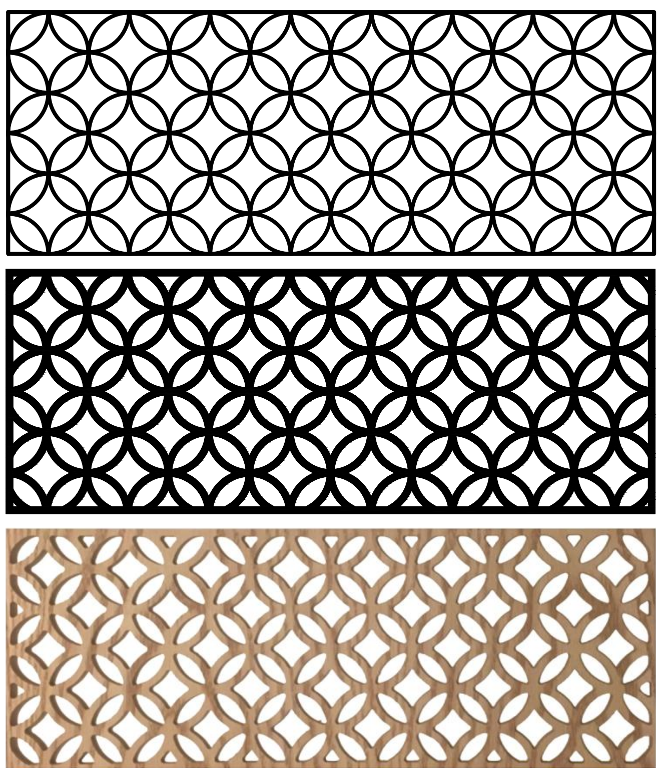


Figure 3.18 IKEA-IG PD to TP Transformation Sample.

Furthermore, Figure 3.19 presents an installation of the developed TP attachment artifact prototype addition to the LACK side-table and coffee table as demonstrated below:

Figure 3.19 IKEA-IG TP on LACK side-table and coffee-table.

Moreover, Figure 3.20(a) presents different installation styles of the TP artifact; a one-panel and a two-panel installation onto this study's selected case study product (IKEA LACK side-table).

- One and two panel installations.

- Two panel installations.

Figure 3.20(a) One and Two-Panel Installation Samples.

Being that the IKEA's style is of simple design (as in the LACK table), while the IG traditional table design is of decorative TP 'enclosures' covering all sides of the table (Figure 3.4), a two-panel installation of the IKEA-IG TPs would be more representational of the traditional IG table, and a one-panel installation would be the balance between the two styles. Therefore, this study measures the cultural-contemporary style integration of a one-panel installation and its relatability to the IKEA style, the IG style, and preference. Nevertheless, due to the lightweight and 'flat-pack' stackability of the developed IKEA-IG TPs (in line with IKEA's product design qualities for ease of packaging, shipping, and affordability), the researcher also experimented with stacking two TPs as one, creating depth and dimensionality to the TP installations. The following, Figure 3.20(b), presents the TPs used in the demonstrations of Figure 3.20(a) and (c).

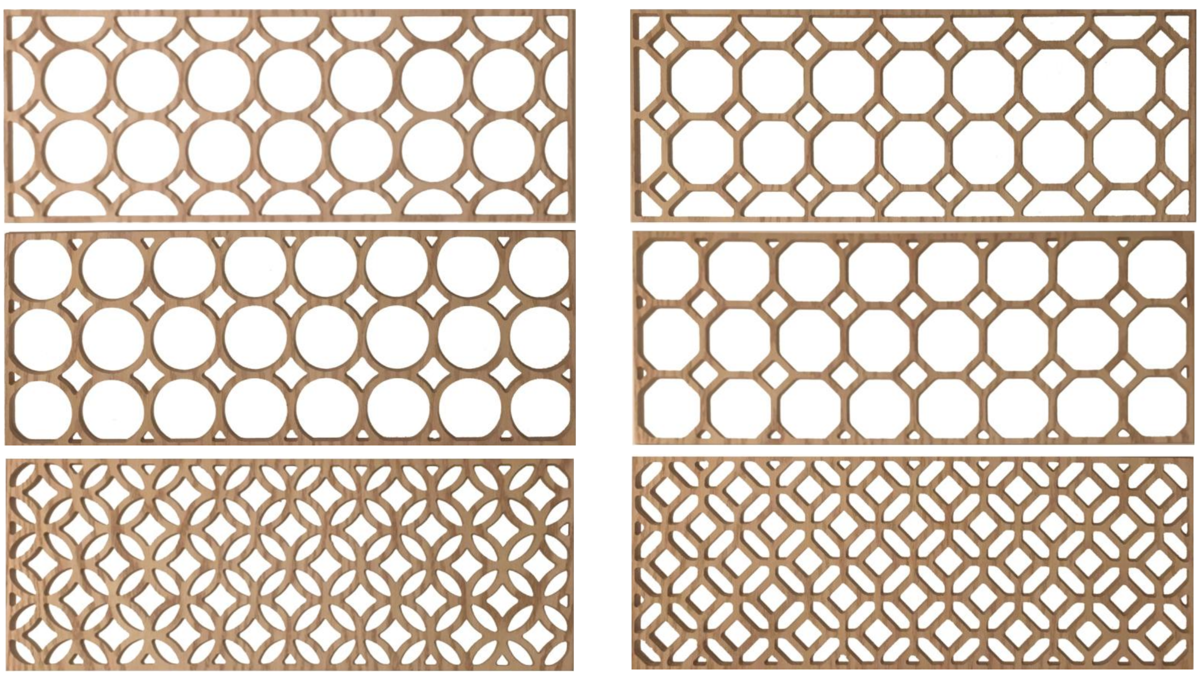


Figure 3.20(b) TPs used in sample demonstration.

In Figure 3.20(b), the top row TPs consisting of shapes 'circle' (left) and 'octagon' (right) are stacked with the middle row TPs consisting also of shapes 'circle' and 'octagon' yet framed differently (framing the PDs addressed in Ch. 5.3.2) respectively, creating the same PD as the bottom row TPs yet is layered. The bottom row TPs are presented in a single-layer two panel installation on one side of the IKEA LACK table (right) in Figure 3.20 (c), while the top and middle-row TPs are stacked and presented in a double-layered two panel installation (left). Having the installations fitted on adjacent sides of the table presents a visual comparison of different outcomes of the same PD attachment due to layering the TPs.

Figure 3.20(c) Single and Double-Layer Panel Installation Samples.

The determined measurement for the TP prototype (based on evaluating durability and sturdiness, and in maintaining with IKEA’s furniture production standards) was 0.5cm thick compared to the LACK table-legs measuring 5cm in width; allowing room to fit more than one TP attachment.

Several TPs can be attached, stacked back-to-back or even spread-out with gaps in between to show more depth and dimensionality in their layering. Figure 3.21 displays an example of partially overlayed PDs of initial shapes ‘circle’, ‘octagon’ and ‘diamond’, revealing intricate pattern combinations of two and three-layer TP arrangements at different points of the TP layering. The layering of the TPs provides for denser, more detailed and customized designs.

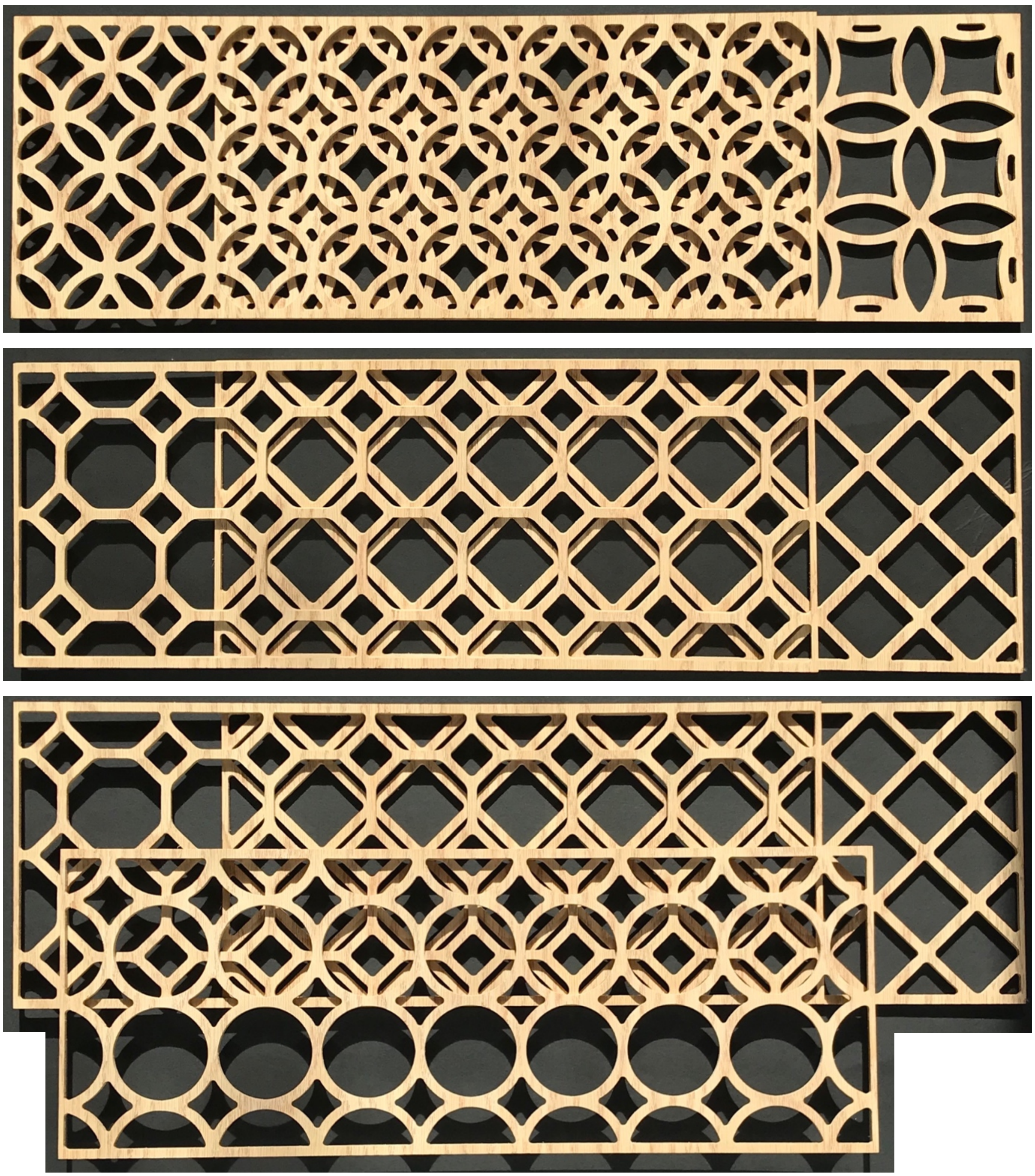


Figure 3.21 PD TP Layering Combination Sample.

Assembling TP attachments on IKEA's LACK table can also be of the same PD or of different PDs such as in Figure 3.22 below. More TP installation are documented in Appendix FF, p.498.

Figure 3.22 TP Installations of Different PDs.

Figure 3.23 presents yet another TP arranged attachment alternative for the IKEA LACK table. The demonstration is of a double-layered panel installation (left) yet not stacked or placed directly on one another but skewed partially revealing each of the layered panels separately and overlayed.

Figure 3.23 Alternative Panel Application.

Having the option of one or two-panel installations, single-layered or multiple, panel arrangement, in addition to the PD range of the IKEA-IG style, provides a variety of options for the 'customer' to choose from and create a combination that suits their taste or preference; a vital aspect in marketing (Ch. 2.4.2). The developed IKEA-IG TP artifacts (see Appendix BB, p.480) were further tested and evaluated with the resulting outcome analysis and interpretation presented in Chapter 5.5.

3.7 IKEA-IG Study Conclusions

Focusing on the interplay of the cultural arts of IG within today's design style of IKEA, the design study investigations describe the design language of IKEA and IG. Using shape grammar as an investigative tool for the IKEA and IG design language, shape-rules and sub-rules guided the formula of design language integration and pattern creation, which are based on geometrical shapes and symmetry, developing a cultural-contemporary style synthesis. The analysed commonalities between them provide insight into the deconstruction and subsequent reconstruction of a cultural-contemporary style. The proposed IKEA-IG style is then measured for the IG and the IKEA style identification, integration, and preference (Ch. 4) for the purpose of this design research progression.

This design research is carried by a semiotic methodology that enables the IGs to develop within IKEA's design style in effort to revive the cultural art into contemporary design. The study uses shape grammar to decode both styles and identify core elements of their design language. From IKEA, a semiotic input of (shape) was derived as basic shapes were identified. No significant shape rule application was derived from its design language, because IKEA only holds basic geometric forms due to its simplistic functional style standards. Yet, when it comes to construction of style, structural coding and pattern production limitations of the integrated IKEA-IG style, IKEA's shape-rule applications play an important role in shape grammar input. From the IG design language, more shape grammar input (of shape-rule and shape-rule applications) was derived from its existing geometric configurations, as well as the symmetry that lays in the structural construction and formation of its pattern designs.

For the proposed integrated IKEA-IG style, both styles were initially identified, compared and related, then synthesized and modified. This in efforts to enable their fusion for a cultural-contemporary design style collaboration that engages the cultural arts of IG into the contemporary style of IKEA. Capturing the essence of the IG art within the IKEA style led to identifying, analysing and synthesizing both styles through a semiotic study, giving design credibility. Providing insight into the analysis of design language was in support to revive and maintain the cultural arts identity. Therefore, this semiotic design study is ideal for the art of IG not to be lost.

With a shape grammar approach to identify design language, initial geometric shapes were extracted from both styles; and analysed for their shape-rules symmetry and pattern formations; as well as scale and proportion. Design elements, parameters and variables of style in this parametric study formulized the geometry maths. Using the identified initial geometric shapes of both IKEA and IG, in a conjunction with SRAs (based on symmetrical proportions) produced a new design concept that is essential to keep the developed styles 'alive and active' simultaneously within contemporary design field; a cultural-contemporary style identity.

The structuring of the IKEA-IG style explores an extent of pattern formations as it unfolds a new evolved style, and shape grammar. Simplicity and multiplicity within the pattern formations allow for dynamism, providing a wide range of outcomes within its flexible symmetrical language of design that embodies its new-found identity. Once this cultural-contemporary style is recognized, its creative potential is then adopted into programming fundamentals of production design and manufacturing. Therefore, by obtaining the IKEA-IG aesthetic DNA, many design concepts within the style integration can then be generated. This allows creations within a defined style structure and potentially an effective strategy and design method for designers.

The IKEA-IG style is a dedication to the revival of the cultural art of IG. In its shape grammar identification, artifact prototype development and execution were made possible by incorporating the IKEA-IG design language into IKEA's furniture production standards. Limitation was set to the pattern scale, detailing and proportional divisibility within the prototype dimensional constraints, in addition to compliance to IKEA's productions processes and standards. Hence, embodied into the design strategy of this study is IKEA's design principles. Ensuring that the pattern design outcomes are of both design languages, the IKEA-IG pattern designs were tested and analysed for style recognition and preference (Ch. 4). Test results were then analysed for the IKEA-IG design style succession and refinement; eventually the illustrations are put into prototype production procedures. A table-panel artifact of the developed IKEA-IG style was then proposed in accordance with IKEA's LACK table design for final prototype production and evaluation.

The IKEA LACK table was selected as the contemporary case study furniture product for the IKEA-IG prototype production stage deliberations. In order to compose, not impose, the IKEA-IG style, the prototype (table-panel artifact) was adopted into the existing IKEA item (LACK table) as an attachment. That way, the prototype does not change the existing IKEA product, but instead is made to complement the existing design. The main objective is to find the IKEA-IG style, not designing an artifact. To examine this new cultural-contemporary design language, within interior design, the development and execution of the IKEA-IG prototype allows for actual application.

A design language of both the IKEA and IG style was synthesized in the production of an IKEA-IG table-panel artifact. For IKEA's extensive range of furniture supply, this allows the IG to add cultural identity as an attachment to its already existing line. The IKEA-IG 'attachment' structural value also follows IKEA's existing interchangeable furniture parts. IKEA's fast-paced mass-production of furniture is economic and 'affordable to the many', yet unique. IKEA's business and design strategy are for its products to complement other merchandises within the brand, allowing its customers to create their 'unique' creative options of the supplied furniture item selection. This offers flexibility and creativity for the customer, which is part of IKEA's business success, yet is a set limitation by what is provided. Therefore, the inclusion of a cultural incorporation within its design style opens possibilities for IKEA's furniture selection expansion, cultural design incorporations in contemporary context, and ultimately the revival of cultural arts.

IKEA's flat-pack furniture design structure falls in-line with its world-wide ease of delivery; rather than the heavy wood craftsmen traditionally used in creating cultural arts, the proposed artifact is also of the same wood material IKEA uses for its contemporary furniture. In addition, since the main design study was to incorporate the IG into contemporary style, the developed artifact of the IKEA-IG design language could be adopted into other furniture products of IKEA, while both IKEA and IG identities are maintained in their cultural-contemporary synthesis. This ultimately also provides cultural sensibility to IKEA's multicultural global market customers. As a case-study, the IKEA LACK side-table (Figure 2.10) was selected due to its exemplifiable simple structural form of the IKEA style, and therefore Scandinavian design principles.

With the deliverance of a physical manifestation of the IKEA-IG illustrations, a prototype of the cultural-contemporary design style was reached (see Appendix BB, p.480). The IKEA-IG table-panel prototype was also tested and evaluated to gather a final outcome of the compiled style results for final analysis and adjustments if required (on IKEA-IG style); aiming, to achieve the revival of the IG in IKEA; therefore, cultural art identity within contemporary interior design.

3.8 Summary

Through semiotic investigations of style and shape grammar interpretations and applications, both the IKEA and IG styles were identified and synthesized creating the integrated IKEA-IG design language. In finding the *ideal* IKEA-IG style DNA integration, its design language was adopted and applied into IKEA's design and production processes – the *real*, to develop an artifact prototype of the integrated IKEA-IG style – the *reflective*.

This research aims to create and establish a link between the IG and IKEA style consistencies. As the IKEA-IG designs are measured and further analysed, the combined shape grammar of geometric shapes and symmetry rules was developed into a prototype artifact under IKEA's product standards, mass-production techniques and parameters. The development of the established cultural-contemporary identity of the IKEA-IG style into a prototype artifact, in-line with IKEA's production practices and design language, makes for a culturally infused style to evolve into contemporary design setting, hence the revival of the cultural art of the IG. Figure 3.24 demonstrates a sample of the IKEA-IG table-panel installations on the IKEA LACK table (inside of an IKEA store) revealing the engagement of the cultural art with (and within) contemporary design style and industry.

IKEA is highlighted for its global success in furniture design and its contemporary design style. Due to its international expansion and success, IKEA realized the importance of incorporating multi-cultural influences within its product designs. IKEA's vision of 'creating a better life for the many people' applies to cultural integration, because IKEA's customers are of a global society branching from different backgrounds and cultures.

The design research methodology of this chapter entailed a semiotic study (the science of signs) to the IKEA and IG style engagement; from which resulted a cultural-contemporary design language and style. The following chapter describes the research methodology where the design study was measured, evaluated and analysed for the refinement of the proposed cultural-contemporary style in order to incorporate the derived conclusions into the progression of this research study.

Figure 3.24 IKEA-IG Style in IKEA.

Chapter 4: Research Study Methodology

4.1 Introduction

In this study, the researcher was following an empirical method where the research philosophy was identified and selected. The researcher also took on a mixed method approach and chose the appropriate data collecting and analysing strategies according to the selected research philosophy. Research methodology expresses the research plan, or what the researchers' plan is for answering the research questions (Saunders et al., 2015); which accordingly contributes to knowledge.

Both of the research philosophy and the research methods were justified for their selection in the following sections. To reach the research objectives, the methods used in collecting data are also outlined (Figure 4.1). Two main stages of data collection took place (from which a total of three survey questionnaires were conducted) following a pilot study. According to Cohen et al. (2011), survey questionnaire can enable participants to express their own reality based on their understanding of particular knowledge or feeling. This enables the researcher to understand the participants own preferences of the proposed cultural-contemporary IKEA-IG style and grammar.

A pilot study is essential to assure the appropriateness of the measuring instrument. Therefore, a pilot study was conducted; to build a reliable and valid questionnaire in order to facilitate accurate results in answering the research questions through accepting or rejecting the research hypothesis. Once the measuring instrument is checked, validated and refined, the researcher proceeded to form the basis of the main study questionnaire (MSQ); Stage one. The data gathered from the main study was then analysed and investigated from which the resulting top IKEA-IG pattern designs were remeasured through two evaluative study questionnaires (ESQ) as case studies and compared; Stage two. The resulting top PD line-drawing illustrations of the MSQ were put into physical production for the ESQs as furniture prototypes (Ch. 3.6) for a more *real* and *ideal* style investigation by further providing participants engagement to the proposed style. The prototype artifacts were presented and tested inside IKEA stores to participating IKEA customers. The two ESQs were also conducted to measure the outcome of different cultural background response to the developed style; the first (ESQ-1) took place in the Middle East, and the second (ESQ-2), which was the control group, took place in the UK.

Pilot Study

|

Main Study

|

____ Physical Implementation of PDs ____

| |

Evaluative Study 1. Evaluative Study 2.

Figure 4.1 Research Methodology Steps.

The tests measured the identity of the styles by cultural recognition, as well as the likability of the developed cultural-contemporary language of design integration. This also in part informs interior designers as to how style can evolve and revive cultural art in contemporary design while maintaining both identities; establishing the common geometries and symmetry rules in both styles; and defining the IKEA-IG style shape grammar.

4.2 Research Philosophy

According to Saunders et al. (2015), the first step in a research methodology is choosing the research philosophy. There are four types of research philosophies: Positivism, Realism, Interpretivism, and Pragmatism. Each of the research philosophies has its unique or a combination of research approach, methodological choice, strategy(ies), time horizon, and techniques and procedures, as depicted in the Research Onion they developed (Figure 4.2).

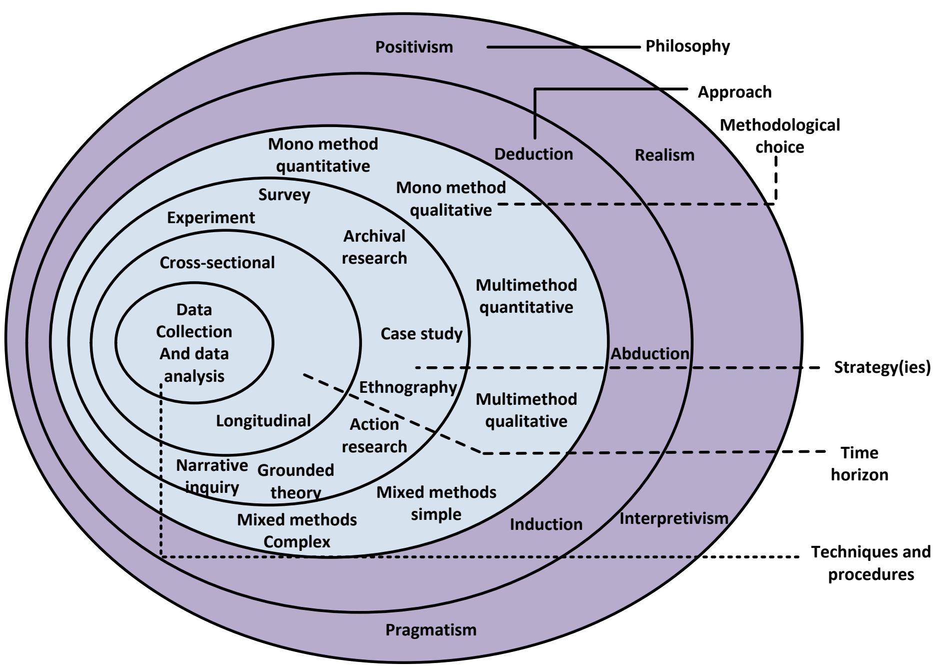


Figure 4.2 The Research Onion (Saunders, M., Lewis, P., & Thornhill, A., 2015).

Saunders et al. (2015) ‘Research Onion’ depicts different research layers in which the relevant ones are discussed for its justification and appropriateness for this research. Starting with the first layer of the Research Onion (Figure 4.2), a Positivism and Interpretivism research *philosophy* of this study takes semiotics in an analytical method using both a Deductive and Inductive *approach*. The approaches carry a Mixed *methodological choice* using Survey Questionnaire *strategy* for Data Collection and Data Analysis; completing the ‘research onion layers’ of this study’s research methodology.

The importance of research philosophy lies in its end-effect or its findings; simply because, research philosophy affects the researcher choice of research methodology, strategies, tools used to collect data, analysis and interpretation of the collected data, and therefore contribute to knowledge. According to Saunders et al. (2015), research philosophy is “the development of knowledge and the nature of that knowledge” (p.127). Research questions are a way of developing new knowledge. According to Crossan (2003), the nature of the philosophical questions is dependent on the research philosophy. The combination of both, while analysing the data, might also lead to more research questions and therefore further analysis of the data at hand. Such in-depth analysis will be conducted in this research leading to new knowledge and practical contribution to design research.

There are two kinds of research: 1) the one that seeks understanding of certain phenomena; and 2), the one that seeks certain interest to the researcher (Bassey, 1992). This research has a combination of both. First, since the aim of this research is to revive the cultural arts of IG in designed interiors within current design; the research seeks the understanding of people’s style recognition and preference when choosing their design interiors. In other words, the phenomenon of whether or not they will accept the integration of a cultural art (specifically the art of IG) within a current furniture design style (specifically IKEA). Second, the researcher has interest in this phenomenon as it represents valuable and significant meaning and concern to the revival of a rich IG cultural and traditional art, and language of design.

Positivism research philosophy, in particular, creates new knowledge through searching regularities as well as cause-and-effect relationships. Its findings can be generalized to the public (Gill & Johnson, 2010; William Lawrence Neuman, 2012) as it aims to analyse facts of the social world objectively (Whitley, 1984). Therefore, positivism and scientific social inquiry are more suitable for a large-scale survey, mainly using quantitative research methodologies, which can provide a basis for descriptive data about the social world, and therefore can be generalized (Benton and Craib, 2001). Positivism seeks empirical generalization through using large observed datasets, or using samples of data; this sample data is the resemblance of the whole population; hence the findings of the sample data can be used to make statements about the population or generalization (Saunders et al., 2015). The research generalization may not be possible using other research philosophies such as interpretivism.

While a positivism philosophy uses large-scale numbers of participants to investigate phenomenon, interpretivism research philosophy relies upon a small-scale of participants in order to understand the participant constructed reality the way they see it. This reality is affected by their experience and hence their actions are the result of their beliefs, intentions and social meaning. Nevertheless, their reality, beliefs or action may change over time through socialization. In general, this philosophy is based on small-scale participants and on their individual reality and experiences, and "because of differences in perception, in interpretation and in language it is not surprising that people have different views on what is real" (Bassey, 2005, p. 38). In addition, according to Ulin et al, (2005) Interpretivism philosophy uses qualitative research methodologies where the researcher has to relay on personal contacts in order to reach a deeper understanding of the subject matter. Therefore, Interpretivism is concerned with discovering deep issues and understanding people's reality and concerns specifically in its unique context.

Research philosophy is mainly about the researcher's choice of how to generate knowledge. For each research philosophy there is a preferred research method that the researcher ought to follow for collecting and analysing the collected data. This enables the researcher to address the research questions and ultimately a contribute to new knowledge (Thornhill, Lewis and Saunders, 2019). According to Bryman (2016) and Saunders et al. (2015), positivism research philosophy uses highly structured quantitative scientific methods, to analyse human behaviour and society, using large samples and measurements, while interpretivism research philosophy recommends using non-scientific qualitative methods to analyse human behaviour.

As quantitative method is primarily associated with positivism and deduction, qualitative method is associated with interpretivism and induction. Having a semiotic thread carried throughout this thesis sustains a qualitative nature to its investigated subject matter; and, to enable the researcher to reach a large number of participants and therefore generalize its findings in a definitive quantitative scientific method, the practical research philosophy chosen for this research is both positivism and interpretivism. Therefore, mixed methods are used for this study in order to find out whether the IG design language can evolve to be revived in our contemporary design realm; in this case, through bridging the cultural art with the contemporary style of the mass manufacturer and furniture distributer IKEA.

4.3 Research Methodology

As this research carries a semiotic thread throughout the study, it is important to understand it as an approach to cultural analysis as well as being a design methodology. Semiotics, as defined by '*The Association for Qualitative Research'*, is a form of structural linguistics that involves "the study of sign systems and how meaning is made within a culture. It was introduced into commercial qualitative research in the UK in the 1980's" (AQR, 2013, para. 1). It is especially pertinent to the analysis of symbolic material relevant to brand. Although often used with interview-based research due to its qualitative nature, it does not depend on it. Rather, it looks at the cultural context for the analysis of a specific brand, product, or cultural phenomenon in order to provide context or insight into a market (AQR, 2013).

Cultural context in relation to semiotics was also highlighted by Dr. Nick Gadsby (2021) explaining that by using semiotics, a greater understanding will be gained centred on relevant visual codes. As a commercial semiotician and cultural analyst, he added that semiotics is a tool that helps researchers, brands, and organizations understand peoples thought and behavior; all revolving around context, and more specifically, cultural context (Gadsby, 2021).

Qualitative research methods seek to understand a phenomenon through people's experience, and hence allows the understanding of social and cultural aspects (Yegidis et al., 2011). Generally, qualitative research is concerned with focus groups, case studies, exploratory research, and in-depth interviews; often employing open-ended questions to find answers. This method is mainly suited for understanding cases rather than calculating variable responses. It allows the participating individuals to express their own experience and understanding of practical knowledge (Cohen et al., 2011). Since the unit of analysis of this research is based off of a semiotic study where participants are giving their opinion (albeit on a Likert scale) of their perspective towards style recognition, relativity and preference, this research methodology falls under a qualitative research method.

Quantitative research methods seek to describe a problem or phenomenon through accurate measurement of the explaining and responding variables. In addition, it identifies the strength of relationship among the variables. Sometimes called empirical research, quantitative research is associated with scientific methods (Yegidis et al., 2011). Quantitative research is based on formulating hypotheses to test a theory. The hypotheses are dependent on investigating whether independent and dependent variables have statistically significant relationships. The significance of the relationship can be measured using different techniques such as descriptive statistics, regression analysis, factor analysis, and stratified sampling along with other techniques (section 4.6). Generally, quantitative research is concerned with data collection using survey questionnaire. One of the advantages in developing a survey questionnaire (Fink, A. G., 2013), is that its findings can be generalized to represent the population (Thornhill, Lewis and Saunders 2019). For this research to collect data from a large number of individuals for a scientific method of data analysis, and to generalizing the findings to population and cultural comparison, this research methodology falls under a quantitative research method.

For this study, being that semiotics is a qualitative method subject matter of design exploration and cultural context analysis taken through a quantitative method of data collection and investigative analysis, a mixed research methodology is used. Both the quantitative and qualitative methodologies are deployed to answer the thesis questions and to meet its aim; therefore, this study adopted a mixed method approach. The importance of using mixed research methods lies in the notion that methods have their limitations. According to Venkatesh (2013), if only a quantitative or qualitative method is used, the data findings will not provide an enriched insight into a holistic nature of a phenomenon as they would if a mixed method is used.

Quantitative lacks the Qualitative aspect of people's opinion and expression provided through an open-ended question, while Qualitative lacks the Quantitative aspect of peoples fast and direct response, therefore creating a limitation number or participants; hence, not representative of the whole population. Yet, Qualitative method provides an in-depth understanding of the finding's outcome, whereas Quantitative method findings can be generalized as it can obtain a large number of participants but uses close-ended questions where individuals do not have the option to elaborate on their thoughts, opinions, perspectives, or express their feeling outside of the options provided, such as in a Likert scale.

Arguably, anything to do with design is Qualitative because design is a Qualitative subject matter, especially when it comes to visual artwork and creative and innovative design. While the nature of this study investigation is of a qualitative nature (design), the research questions are also qualitative (of an opinion), yet the researcher measured the response in a quantitative way and analysed the data in a quantitative way as well. Data collection was involved using a Likert scale, and data analysis was done using the SPSS statistical software tool. In other words, the response to the questions is a quantitative opinion of the qualitative questions; therefore, a qualitative and quantitative mixed methodology was used for this study.

A survey questionnaire is developed according to the gaps found in the literature review. Once the survey questionnaire was developed, a pilot study was conducted to check the questionnaires' reliability and validity to insure appropriateness of the measuring instruments. The researcher also chose snowball technique as a distribution method of the survey questionnaire for the pilot and main study of this investigation. Then, following the mains study questionnaire, two focus group evaluative study questionnaires were also conducted for cultural comparison and further design analysis. The survey questionnaires were designed to answer the thesis hypothesis which are presented in the following section.

4.4 Research Hypothesis

Research hypotheses were developed prior to a survey questionnaire. They were developed to investigate the research questions (Ch 1.2) thorough dependent and independent variables for their correlation and acceptance. Accordingly, the following are the four research hypotheses (H1 to 4) of this study:

H1: The pattern designs do represent the IG style.

H2: The pattern designs do represent the IKEA style.

H3: The participants like the integrated IKEA-IG pattern designs.

H4: The participants do want the inclusion of the IKEA-IG into IKEA's contemporary design language.

4.5 Data Collection

For data analysis and sampling, data collection was developed using a snowball technique for the main study questionnaire of this research. Several techniques can be used for data collection, and according to Bryman (2016), snowball sampling is a technique where the researcher can target a small group of people who are relevant to the research topic; this small group is asked to allocate another group of participants to take part in this survey. Likewise, the second group is also asked to allocate another group to participate to find more participants and so on, leading to a generation of multiple survey participants.

In practice, this technique was used for data collection of this research's pilot and main study questionnaires. A pilot study was conducted in order to assure the appropriateness of the measuring instrument of the survey questionnaires. Conducted in Kuwait, the questionnaire distribution started with approximately 20 participants of family members and friends, who are familiar with both design styles (IG and IKEA); from which the snowball technique took place by asking the participants to recruit others to participate (of work, family, and friends) for this research study and so forth. The survey format was hard copy questionnaires which participants found to be more practical to have for distribution to gain more potential participants for the study. In addition, participants also found it more engaging to have a copy at hand rather than perhaps a digital questionnaire; this could be due to societal and cultural attributes, or a busy lifestyle as some participants commented that if it was not printed, the process would have been delayed or probably forgotten because it would not be in front of them as a reminder or as accessible.

The research study also took on two evaluative study questionnaires following the main study. The questionnaires were carried out as case studies, one being in the Middle East and one in the UK as the control group. Both evaluative studies were conducted inside of IKEA stores, where the participants were IKEA's customers. Here, the data collection process did not take on a snowball technique, yet it followed a Convenience Sampling technique. This sampling technique is a method adopted by researchers to collect market research data from a convenient and available pool of respondents (Etikan et al., 2016).

The questions were the same as that of the MSQ, but instead of measuring an illustration of the integrated IKEA-IG style, the ESQs measure a product prototype of the cultural-contemporary style integration. Both hard and soft copy versions of the questionnaire were presented for a more convenient data collection and analysis process because paper-based questionnaire answers must be manually put into the statistical data-base one at a time (the MSQ was over 300 participants), although convenient for the participants, it is time consuming for the researcher; therefore, both versions were presented where participants can choose their preferred method.

Not all PDs measured in the MSQ were presented in the ESQs, only those that have measured high in identifying with the IG style, the IKEA style, and were liked. The ESQs attempt to compare results with the MSQ to further validates the top PDs from the investigative constructs; to narrow down the top PDs to identify the most ideal integrated shape-grammar holding both the IG and the IKEA core identities – and liked; and for a comparison towards cultural art perception and acceptance in relation to cultural relativity or significance.

The IKEA-IG prototypes were displayed and presented inside of the IKEA stores in order to get an actual setting for the evolved and integrated cultural art to be embraced and part of contemporary design; not only by means of shape grammar synthesis with IKEA's design language, but also by being present within and part of. This way, measuring the style would be more relevant and accurate, as well as having access to convenient and authentic pool of respondents – IKEA's customers.

The developed prototype takes form as a table-panel attachment for the IKEA LACK side-table; strategically (with the support of IKEA's managers), the prototypes were installed and displayed in IKEA's LACK furniture series section of the store for data collection procedures. Conducting the ESQ inside of IKEA stores provides a *real*, *ideal*, and *reflective* arrangement for customers to engage with and experience (part of IKEA's marketing strategy), and therefore a more effective and efficient measure of style, style identity, and preference to style.

4.5.1 Survey Questionnaire Ethics

In this study's survey, collection of data, research ethics, health and safety are the researchers' standards of behaviour and conduct in relation to the participants' right from being harmed by the research procedures. Accordingly, codes of ethics are principles that present the nature of the ethical research, and the statement of the ethical standards that guide the researcher's conduct (Thornhill, Lewis and Saunders 2019).

The researcher ensures the participant the right to stop participation any time they feel discomfort. In addition, the researcher assures that the collected data will not lead to the identity of any of the participants, nor will the collected data be used for anything but for these research purposes. According to Creswell and Creswell (2018), the researcher should develop a 'participant information sheet' that includes all necessary information needed by the participant to enable them to decide whether or not to participate. This sheet included information such as the nature of the research, participants' rights, the reporting and storing of the data, and participant privacy protection.

Another important ethical issue is accuracy and objectivity. The researcher needs to ensure that nothing is omitted during data collection, analysis and interpretation (Thornhill, Lewis and Saunders 2019). In addition, the researcher needs to be accurate when interpreting the data and not mispresent it. Also, not to choose what data to use or to omit for the analysis; serving the researchers own agenda. This is based on the researcher's integrity (Zikmund, Babin, Carr, & Griffin, 2012). This research complies with BU Ethics Code of Practice.

4.5.2 Questionnaire Design

The questionnaire was designed to provide the necessary data collected for this research study's progression towards meeting the research question (Ch. 1.2), aim and objectives (Ch. 1.3). Therefore, a pilot study was conducted before a main study in order to verify the research questionnaire. This can be achieved through the validity and reliability tests. In case there are one or more question(s) that are not reliable, the researcher can eliminate those questions to improve the research reliability and validity (Thornhill, Lewis and Saunders 2019).

According to Bryman (2016), research questionnaire is also called research measuring instrument. The reliability and the validity tests improve the measuring instrument; as well as ensuring that the questionnaire design functions well as a whole for the purpose of this research. Luck & Rubin, (1987), recommend that the pilot study size to be around 10 to 30 participants. The actual pilot study sample for this research was 36 participants. Prior to the questionnaire design, the researcher developed the research hypothesis (see section 4.4) through the rigorous analytical research of the literature review.

Since the research aims to understand and revive IG into contemporary design, the research questions are targeting participants who are familiar to the IG and to IKEA furniture. The pilot study consisted of a survey questionnaire to be conducted in Kuwait to participants (natives of the cultural IG style) whom are customers of the contemporary furniture retailor IKEA. Using a mixed research methodology, a survey questionnaire was developed using a Likert scale for data collection of participant's responses; and SPSS software for analysing the collected data (IBM: SPSS, 2017).

SPSS or 'Statistical Package for the Social Science', is a comprehensive system for analysing data to generate tabulated reports, charts, and plots of distributions and trends, descriptive statistics, and complex statistical analysis (SPSS, 2017). As a result, it enables the researcher to make meaningful insights of the collected data. For this research, SPSS enabled the researcher to answer the research questions and investigate variable correlations or relations; in order to determine the research hypothesis as being accepted or rejected. This questionnaire design (following a mixed methodology) was designed for data collection and data analysis, in an attempt to generate science for this research study.

4.6 Data Analysis Methods

Different statistical methods were used to analyse the data and investigate correlations within the study in efforts to test the study hypothesis. Descriptive statistics is a data analyses procedure for finding mean and average value of a distribution (George and Mallery, 2019). They are brief descriptive coefficients that summarize a data set representation of an entire, or sample of, population. Descriptive statistics measures include mean, median and mode, in addition to measures of variability such as standard deviation and variance (Creswell and Creswell, 2018).

Regression analysis was also used for estimating the strength of relationships between a dependent variable and one or more independent variables. Many forms of regression analyses were used for this study such as linear regression, unstandardized and standardized regression coefficient, ANOVA and MANOVA, each to find significance in the correlations between variables. Linear regression is a set of statistical processes for measuring and identifying the linear combination when the residuals of observations in a regression model are correlated that most fit the data based on specific mathematical criterion (Bryman, 2016). Unstandardized regression coefficient indicates the amount of change between a dependent variable due to change in unit of measurement of an independent variable. It is the change in the outcome associated with a unit change in the predictor. Standardized regression coefficient indicates the strength of a relationship between an independent variable to a dependent variable. It is the change in the outcome of standard deviations associated with a one standard deviation change in the predictor (Bryman, 2016). Another analysis method that is part of regression, ANOVA, is an acronym for analysis of variance. It is used in controlled experiments detecting several differences in a single dependent variable. MANOVA, an acronym for multivariate analysis of variance, is used to detect several differences in several dependent variables or several outcomes simultaneously (Field, 2018). Another method also used for the standardized measure of strength of relationship between two variables was Pearson correlation analysis. It measures the strength of a linear association between two variables or sets of data providing the ratio between the covariance of the two variables and the product of their standard deviations (Field, 2018).

Another method used was factor analysis for large numbers of variables to determine if the variables can be clustered into groups. The grouping is in order to minimise the number of variables, usually using measures such as Likert scale, by detecting structures based on common features (Bryman, 2016). Post-hoc analysis was also used to explore data between different groups. These set of tests typically involve comparing the means of all combinations of pairs of groups. Each test uses a strict criterion for significance to compensate for the number of testes conducted (Field, 2018).

Stratified sampling technique was also used in order to enable obtaining a sample population that best represents the entire population being studied. Stratified sampling is a method that involves dividing a target population into homogeneous sub-groups formed based on shared attributes or characteristics, known as strata, then randomly selecting samples proportionally from the different strata such as cultural background or age group (Thompson, 2012, and Arnab, 2017).

T-test statistical tool was also used in this study to determine whether there is a significant difference between the means of two groups that may have relation in certain features. It uses three data values: difference between mean values of each data set (mean difference), number of data values of each group, and standard deviation of each group (Thornhill, Lewis and Saunders 2019).

Each of the data analysis methods mentioned was implemented in chapter 5 along with the finding outcomes.

4.7 Pilot Study Questionnaire Data Collection

It is essential for the researcher to conduct a pilot study prior to the main survey questionnaire. A pilot study is considered as an important process; First, it ensures that the research's measuring instrument or questions as valid and reliable for the main survey questionnaire (Thornhill, Lewis and Saunders 2019). Second it is essential for improving the questions formatting and scale design (Creswell and Creswell, 2018). Third, it refines the survey questionnaire by eliminating questions with low reliability and validity. Fourth, it incorporates people's opinion of the survey, which leads to improving the main sample questionnaire (Saunders et al., 2015 and Creswell, 2013).

The pilot study was conducted on the 23rd of December 2016, in Kuwait (the research context). The questionnaire was presented in both the English and Arabic languages for those participants who are not bilingual or prefer it in the region's native language. The researcher used a snowball sampling technique in collecting the survey questionnaires (Ch. 4.5). According to Diamantopoulos and Siguaw (2000), a pilot test should not be more than 100 respondents; at the same time, according to Fink (2013), a pilot test should not be less than 10 respondents. For this survey, the researcher distributed 50 pilot study questionnaires (see Appendix F, p.276) as hard copies and a pen for ease of distribution and fast response. It took about two weeks to collect only 39 answered questionnaires. From the 39 answered questionnaires, two of them were not completed, and one was checked with 'highly agree' in the mass majority of its questions; therefore, a total of three questionnaires of the submitted were eliminated. Hence, the total survey questionnaires of this pilot test are a total of 36 participants.

In the survey questionnaire layout, the first page contained the ethical consideration of this thesis. Namely, it included a brief background and aim of this research, the participants' right of accepting or rejecting to participate in this questionnaire, the purpose of conducting this questionnaire (which is solely for research proposes), participant ID protection (no participants will be identified), and a brief guideline of answering the survey questionnaire (see Appendix E, p.274). As for the content of the questionnaire, it was set and presented in three main parts (see Appendix F, p.276): Part 1, presents images of different pattern designs (PD) that resulted from this design study (Ch. 3). From each of the 10 identified and combined IKEA-IG shapes, 6 pattern compositions of its shape grammar formations are presented (3 sets of pattern illustrations to each of the 10 shapes – designed in 2 different scale presentations: 3 small-scaled, and 3 large-scaled patterns of the same design); totalling 60 PD compositions. Each of the presented patterns are followed by three main questions: its relevance to the IKEA style (first construct), to the IG style (second construct), and their preference of the proposed integrated IKEA-IG PDs (third construct). Figure 4.3 illustrates a few of the PDs presented in Part 1 of the pilot study questionnaire (PSQ); the complete set of PDs from each of the 10 combined IKEA-IG shapes are presented in Appendix I, p.348.

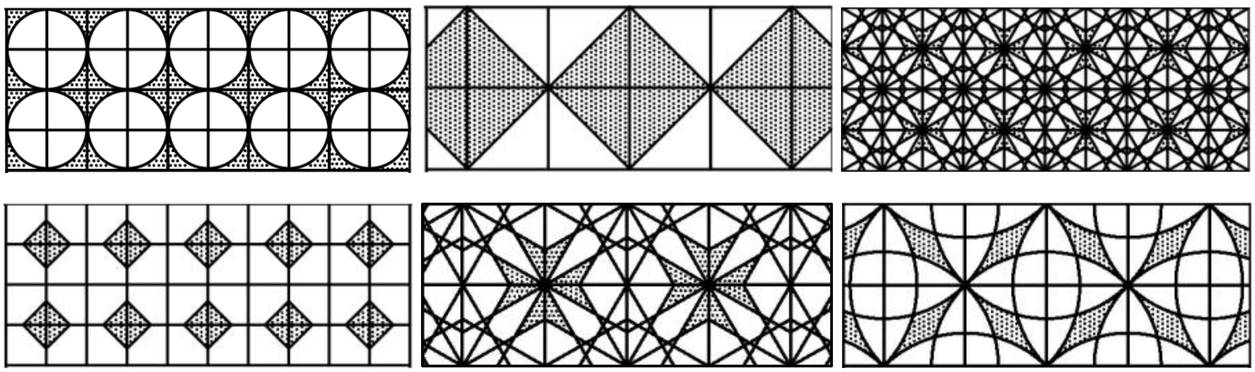


Figure 4.3 Pilot Study Sample PD Illustrations.

A tick-box answer choice was provided on a Likert scale design (Table 4.1) ranging from strongly disagree to strongly agree for participants answers. Variance in results will provide more insight and a bigger scope of the participants' preferences.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
- This is an IKEA style.	■	■	■	■	■
- This is an IG style.	■	■	■	■	■
- I like this design.	■	■	■	■	■

Table 4.1 Pilot Study: Part 1 Likert Scale.

Part 2 (forth construct – dependent variables) is short questions of participant likability to the IKEA furniture (or brand), and the IKEA-IG style inclusion to the IKEA furniture-line; also provided to answer using a Likert scale. The final part of the survey is Part 3 and concerns participants' demographic data.

4.8 Main Study Data Collection

The main study questionnaire (MSQ) was conducted in Kuwait on the 24th of March 2019. Distributed amongst 379 participants, the data was collected on the 7th of April 2019. Data collection was developed using a snowball technique. And, similarly to the pilot study, it was presented in both the English and Arabic languages, the first page of the questionnaire is the ethical considerations, research aim and background, and participant anonymity. The questionnaire was made up of three parts (see Appendix J, p.353). After PD adjustments applied, Part 1 presented 26 IKEA-IG PDs followed by three main questions (constructs); does the PD represent the IKEA style, the IG style, and preference to style. Part 2 was two short questions towards IKEA brand likability, or preference, and the inclusion of the IKEA-IG style to IKEA's furniture line. Part 3 concluded the questionnaire with the participants' demographic data. The following illustrations are a sample of the IKEA-IG PDs presented in the MSQ for measuring the style (Figure 4.4):

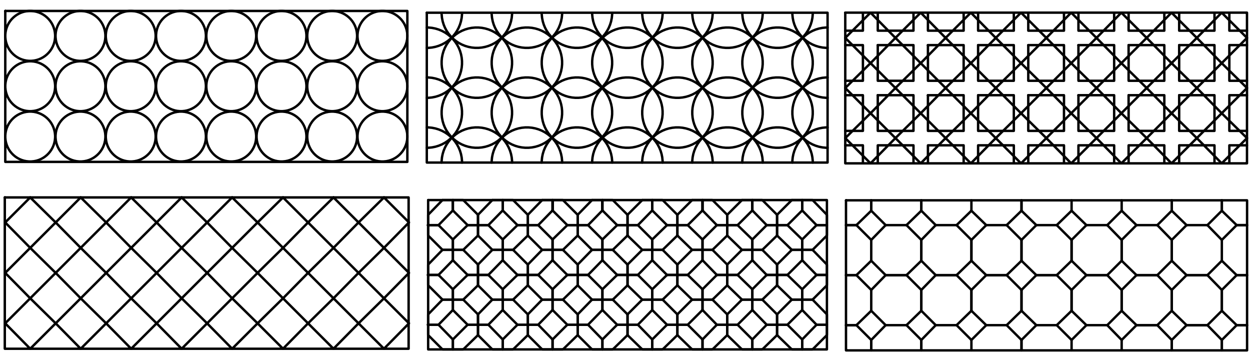


Figure 4.4 Main Study Sample PD Illustrations.

MSQ results, data analysis, and discussion (Ch. 5.4) revealed the top PDs within the three constructs individually, and as a group. With the top PDs identified, the illustrations were taken into physical production methods for artifact prototype testing. In efforts to find the *ideal* IKEA-IG shape grammars, an evaluative study questionnaire also takes place to re-evaluate the top PDs providing a *real* and *reflective* engagement with participants for more *ideal* results and analysis.

4.9 Evaluative Study Data Collection

The evaluative study questionnaire (ESQ) was conducted in two parts (see Appendix U, p.411); the first one took place in the Middle East (IKEA Kuwait) on the 7th of February 2020, and the second in the UK (IKEA Southampton) on the 10th of March 2020. With ethical approval obtained, a request for approval from the IKEA stores was composed (see Appendix CC, p.484) in order to gain permissions to conduct the case study inside their store location branch. From the IKEA Southampton store, the researcher met with both the local marketing manager and the marketing specialist, and from the IKEA Kuwait store, the researcher met with both the store manager and the customer relations manager; the researcher also met with both the IKEA stores design teams.

Top resulting PDs of the MSQ, from each of the three constructs (individually and as a group), were taken into physical production to be measured in the ESQ. The translation of the PDs from 2D illustrations into 3D product artifacts entailed line-weight assessments (Figure 4.5) for their development to take physical form following IKEA's production processes. A collection of table-panel prototype artifacts were produced (see Appendix BB, p.480) designed to fit the IKEA LACK side table as an attachment. The table-panels were presented to the IKEA stores to demonstrate the integrated cultural-contemporary style prototypes designed to fit the IKEA LACK table, along with research background, aim and questionnaire study details.

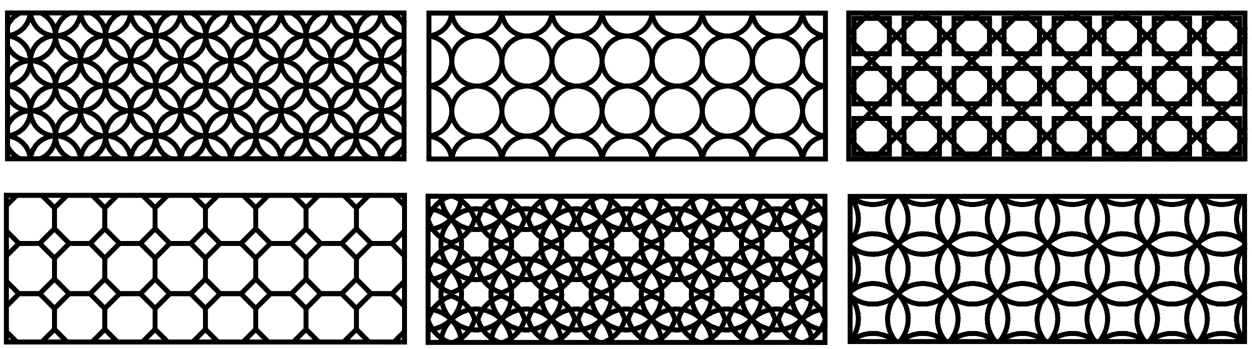


Figure 4.5 Evaluative Study Sample PD Illustrations.

The PD line-weight was adjusted in order to create the PD table-panel artifacts. Line-weight of PDs must not be too thick to where the lines blend into each other nor too thin where the pattern cannot hold a physical form for production. A total of 12 table-panel PDs were tested and evaluated in the ESQs customed to fit the IKEA LACK side table. The table-panels are created to be installed as an addition to the existing IKEA product, not as an alteration. Providing the customer, the option of customizing their furniture selection with the addition of cultural design identity, adds to IKEA's principles of providing the customer the ability to personalize their home interiors. The flat structure of the table-panels (Figure 4.6) was also in accordance with the 'flat-pack empire's' methods of design for ease of storing, packaging and shipping.

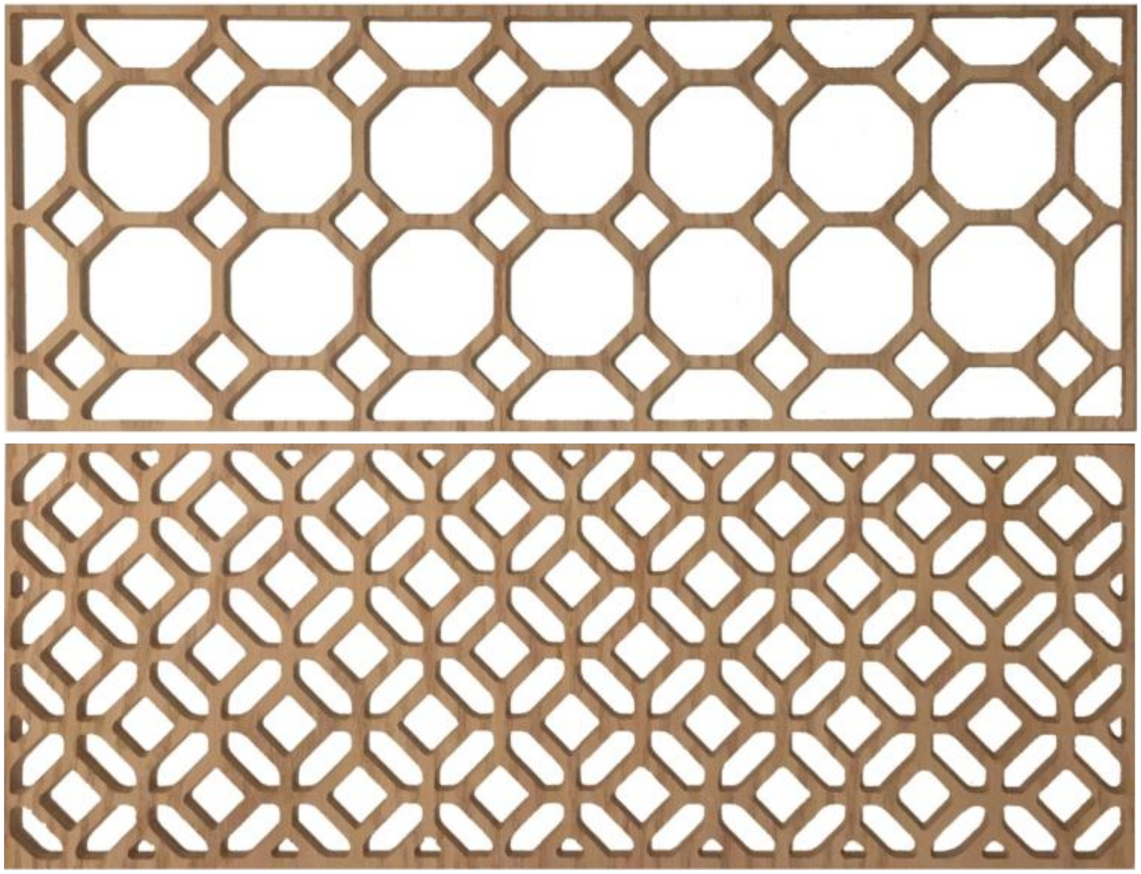


Figure 4.6 IKEA-IG Table-Panel Sample.

Granted access by the IKEA stores, the IKEA-IG table-panel artifacts were assembled in IKEA's 'Creation Hub' section of the store adjacent to the IKEA LACK furniture section of the IKEA Southampton store, and in the 'IKEA team' work-stations private part of the IKEA Kuwait store. The table-panels were installed onto IKEA's LACK tables and displayed in the LACK series product-line section of the stores for product relevancy (Figure 4.7, also see Appendix DD, p.488). The 12 table-panel attachments were installed on 3 IKEA LACK tables displaying a different IKEA-IG pattern design on each of the table sides (Figure 4.7) for the IKEA customer evaluation.

Data collection was developed using a convenience sampling technique. Similar to the MSQ, it was conducted in English and Arabic, the first page of the questionnaire is the ethical considerations, purpose of research study, and participant anonymity. The questionnaire contained three parts (see Appendix U, p.411). Part 1 consisted of 12 IKEA-IG PD illustrations of the case study table-panel attachments presented for participants to refer to and assess the actual product prototype – not the illustration – followed by the three main questions (constructs); is the table-panel PD of the IKEA style, the IG style, and preference to the integrated IKEA-IG PD.

Figure 4.7 Showcasing the IKEA-IG table-panels: IKEA Kuwait.

Part 2 was short questions towards preference to IKEA style, familiarity to the IG style, preference to the IKEA-IG style and its inclusion to IKEA's furniture line or product range, and why (optional). Unlike the PSQ and the MSQ, the ESQ included additional questions towards the participants familiarity to the IG style; and whether the participant prefers the IKEA LACK table with or without the IKEA-IG table-panel as an attachment (albeit optional) in Part 2 of the questionnaire (Table 4.2). This, specifically to measure the familiarity of the UK participants as they are of a different cultural background and geographical location; also, to measure the adaptability of the integrated style within contemporary design in a non-native cultural background to the art of the IG in order to assess its integration and revival outside of its origin of style identity. Concluding the questionnaire was Part 3 concerning participants' demographic data.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
- I like IKEA's furniture.					
- I am familiar with the IG style.					
- I like the IKEA-IG style.					
- I prefer the IKEA LACK side-table without the IKEA-IG attachments.					

- Why?

Table 4.2 Evaluative Study: Part 2 Likert Scale.

The approval from both IKEA Kuwait and IKEA Southampton showed acceptance towards the research project and provided the study precise evaluation of style and preference; provided the participants are IKEA customers. This admission is ultimately beneficial for both the cultural art reservation of the IG style, as well as for IKEA by the inclusion of cultural significance into its contemporary art style and interior design.

Figure 4.8 presents more images of the integrated IKEA-IG style table-panel attachments as they were displayed for the actual survey questionnaire to take place. This was the presentation set-up for both ESQs (in IKEA Kuwait and IKEA Southampton).

Figure 4.8 Showcasing the IKEA-IG table-panels: IKEA Southampton.

Showcasing the cultural-contemporary style, the IKEA-IG table-panels compliment IKEA's products, its design language for home interiors, as well as introduce cultural arts to its existing collection. Displaying the table-panel artifacts in the LACK product section of IKEA provided customers (potential study participants) a *real* and *reflective* experience of the integrated cultural-contemporary style within IKEA's furniture design selection.

Presenting the prototype artifacts and conducting the questionnaire in IKEA showrooms is beneficial towards the purpose of this study and is also in accordance with Scandinavian design principles. During the 1950's, exhibitions showcasing Scandinavian design played an important role in home furnishings and the customer so much so as becoming one of its design principles. With the first furniture showroom opening in 1953 Älmhult, Sweden, the influence of showrooms flourished into Europe and North America (Smith Brothers Construction: Scandinavian Design 2016). Providing visual presentation is significant to IKEA's product sales; IKEA displays its products in showroom layouts (Figure 2.14) allowing the customer to view the products along with its interaction with other IKEA products. Showrooms and furniture layouts reveal actual furniture displays of home interiors allowing customers to have full experience of the product at hand.

The initial response of some of the customers to the IKEA-IG prototype artifacts was to inquire as to where they can find the table-panel products to make a purchase; this indicated that the table-panel artifacts are accepted and are in-line with IKEA's style and the LACK product-line. The IKEA-IG table-panels are proposed as an optional addition complimenting IKEA's existing products, providing a cultural identity within its existing contemporary style. Having the table-panels displayed in IKEA's showrooms for its customers to view, experience, and rate as an option for IKEA's furniture selection, allows for the data collection to be more engaged with its particular participant; one that is accustomed to IKEA's style. As the integrated IKEA-IG style is of two different cultural backgrounds, the data collection is also conducted in two different geographical locations. The ESQ was executed in both the Middle East and the UK providing the researcher means for cultural comparison; one that is of the IG cultural background and identity, and one that is not. Data analysis and discussion of the ESQs are presented in Chapter 5.5.

4.10 Summary

This chapter reviewed the study's research philosophy, methodology, hypothesis, data collection and analysis methods. This semiotic design study, using shape grammar tool for its investigation, intends is to establish the extent to which the geometric properties relate to the IG style, the IKEA style, and their synthesis. The developed IKEA-IG style was measured for style identification, preference, and integration into contemporary design.

Because design and semiotics hold a qualitative aspect, and the investigation was carried through a quantitative method, this study follows mixed methods research approach. Arguably, although the data collection and analysis took a quantitative approach for the researcher to generalize the findings and analyse the data with definitive statistical translations, the survey questionnaire was of a qualitative consensus of opinion. In other words, the study participants were giving their qualitative opinion in a quantitative response; therefore, a mixed methods research study. Survey questionnaires were developed to answer the research questions, test the hypothesis, evaluate outcomes, and reach the research objectives.

Data collection was established in two stages following a pilot study: Stage One being the MSQ, and Stage Two being the two ESQs. The pilot study was used to check the measuring instrument's reliability and validity prior to conducting the main study. In Stage One, the IKEA-IG style was presented in the Middle East (Kuwait) to participants as PD line-drawings focusing on the *ideal* style integration; hence, design language. In Stage Two, the IKEA-IG style was presented in the IKEA Kuwait store (Middle East), and IKEA Southampton store (UK), as prototype artifacts for a more *real* and *reflective* assessment. The proposed designs are measured to ensure style identity was not lost, to determine style preference, and the possibility of its inclusion into the IKEA product line for cultural-contemporary style furniture design integration. The two ESQs also provide an additional factor for data analysis that of a cultural comparison; two different background demographic groups (UK being the control group) having input towards two culturally different integrated design styles (cultural arts of IG and contemporary design style of IKEA).

The prototype artifacts are table-panel attachments designed to fit IKEA's LACK table. The addition of the decorative panels are a product of a genuine design augmentation rather than ornamentation. Adding the panel is in line with traditional Islamic furniture yet it is not only the IG pattern decorating the table, but the combination of the IG and IKEA styles developed before implementation. It is an art integration of a different culture, style, era, and geographical location. The process is one of evolution. Evolving the style by integrating the cultural design language with contemporary style (DNA synthesis) and within contemporary design.

The culturally integrated table-panel has an aesthetic function that does not modify the existing IKEA product but provides an optional style augmentation. The attachments do not interfere with or alter LACK's table design, but rather add structural sturdiness bracing the table legs. Their flat-pack design, low production cost, lightweight recyclable material, and ease of being assembled by the customer fits with IKEA's design philosophy, functionality, and production. As a global industry, the integration also supports IKEA's search for cultural diversity within its furniture design products realizing that incorporating cultural identity is an important aspect in design.

Accredited scientific design and research methods were carried for the fusion of styles and cultural integration. This study took on a semiotic design methodology for identifying, synthesizing and evolving the style, as well as a mixed research methodology for measuring, analysing and evaluating the style's integration with and within contemporary design. Research study results and analysis of the conducted questionnaires are covered in the following chapter (Ch. 5) from which further design investigations and interpretations defining the IKEA-IG style were revealed.

Chapter 5: Research Study Analysis and Discussion

5.1 Introduction

This chapter presents research study results and methodologies of data analysis and outcomes; Stage one covering the pilot and main study, and Stage two covering the two evaluative study questionnaires. The collected data was analysed using SPSS software to check reliability and validity of the data collected. Once the reliability and validity were confirmed, the data was analysed in efforts to determine if the research hypothesis has been accepted using several analytical methods such as: Descriptive statistics, Regression analysis, Correlation techniques, Stratified sampling, and Factor analysis as well as other data analysis methods. Results identify the PDs that most represent each of the three constructs of the study separately and as combined units, as well as preference to style and style inclusion. In addition to the study results and data analysis, the top PD outcomes were also compared and investigated in relation to demographic data to identify the demographic group prevalence.

As the analysis clarify the study results, the researcher further investigates the PD outcomes in terms of style and design language. The design language of the combined developed style is explored by using shape grammar approach to define the most prevalent design elements, composed of geometric shapes and symmetry rules, within the PDs. Defining the design language of PDs that most represent the IKEA and the IG style, and those that are most liked, reveal and identify the most *ideal* grammars for the combined IKEA-IG PD style; this in efforts to revive the cultural art identity of IG by bridging it into IKEA's contemporary style identity.

5.2 Pilot Study Data Collection

The survey questionnaire was collected from the participants and tested for the questions' reliability and validity of the pilot test. Pilot study measuring instruments must be checked for reliability and validity before launching the main sample test questionnaire. The researcher numbered and coded all the questions of the survey questionnaire in order to summarize the questions main characteristics for easier identification in the SPSS software (SPSS, 2017).

The researcher started by coding Part 1 of the questionnaire; the pattern designs (PD). The presented PDs were developed either using straight or curved lines. In addition, each PD was presented twice, in small and large-scale, in order to investigate whether scale has any effect on the participants' choice or preference. Therefore, the coding of each question was based on its relevant pattern as follows:

- Straight-line patterns are coded as 'T'
- Curved-line patterns are coded as 'C'

Followed by:

- Small-scale patterns are coded as 'S'
- Large-scale patterns are coded as 'L'

For instance, if the question involved a straight-lined PD presented in small-scale, then the code would be 'TS'; whereas if the question was about a curve-lined PD presented in large-scale, then the code would be 'CL'. The second code for SPSS was based on the survey questionnaire number; for example, the first question was numbered '1' and so on. The third code was based on the three constructs presented for each PD in Part 1; for example, if the question was about IKEA construct, then IKEA was used. So, for the first question of this survey, the following code was used: TS_1_IKEA. This code reads: straight-line pattern in small-scale, question number 1, and is about IKEA. This coding, therefore, facilitates a faster recognition of the question at hand.

For coding the second part of the questionnaire (Part 2) which was based on the participants' preference of IKEA's furniture, and the inclusion of the IKEA-IG style into IKEA's design language, the researcher used key words to identify each question. So, for the two questions in Part 2, question number 181 'I like IKEA's furniture' is coded 'Like_IKEA_Furniture_181'; and question number 182 'I would you like to see more IKEA-IG designs on IKEA's furniture was coded 'Like_IKEA-IG_in_IKEA_182'.

Part 3 of the pilot test was concerning participants' demographic dat. The researcher also chose to use keywords and question number coding as a mechanism to include in the SPSS software to easily identify the questions for analysis of the resulting relations. All of the 36 collected questionnaires were entered into the SPSS software to investigate its reliability and validity in order to ensure its proper usability in the main study's survey questionnaire.

The findings of the conducted pilot study questionnaire (PSQ) were revealed (see Appendix G, p.298), and SPSS was used for the analysis of its collected data. Prior to the analysis, the collected data was screened for any missing data and inconsistencies. The data was then checked by: First, testing for its Normality, to check that all data was normally distributed (Field, 2018). Second, Linearity, where the data was checked for a straight-line relationship (Tabachnick and Fidell, 2012 and Hair et al., 2013). Third, Homoscedasticity, to ensure that the score of one continuous variable was similar to all the other continuous variables. Fourth, Multicollinearity, in order to investigate whether there was a relationship between two or more variables (Tabachnick and Fidell, 2012). Moreover, the data was also investigated for regression and correlation in order to determine the research hypothesis as being accepted or rejected.

5.2.1 Pilot Study Reliability

The reliability of the data actually measures the data's consistency. If the data proves to be consistent then it was considered as acceptable or reliable. This study's PSQ proved to be reliable, therefore can be used for the main study questionnaire (MSQ). On the other hand, if the data's reliability was weak, then there was the option of deleting some of the weak item(s) in the construct(s) in order to increase its reliability (Saunders et al., 2015).

According to Bryman (2016), there are three ways to test the data reliabilities as follow:

1- Stability: which involves doing more than one test of the survey questionnaire and later correlate between them. The tests should have high correlations.
2- Internal reliability: which measures multiple indicators and at the same time test for data coherence. It indicates whether the measured data are related or not.
3- Inter-observer consistency: which involves having multiple observers for a large amount of subjective judgment and observations and the organization of data into categories. This may result in lack of consistency among the subjective judgments.

Both the stability reliability test and the Inter-observer test require multiple tests to check for reliability. Nevertheless, they lack testing the data coherence and correlation among the data itself. While the internal reliability test measures the aggregated data to form an overall score. As a result, it checks whether they are related to each other or not. The required measurement should be as close to 1 as possible. The closer the outcome is to 1, the more consistency there is in the data; however, the closer it is to 0, the more the data is not correlated and therefore not consistent and should be rejected. Therefore, the researcher chose the internal reliability for this research to investigate the pilot study data.

According to Saunders et al. (2015), for an internal reliability test, researchers use Cronbach's alpha. Developed by Lee Cronbach in 1951, Cronbach's alpha is defined as the proportion of the response variability of the survey resulting from the responding difference (IBM: Cronbach, 2017). If the participant's responses were different, this means that the participants have different opinions. Cronbach's alpha (α) will measure each construct separately; the closer α value to 1, the better. According to Keil et al. (2000), α should not be less than 0.6 to be accepted. Other researchers, such as Field, A. (2018), suggest that α should not be less than 0.7 to be accepted. However, for constructs that contain 10 items or more, Cronbach's alpha should be used. If the construct holds less than 10 items, then item-total correlation should be used rather than Cronbach's alpha. In that case item-total correlation should not be less than 0.2.

	Constructs (Variable)	Mean	Standard Deviation	Number of Item	Cronbach's Alpha Based on Standardized Items	Average Corrected Item-Total Correlation
IKEA Style	IKEA	2.393	1.047	60	0.966	0.595
IG Style	IG	3.043	1.044	60	0.964	0.580
I Like this Style	LIKE	3.092	1.108	60	0.958	0.551
IKEA Preference	Preference	3.940	.894	2	0.770	0.517

Table 5.1 Pilot Study Reliability Measures.

As depicted in Table 5.1, all constructs were found to be highly reliable. In the three constructs (IKEA, IG and LIKE), the researcher used Cronbach's Alpha to check for their reliability because they have more than 10 items (60 item in each construct). They all scored above 0.9 in Cronbach's Alpha. According to Field (2018), they are all highly reliable. On the other hand, the researcher used item-total correlation to check on the reliability of the fourth construct (or dependent variable) because it only holds 2 items. It scored 0.517 for the item-total correlation, which is also considered as highly reliable according to Field (2018).

Even though the four constructs are highly reliable, all constructs can be more reliable if some of the questionnaire items were deleted (see section 5.2.2). Therefore, in order to increase construct reliability, the researcher deleted some items from the first three constructs as they do not correlate. Additionally, for this research development, the questionnaire layout was redesigned for better data collection and analysis as many participants complained about the number of questions in the pilot study.

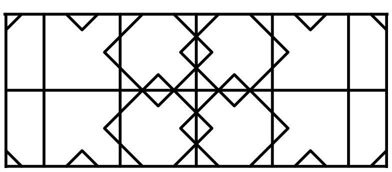
5.2.2 Pilot Study Validity

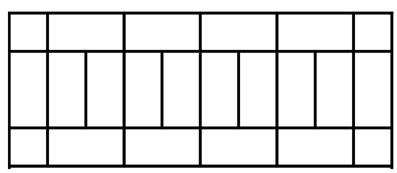
Validity checks if the measuring instrument (the survey questionnaire) is actually capable of measuring what it is intended to measure. There is no specific instrument assigned to test the validity of the data. In order for an instrument to be valid it has to be reliable first (Pallant, 2013). Nevertheless, there are widely accepted validity measurements as follow:

1- Convergent validity: This is based on the correlation of two measurements from the same concept. The higher the value, the more they are correlated. According to Zikmund et al. (2012), they are also called criterion validity.
2- Discriminant validity: This is the degree to which two concepts are conceptually distinct. In this case, the lower the value, the better.
3- Nomological validity: This is the degree of the accuracy of the scale, to make accurate prediction of the other concepts in the model. Therefore, it is based on identifying the theoretical relationships found in the literature review, later determining whether the scale has corresponding relationships (Hair et al., 2013).

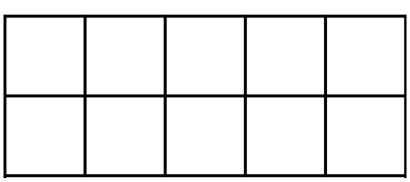
Since the nature of the data analysis is through its correlation, the most relevant validity test in this case is the convergent validity test. This measurement can be conducted using the same reliability test used earlier (section 5.2.1). The test reveals that the items do correlate with each other, except for some as follow (Figure 5.1):

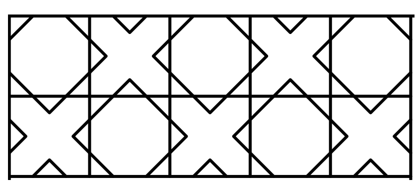
1- IG Style: (they all correlate).
2- IKEA Style: ‘TL_10_IKEA’, and ‘TS_19_IKEA’ do not correlate.


‘TL _10_IKEA’


‘TS _19_IKEA’

3- Liking: ‘TL _6_LIKE’, and ‘TL _18_LIKE’ do not correlate.


‘TL _6_LIKE’


‘TL _18_LIKE’

4- Preference: ‘Like_IKEA-IG_in_IKEA_182’ does not correlate (see Appendix G, p. 298).

Figure 5.1 Pilot Study Non-Correlated Items.

According to this test, the above listed items that do not correlate can be eliminated, except for the one item in the preference construct. This is because this particular construct holds only two items; more importantly, because the 'Like_IKEA-IG_in_IKEA_182' item investigates participant's preference in having the IKEA-IG patterns in IKEA. Therefore, eliminating this item will result in a loss of important information. In addition, this construct in general was found to be reliable (section 5.2.1). Therefore, this item will be kept for further investigation.

5.2.3 Pilot Study Data Analysis

A PSQ was considered a primary step of conducting the MSQ, as discussed earlier (section 5.1). It was conducted mainly to check whether the measuring instrument is valid and reliable before using it on a bigger population. Although the pilot test informs the design of the survey for the main questionnaire, however, the pilot study output (see Table 5.1) still provided some generalized findings of the investigated pattern design (PD) outcomes of the pilot study, as follows:

1- In the first construct, participants were presented with 60 PDs and asked whether they can identify them as IKEA style. Their response mean average (2.393) reveals that they mainly disagreed. In other words, most participants did not relate the PDs to IKEA style.

2- In the second construct, participants were presented with 60 PDs and asked whether they can identify them as IG style. Their response mean average (3.043) reveals that they were neutral whether the pattern design were considered to be of the IG style. Therefore, they were indecisive.

3- In the third construct, participants averaged (3.092) when asked whether they like the presented IKEA-IG PDs or not; they were indecisive as well.

4- The fourth construct consists of two dependent variables; participants were asked about their preference of IKEA - such as its affordability, tractability and style; and to the inclusion of the IKEA-IG style into IKEA. Their mean averaged was 3.940, which is close to 4, indicating that they did agree on their preference of IKEA and the inclusion of the IKEA-IG style.

These findings however are to be investigated further in the MSQ, where the data was correlated and tested for more results to refine the IKEA-IG style; this in order to satisfy the research questions and test the hypotheses. For instance, from the data results of the presented pattern illustrations of 6 grammar compositions from each of the 10 identified IKEA, IG, and combined

IKEA-IG shapes (Appendix I, p.348), the researcher was able to identify the hidden shape grammar that lays within the construction of its design DNA (ex. Figure 5.8).

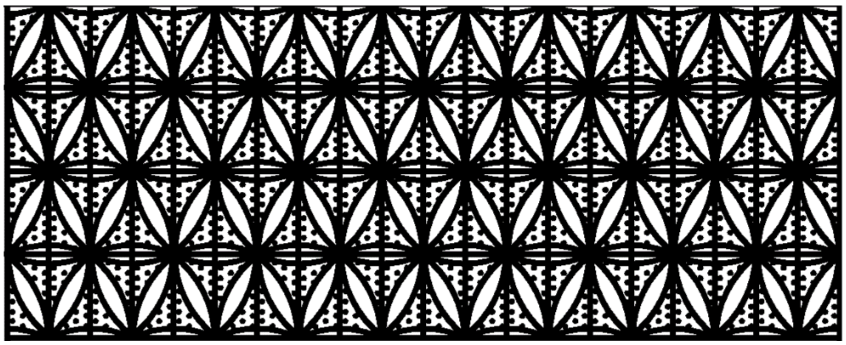
From the top results of PD preference, the researcher can obtain the most relevant, effective and identifiable shape grammars within the identified PDs of the pilot survey questionnaire. Deeper SPSS analysis can also provide limitations in the shape-rule parametrics, such as the understanding of the shape grammar used in the PD compositions that were most 'liked' resulting from the pilot study outcome. Finding the fundamental shapes and rules of the top PDs resulting from the study would identify and refine the design language of the integrated style. As an example, if the top resulting PDs of the pilot study all contained a certain common shape grammar, such as shape-rule 'Overlap' and shape 'Arched-Diamond', then this would create a limitation of using 'Overlap' as shape-rule application to 'Arched-Diamond' shape resulting in a defined shape grammar for the IKEA-IG design language. Therefore, this research design methodology was tested using mixed methods in order to reach the desired aim of an *ideal* IKEA-IG design language and style.

5.2.4 Pilot Study Conclusions

The pilot study research methodology reflects on the content of the design methodology (Ch. 3). This research study's methodology informs the empirical model with shape grammar that incorporates the IG to IKEA; a Shape Grammar that works for establishing clear shapes and rules that arguably restricts the IKEA-IG design language. The methodology is the researcher's tool of extracting knowledge; accordingly, choosing the research tool is as important as the collected data. Therefore, the researcher assured that the used tool or method is reliable and valid for the main questionnaire sample size.

The main purpose of a research pilot study is to ensure that the collected data is reliable and valid (sections 5.2.1 and 5.2.2). Therefore, the researcher chose to conduct the pilot study prior to the main data collection. However, the researcher conducted minor analysis using data correlation in order to look into the data for primary reading. Nevertheless, in the main study of this research, an in-depth analysis was conducted (Ch. 5.4) using descriptive statistics and correlations analysis methodology in order to answer the research questions and to accept or reject the research hypothesis; this will accordingly enable the researcher to contribute to knowledge.

Observational analysis of the IKEA-IG pattern design outcome can also provide limitations to shape-rule parametrics such as pattern-scale and line-weight intensity. For example, from the PDs used in the pilot study, Figure 5.2 presents a visually intense and detailed pattern design therefore a shape grammar limitation of shape-size or scale, shape-rule repetition of pattern formation, and framing presentation. Another determinant of pattern design limitation is its relevance to both the IKEA and IG style. In this case, not only should the pattern design lend itself to IKEA's simple design style, but also to IKEA's manufacturing production processes is to be considered in the limitation processes.



Shape – Arched-triangle

Shape-rule – 'mirror'

Scale size – 'small'

Figure 5.2 IKEA-IG Pattern Design Limitation.

The small-scale illustration of the 'arched-triangle' shape using 'mirror' as applied shape-rule, revealed a pattern that is visually intense (Figure 5.2) – opposing that of IKEA's simplicity in style. A minimal number of shapes in pattern formation is required to fit a balance in between IGs dense design style and IKEA's simplicity; giving the best minimum compromise that complements both design styles. This process of elimination and reduction is the convergence of the best balance of the IKEA and IG design language parameters. Yet the researcher included such an intense pattern iteration for the pilot study to get a generalized constructive feedback and analysis of the participant's answer response to its identification and of style and preference; and, for pattern outcome comparisons and relations for obtaining the most *ideal* IKEA-IG shape grammar, to enable its actual engagement with contemporary design - the *real* and the *reflective*; which would be the detail and focus of the MSQ of this research, in addition to participant's preference to the inclusion of the IKEA-IG into IKEA.

5.2.5 Problems Encountered with Questionnaire

The survey questionnaire was tested for the time it took participants to complete. On average, a pilot test would take between 10 to 15 minutes to be completed by the participant. However, the participants seemed to be annoyed with its length and the time it took to complete the survey. This is due to the survey design of question layout and numbering. Instead of the three construct questions of the PD (Table 4.1) repeated under each pattern illustration, the numbering for the main questionnaire needs to be designed to reduce the number of questions within the questionnaire to reduce size, and time of completion, of the survey questionnaire.

The pilot study revealed that the measuring instrument was valid and reliable. However, prior to the MSQ, and according to the above encountered problems, the researcher adjusted the questionnaire layout for the main survey. The questionnaire refinement entailed reducing the number of questions in the survey for the participants and eliminating questions to increase reliability. The following section covers the questionnaire refinements in detail for compiling and developing the MSQ of this research study.

5.3 Pilot Study and Design Investigation Refinement

In the pilot study questionnaire (PSQ), the participants were asked to answer three main questions for each proposed pattern design: This is an IKEA style; This is an IG style; and I LIKE this design. Each shape was illustrated in three pattern design, with each presented in two different scales; small followed by large-scale of the same pattern design. The three main questions (three constructs) were applied to each of the pattern design illustrations; this developed a large number of design illustrations and questions in the PSQ. As a result, the majority of the participants' complained about the length of the survey questionnaire. Therefore, to refine the questionnaire, the researcher considered the following:

1- The number of initial shapes and pattern designs;
2- Pattern design scale;
3- Preference among the IKEA, IG and LIKE constructs;
4- Straight-line vs curve-line pattern design;
5- and Questionnaire layout.

The elimination and refinement process started with the number of shapes used. With 10 initial geometric shapes (Figure 5.3) creating 3 pattern designs each, and in 2 scales, a total of 60 pattern designs were used in the pilot study (Table 4.1).

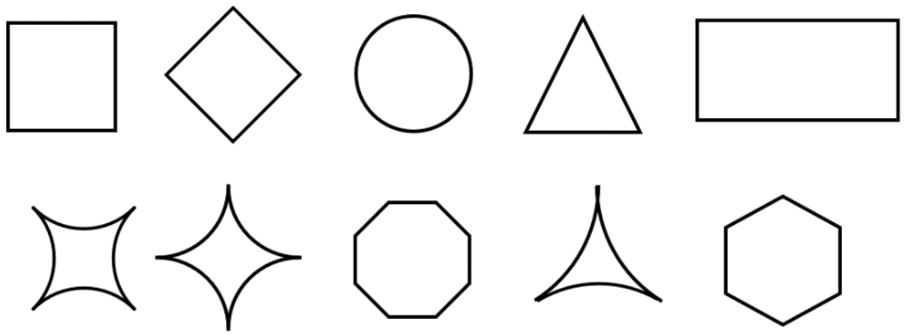
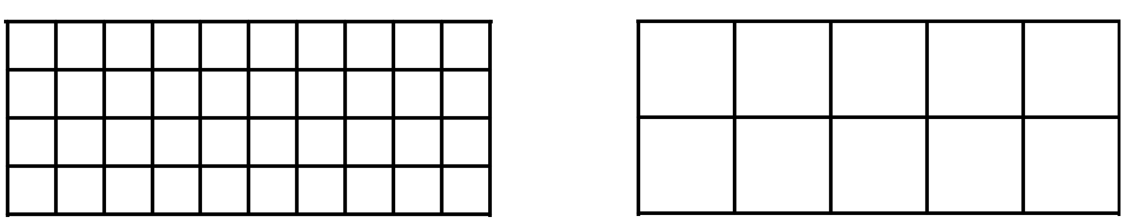


Figure 5.3 Initial Geometric Shapes.

Part 1 of the PSQ has 3 main questions (constructs) to each of the 60 pattern designs (PDs) resulting in 180 questions. The three questions are to remain while the number of PDs reduced, and the questionnaire layout refined.

(1) First, eliminate all shapes that do not fall under a 4-point grid by taking out 3 and 6-point geometries. This is because the design program (Auto-CAD) used to illustrate the PDs is based on a 4-point grid layout, therefore, the only shapes used will be those which fall under a 4-point grid. This reduces the number of PDs, hence questions, for more accuracy and ease of transforming into 3D printing or laser cutting. The remaining shapes after elimination are reduce from 10 to 7; 7 shapes x 3 designs x 2 scales = 42 PDs.

(2) Second, according to Saunders et al., (2015) and Creswell, (2013), a pilot study refines the survey questionnaire by eliminating questions with low reliability and validity; it also incorporates peoples' opinion of the survey. Therefore, the researcher conducted a reliability and validity test towards scale size and preference of each of the PDs. Of the remaining 42 PDs, reliability between the two different scales of the same PD (small vs. large-scale) was investigated in order to eliminate the least reliable value (see Appendix N, p.381); doing so reduced the number of IKEA-IG PDs tested in the main questionnaire of this study.



PD 1 (Q# 1-3)   PD 1 (Q# 4-6)

Figure 5.4 PD Scale Ratio (1 : 2).

Figure 5.4 illustrates the two scale sizes of PD 1 from the PSQ (see Appendix F, p.276), maintaining scale ratio 1 : 2 of the same PD creation; PD 1 holding Q# 1-3 is the small-scale with PD divisibility being half of that to PD 1 holding Q# 4-6, large-scale. The resulting reliability value outcomes were 0.344 and 0.278 respectively (see Appendix N, p.381). Therefore, since PD 1 large-scale was least reliable, it was eliminated from further study investigation. This reliability elimination process of small-scale versus large-scale was applied to all remaining 42 PDs resulting with 21 PDs that were carried to the MSQ for further testing.

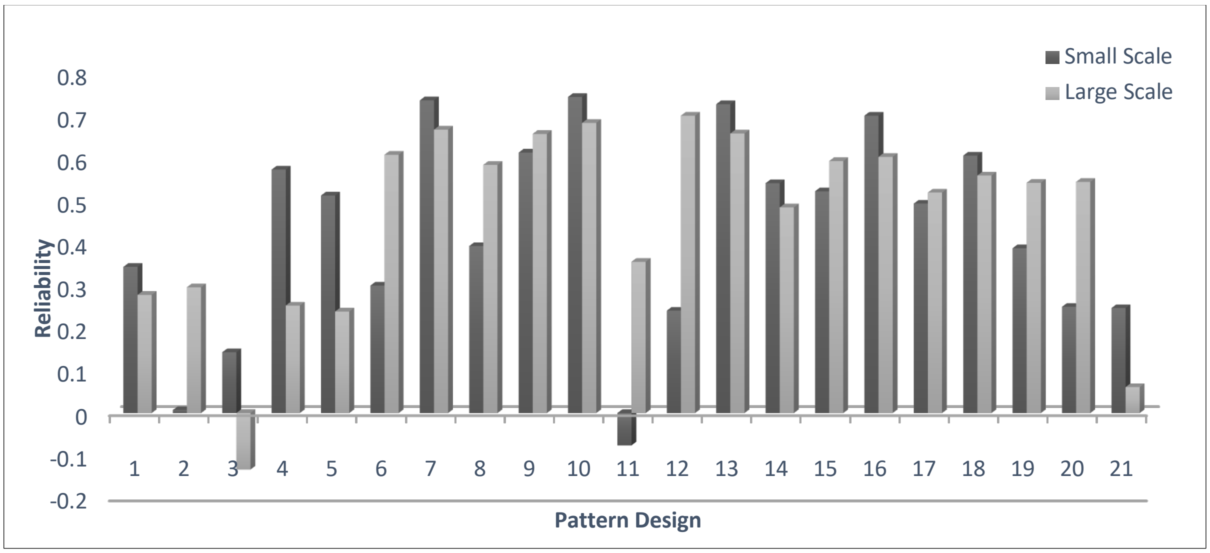


Figure 5.5 Scale Reliability (Small vs Large PDs).

Figure 5.5 demonstrates the reliability value between the small and large-scale of each PD outcome from the PSQ. The results revealed that high reliability values for the PDs are of both scale sizes. After the elimination of the least reliable PD scale size, the remaining 21 PDs were presented in Table 5.2.

(3) Third, further investigations reveal participants' preference to the PDs amongst each of the three constructs; IKEA, IG and LIKE. The higher the variable mean outcome, the more participant preference there is; the lower the mean, the less preference there is. Presenting the mean value of the PSQ items, Table 5.2 reveals the highest and lowest PD reliability values amongst each of the three constructs. This investigation was in order to eliminate PD items of low reliability; doing so also reduced the number of IKEA-IG PDs for the refinement of the main questionnaire of this study.

PD	Question Sets	PD Scale	Question Item Number	IKEA Mean	Question Item Number	IG Mean	Question Item Number	LIKE Mean
1	1,2,3	S	TS_1_IKEA	**<u>2.89</u>**	TS_2_IG	**2.47**	TS_3_LIKE	2.67
2	10,11,12	L	TL_10_IKEA	**2.11**	TL_11_IG	**<u>3.58</u>**	TL_12_LIKE	3.28
3	13,14,15	S	TS_13_IKEA	**2.06**	TS_14_IG	**<u>3.83</u>**	TS_15_LIKE	**<u>3.94</u>**
4	19,20,21	S	TS_19_IKEA	**<u>3.28</u>**	TS_20_IG	**2.03**	TS_21_LIKE	**2.39**
5	25,26,27	S	TS_25_IKEA	2.36	TS_26_IG	3.19	TS_27_LIKE	**<u>3.31</u>**
6	34,35,36	L	TL_34_IKEA	2.17	TL_35_IG	2.58	TL_36_LIKE	**2.44**
7	37,38,39	S	CS_37_IKEA	**2.14**	CS_38_IG	**2.39**	CS_39_LIKE	2.58
8	46,47,48	L	CL_46_IKEA	**<u>2.67</u>**	CL_47_IG	2.67	CL_48_LIKE	**2.56**
9	52,53,54	L	CL_52_IKEA	**1.94**	CL_53_IG	3.03	CL_54_LIKE	3.08
10	55,56,57	S	TS_55_IKEA	2.31	TS_56_IG	**2.36**	TS_57_LIKE	**2.44**
11	64,65,66	L	TL_64_IKEA	**<u>2.94</u>**	TL_65_IG	2.81	TL_66_LIKE	3.14
12	70,71,72	L	TL_70_IKEA	2.61	TL_71_IG	2.69	TL_72_LIKE	2.92
13	109,110,111	S	CS_109_IKEA	2.17	CS_110_IG	**2.28**	CS_111_LIKE	**2.50**
14	115,116,117	S	CS_115_IKEA	2.28	CS_116_IG	3.36	CS_117_LIKE	**<u>3.53</u>**
15	124,125,126	L	CL_124_IKEA	2.17	CL_125_IG	3.00	CL_126_LIKE	2.94
16	127,128,129	S	CS_127_IKEA	2.17	CS_128_IG	2.94	CS_129_LIKE	3.06
17	136,137,138	L	CL_136_IKEA	2.5	CL_137_IG	2.92	CL_138_LIKE	2.94
18	139,140,141	S	CS_139_IKEA	**2.14**	CS_140_IG	**<u>3.64</u>**	CS_141_LIKE	**<u>3.56</u>**
19	166,167,168	L	TL_166_IKEA	**<u>2.69</u>**	TL_167_IG	3.39	TL_168_LIKE	3.25
20	172,173,174	L	TL_172_IKEA	**2.14**	TL_173_IG	**<u>3.53</u>**	TL_174_LIKE	**<u>3.31</u>**
21	175,176,177	S	TS_175_IKEA	**2.08**	TS_176_IG	**<u>3.92</u>**	TS_177_LIKE	**<u>3.75</u>**

Table 5.2 Mean Value of PDs in constructs IKEA, IG, and LIKE.

From the above table, results show PDs pertaining to 'question item number' scoring high on mean value (highlighted, bold and underlined) within each of the constructs as follow:

- IKEA construct: PD 1, PD 4, PD 8, PD 11 and PD 19.
- IG construct: PD 2, PD 3, PD 18, PD 20 and PD 21.
- LIKE construct: PD 3, PD 5, PD 14, PD 18, PD 20 and PD 21.

Notice that the Top PD outcomes from the IKEA and IG constructs were of both small and large 'PD Scale' designs, whereas Top PD outcomes from the LIKE construct were mainly of small-scale designs (only PD 20 was large-scale). It is also noted by reading the 'Question Item Number' coding, that the Top PD outcomes from the IKEA and IG constructs were mainly of straight-line design creations (except for PD 8 and PD 18 respectively), whereas Top PD outcomes from the LIKE construct were of both curved and straight-line design creations.

Results from Table 5.2 also show PDs pertaining to 'question item number' scoring low on mean value (highlighted and bold) within each of the constructs as follow:

- IKEA construct: PD 2, PD 3, PD 7, PD 9, PD 18, PD 20 and PD 21.
- IG construct: PD 1, PD 4, PD 7, PD 10 and PD 13.
- LIKE construct: PD 4, PD 6, PD 8, PD 10 and PD 13.

It can be noted that PDs can obtain a high or low mean value in one or two of the constructs but not in others. Focusing on high mean value results, PD outcomes and relations among the constructs are as follow:

- High only in IKEA construct (not low in others) – PD 11 and PD 19.
- High only in LIKE construct (not low in others) – PD 5 and PD 14.
- High in IKEA construct, low only in IG – PD 1.
- High in IKEA construct, low only in LIKE – PD 8.
- High in IG construct, low only in IKEA – PD 2.
- High in IG and LIKE constructs, low in IKEA – PD 3, PD 18, PD 20 and PD 21.
- High in IKEA construct, low in IG and LIKE – PD 4.

Observations reveal that all PDs scoring high in the IG construct (PD 2, PD 3, PD 18, PD 20 and PD 21) also scored high in LIKE construct except for PD 2. The link of common PDs between the IG and LIKE constructs denotes that participants found these PDs to be of (or represent) the IG style and are also 'liked (or preferred). This could interestingly be due to the Arabian cultural background of the pilot study participants. On the contrary, scoring low in both IG and LIKE constructs, PD 4 denotes that participants found it not to be of the IG style nor is it 'liked' as a style; yet it does represent the IKEA style due to its high mean value within the IKEA construct.

Further investigations also revealed that all PDs scoring high in the IG construct also scored low in IKEA; while only two of the PDs scoring high in the IKEA construct scored low in IG (PD 1 and PD 4). This denotes that the participants that found the PDs to be of the IG style do not represent the IKEA style; however, some of the PDs that participants found to be of the IKEA style somewhat represent the IG style as well (PD 8, PD 11 and PD 19).

Of the high mean value results, the most significant top PD outcomes and relations are those that score high in at least one construct and not low in any of the three constructs. Scoring high in the LIKE construct, PD 5 and PD 14 scored neutral in IKEA and IG; and scoring high in the IKEA construct, PD 11 and PD 19 scored neutral in IG and LIKE.

The following illustrations are the top resulting PDs from all constructs IKEA, IG and LIKE of the pilot study questionnaire (Figure 5.6):

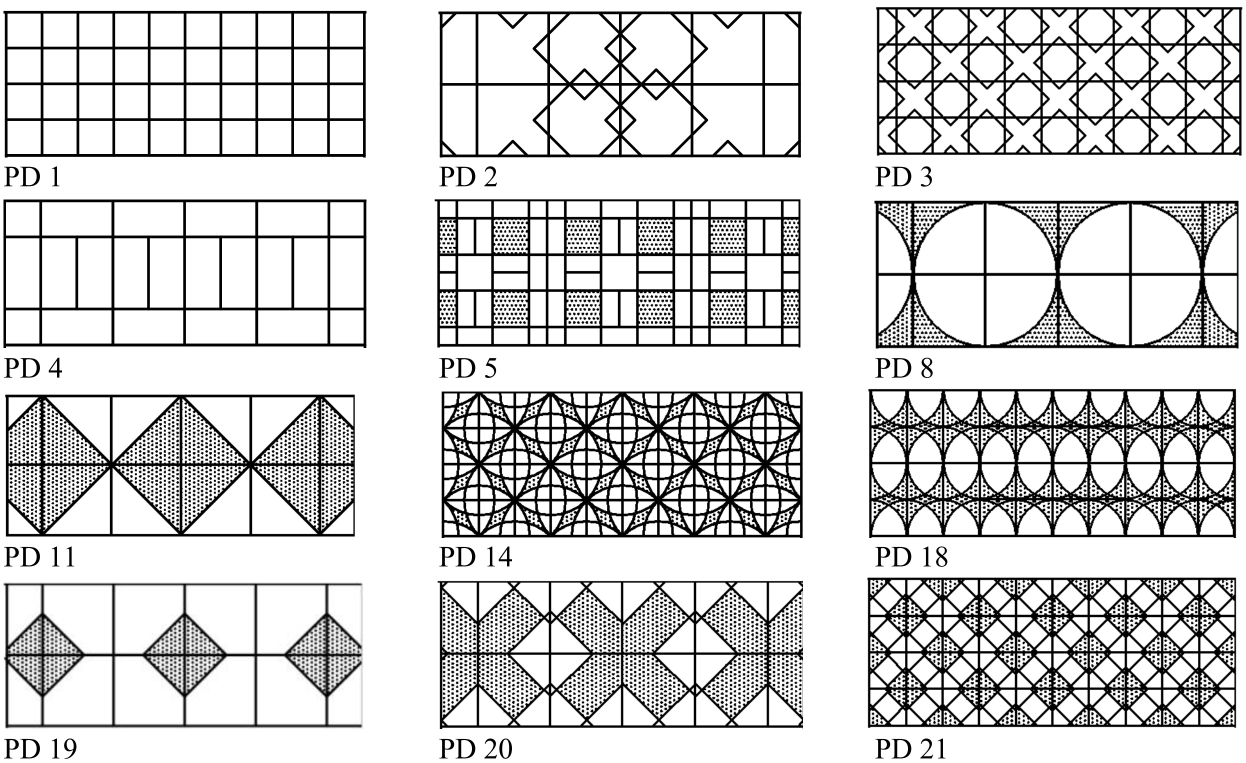


Figure 5.6 Pilot Study Top PDs.

Furthermore, PD 12, PD 15, PD 16 and PD 17 illustrated below in Figure 5.7(a) scored neutral in all three constructs as all of them fell between the high and low mean value results.

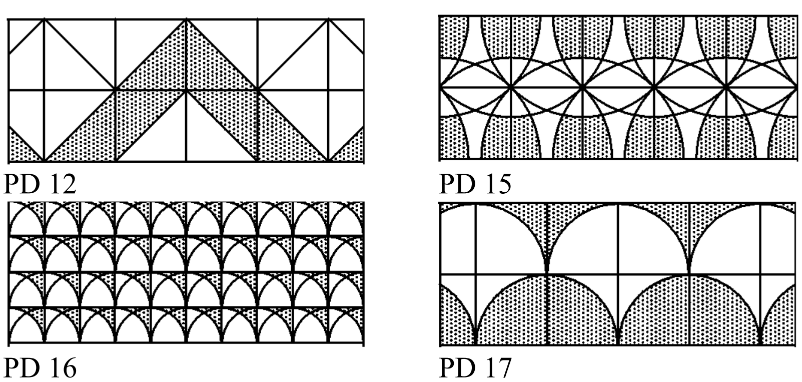
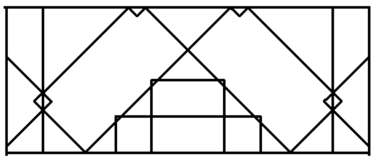


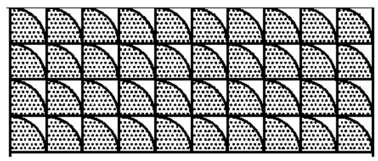
Figure 5.7(a) Pilot Study Mid-Range PD outcome.

Focusing on PD outcomes and relations that did not score high in any of the constructs that are of low mean value results are illustrated below in Figure 5.7(b).

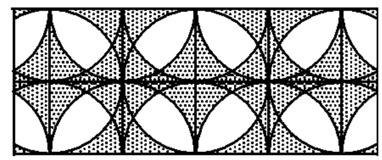
- Low in IKEA construct – PD 9.
- Low in LIKE construct – PD 6.
- Low in IKEA and IG constructs – PD 7.
- Low in IG and LIKE constructs – PD 10 and PD 13.



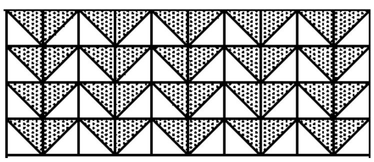
PD 6



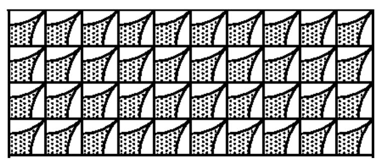
PD 7



PD 9



PD 10



PD 13

Figure 5.7(b) Pilot Study Low-Range PD outcome.

Provided the lowest mean items within each of the three constructs, PD elimination was carried out unless the same PD was of high mean value in another construct or constructs. Therefore, holding one or more low mean values with no high mean values amongst any of the other constructs, PD 6, PD 7, PD 9, PD 10 and PD 13 were eliminated.

(4) Fourth, the three constructs were also investigated for participant preference to straight-line verses curved-line PDs for further eliminations. According to Table 5.3 results, participants preferred straight-line designs in each of the IKEA, IG and LIKE constructs.

Construct	PD Line Style	Mean
IKEA	Straight	2.488
	Curved	2.273
IG	Straight	3.118
	Curved	2.948
LIKE	Straight	3.130
	Curved	3.043

Table 5.3 Straight vs Curved-Line PDs.

Interestingly, of the four most significant pilot study top PD outcomes (PD 5, PD 11, PD 14 and PD 19), PD 14 was the only PD using curved lines for its pattern creation; composed of interlocking circles. While PD 5, 11, and 19 used Straight Line for pattern creation, PD 5 was composed of horizontal and vertical lines, PD 11 was diagonal lines, and PD 19 was horizontal, vertical, and diagonal lines.

Eliminating curved-line PDs for the MSQ means eliminating initial shape Circle, Arched-Square and Arched-Diamond. This reduces the remaining shapes from 7 to 4: Square, Diamond, Rectangle and Octagon. However, the researcher decided to keep both straight-line and curved-line PDs for the main questionnaire to retest and further confirm the outcomes (7 initial shapes).

(5) Fifth, the layout of the questionnaire also can affect the number of questions for this study, hence the amount of time required for participants to complete the questionnaire. A better questionnaire layout results in a more effective outcome from the participants, and for the study. Some participants complained about the length of the pilot study resulting in some not completing the questionnaire. A better questionnaire layout can reduce the number of questions hence the amount of time required for it to be completed. Therefore, adjustments to the questionnaire layout resulted not in the elimination of questions, but in their reduction.

In the refinement of the study questionnaire, the pilot study ensured the survey data as reliable and valid. By eliminating items of low reliability and validity, the study questionnaire and layout was refined in efforts to obtain the necessary data for this study's intent. The elimination process led to a reduced number of illustrations and questions conducted in the MSQ (based on statistical outcomes), as well as a refined design methodology to finding the *ideal* IKEA-IG style.

The refinement of the design study investigation narrowed down the number of initial shapes to ones that fall under a 4-point grid, PDs based on small-scale versus large-scale, top PDs within the three constructs, as well as preference towards straight-line and curved-line PDs. These design investigations and refinements of the questionnaire layout were applied to the main study of this research as an in-depth analysis was conducted (Ch 5.4).

5.3.1 Design Semiotics and Shape Grammar Analysis

As the initial shapes (IS) are narrowed down, the researcher also refined the shape-rule (SR) and shape-rule application (SRA) to find the *ideal* IKEA-IG shape grammar (SG) of the synthesized design language. Dimensional structuring was also reviewed for framing the IKEA-IG PDs fitting for an artifact prototype for further testing the style. Therefore, more analysis of design methodology was addressed:

- Shape grammar analysis using deconstruction and reconstruction of top PDs from the pilot study – investigating IS, SR, and SRA.
    - SG coding and decoding to find the DNA structure of the IKEA-IG style.
    - Creating and recreating the IKEA-IG style.
    - Defining the found SR and SRA based on design investigation.
- Shape grammar application (SGA).
    - Consistency in style.
    - Framing the IKEA-IG PDs.
    - Apply found SR, Sub-Rules, and SRA to the defined IS.
    - Refining, defining, and finalizing the PD outcomes.

Shape grammar analysis and investigation of the PDs reveal the design language of the integrated style. Created using the found shapes of both IKEA and IG design styles, the IKEA-IG PDs were generated using shape-rules, sub-rules and shape-rule applications to the found initial shapes.

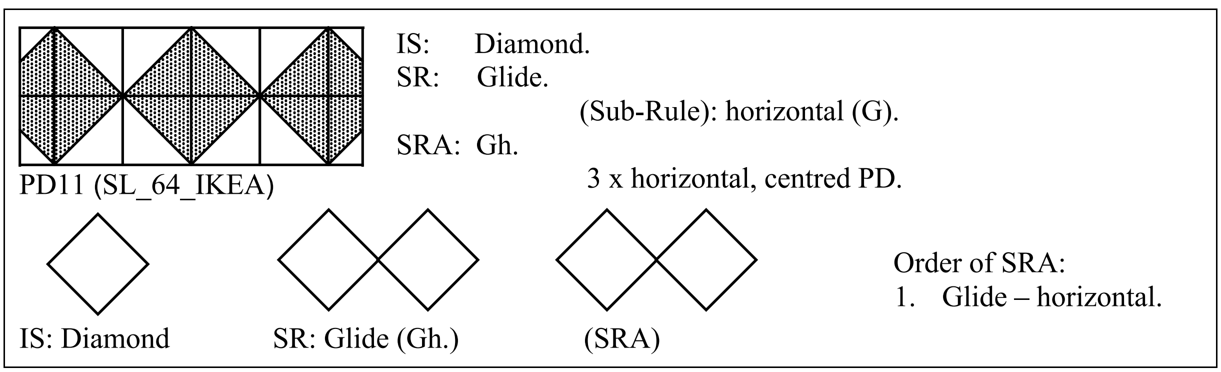
The top PDs resulting from the pilot study within the 3 constructs (IKEA, IG and LIKE) were further investigated for their design language. A total of 12 Top PDs were derived from the statistical analysis of participants' response (Figure 5.6), some resulting top in more than one construct yet low in another (PD 3, 18, 20, and 21), and some resulting top in one construct and not low in any other (PD 5, 11, 14 and 19). In this part of the study, further analysis of design investigation took place to refine and define the PD shape grammars (SG).

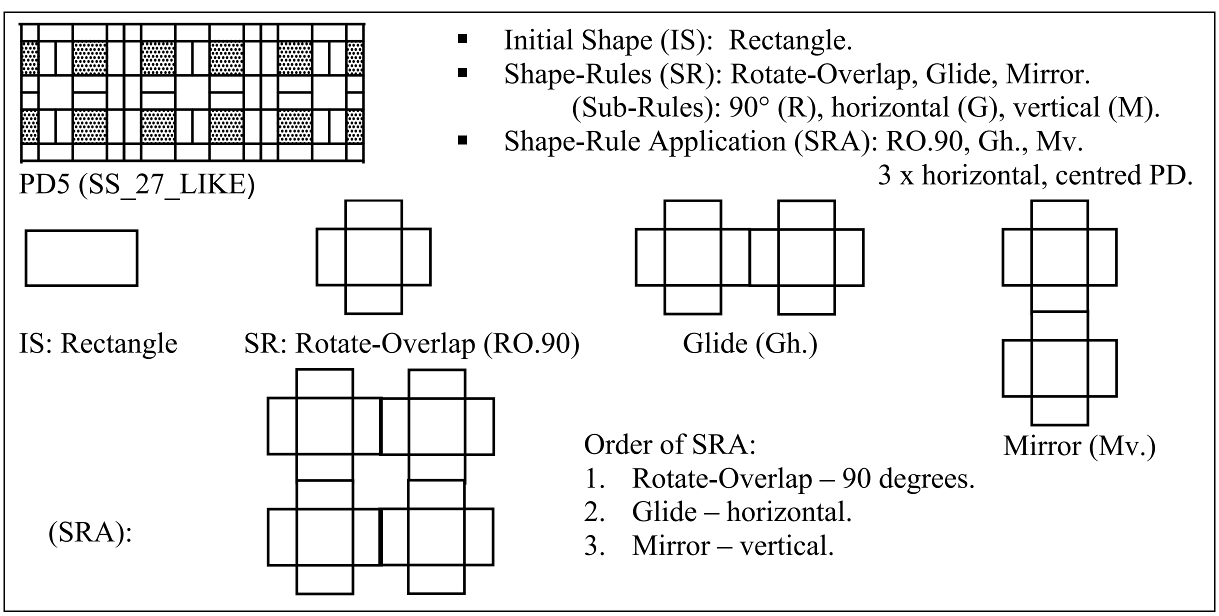
Since symmetry is embedded throughout the IKEA-IG PD language, the geometric initial shape was transformed as a unit (not shape-corner; see Ch. 3.5) with respect to the scale size reliability outcome (Figure 5.5) of its PD formation. The initial shapes were taken through a shape grammar process of shape-rule and sub-rule applications producing the IKEA-IG PDs measured in the pilot study (see Appendix F, p.276). Therefore, in order to further analyse the components of the top PDs, SG was used to extract and define the IKEA-IG design language and style.

In conducting the design investigation, deconstruction and reconstruction of top PDs design language was implemented in order to obtain the SG of each of the PDs. This involved the coding and decoding of the IKEA-IG style DNA structure composed of initial shapes (IS), shape-rules (SR), sub-rules, and shape-rule applications (SRA).

- IS: Initial Shape from which the pattern design emerges. (ex: Rectangle)
- SR: Shape-Rule/s that define how and where the IS evolves. (ex. Glide/Rotate)
    - Sub-Rule/s give specifications as to the direction (horizontal, vertical, diagonal), the degrees (180°, 90°, 45°), and/or the percentage of transformation path extent (75%, 50%, 25%) to the SR.
- SRA: Shape-Rule Applications
    - the order and number of repetitions of in which the Shape-Rules and Sub-Rules are applied to Initial Shape.

Figure 5.8 presents the analyses of the most significant top PD outcomes of the PSQ (PD 5, 11, 14 and 19) in a design investigation to refine and define PD shape grammars for the MSQ. This in efforts to identify the IKEA-IG style and its design methodology.





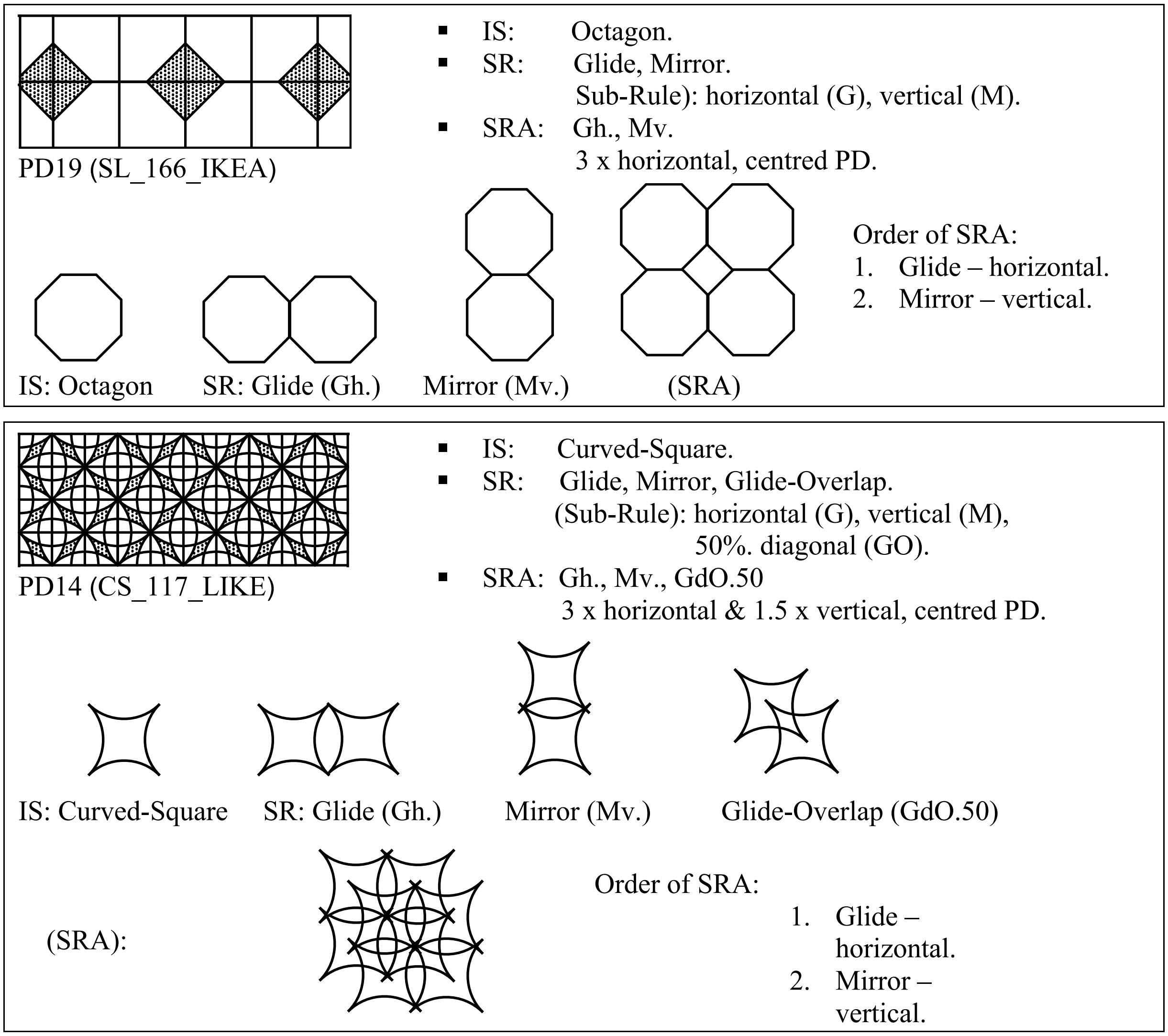


Figure 5.8 Top Pilot Study PD Shape Grammars.

Deconstructing the top pilot study PD outcomes (Figure 5.8) is only one of many ways to formulating the PDs. Shape-rules and order of their application identify the PD outcome. Identifying the number of repetitions depends on the surface area to be covered; framing the PD (Figure 3.8; section 5.3.2). Typically, in the order of SRA, Glide (G) is applied before SR Mirror (M). This is because applying (M) to a non-symmetrical shape-unit will change the PD outcome; depending on the IS and order of SRA (including Sub-Rule), one SR would be used over the other unfolding different PD outcomes (see Table 3.8). Therefore, SR (G) and (M) can sometimes be applied interchangeably. Whereas SR (O) is applied after an initial SRA; ex. (RO) = Rotate-Overlap (Figure 3.12). From the top PDs of the pilot study, (G) is applied initially on a single unit of IS as in PD 11, 14, and 19; (RO) is applied on a single unit of IS, in that order, as in PD 5; and (M) is applied on a set of units to reflect the PD transformation as a group as in PD 5, 14, and 19.

From Table 3.4, Shape-Rules and Sub-Rules are demonstrated and categorised. Holding Sub-Rule (GdO.50), the grammar used in PD 14 is illustrated in Figure 5.9.

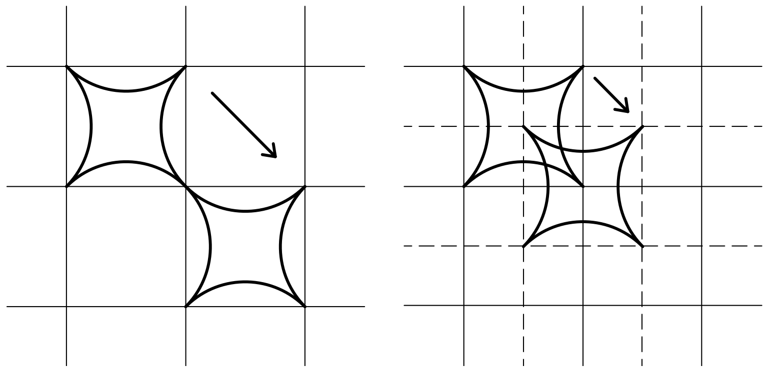


Figure 5.9 PD Transformation Path.

Similar to how SR (RO) in PD 5 is followed by the number 90 representing the angle of the directional path of the SRA, IS ‘Arched-Square’ (Figure 5.9) is depicted with Level 2 Shape-Rule category (Figure 3.12) application followed by the detail 50 representing the percentage of the transformation path. (GdO.50) is therefore a 50% transformation of Shape within a cell-unit of the PD grid to the directional shape rule of Glide diagonally and Overlap (GdO). Hence, SR (R) is followed by the degree of angle of the rotation required: 180°, 90°, or 45°; and SR (O) is followed by the percentage of the shift required: 75%, 50%, or 25%.

Interestingly, depending on the shape grammar used, the PD outcome can reveal a variety of scale sizes based on the SR and SRA towards the IS. The SR ‘Overlap’ for example could multiply the scale of the PD outcome into a smaller fraction creating a denser compilation. For instance, PD 5 and PD 14 both used SR ‘Overlap’ (Figure 5.8), and although they hold small-scale PDs, the application of directional Sub-Rule specification to the SR Overlap further effects the PD intensity and resulting outcome.

The following figure (Figure 5.10) demonstrates a further investigation to different possibilities of reconstructing the top PDs (within the table-panel frame size) by applying SRs to the IS’s in a certain order of application, resulting with identical PD outcomes. The figure demonstrates PD14 from the pilot study (also in Figure 6.1), refer to Appendix H, p.304, for the complete set of PD formation and outcome investigation.

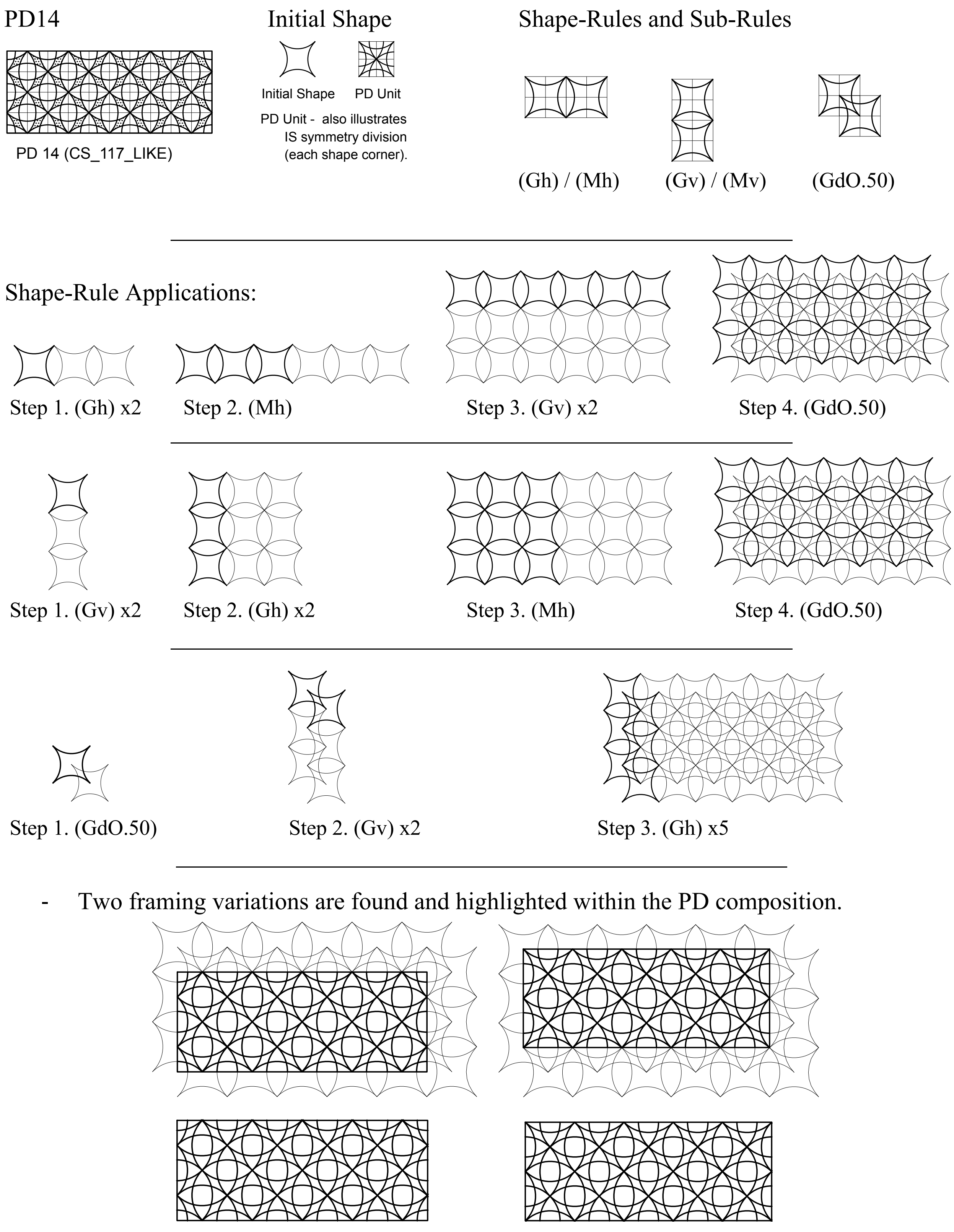


Figure 5.10 PD14 Shape Grammars and Framing.

The resulting PD investigation from Figure 5.10 demonstrates the IS, SR, sub-rule, and SRA creating the PD outcome. Steps taken from one shape-rule application to the next, the PD progresses as a unit from which the previous set of PD outcome progressed. Framed variations of PD 14 outcome are also presented with no gridline or fill-in colour.

Investigating the top PDs from the PSQ aids in finding, refining and defining the *ideal* IKEA-IG design language. Consistency of stye is also necessary for design evaluation and therefore the PD style outcome also requires presentation refinement. Some PD outcomes maintain the gridline of the creating process as part of the PD, and some used fill-in colour, or shading, within the PD line drawing. For instance, from the top PD outcomes of the pilot study illustrated in Figure 5.6, the following PDs are selected to demonstrate and address style inconsistencies (Figure 5.11).

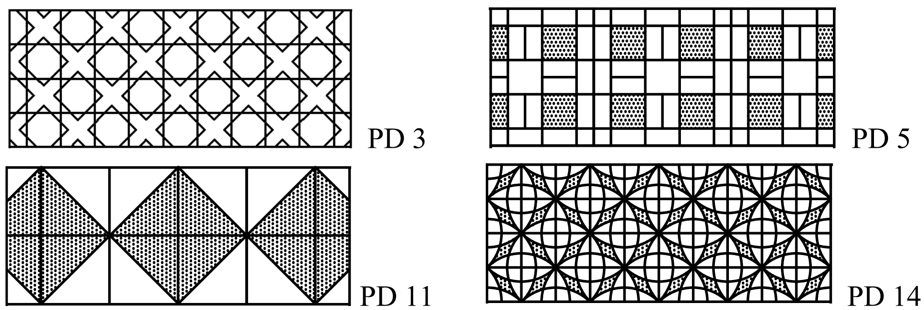


Figure 5.11 Addressing Style Inconsistency.

It can be observed from the demonstration above (Figure 5.11) that PD 5 was illustrated with no gridlines whereas PD 11 was with; PD 5 was illustrated with fill-in colour whereas PD 3 was without; and PD 14 was illustrated with both, gridlines and fill-in colour. For the PDs to be consistent in style execution and presentation, no gridlines were included in the final PD outcome. This is because of two main reasons: the IG style does not include gridlines from which the patterns emerge, and the IKEA style is of simplicity using simple geometries. As for the use of fill-in colour, it was eliminated as well where only the line-drawing was presented; to ensure that the IKEA-IG pattern was measured for its pure geometric form.

It was also found that framing the PD must also be taken into consideration in order to obtain a complete PD arrangement of the IKEA-IG style. Notice that of the top PDs further investigated (PD 5, 11, 14 and 19), only PD 14 is symmetrically framed, centred both vertically and horizontally to where complete PD units are centred within the frame. PD 5, 11, and 19 only maintain ‘complete PD units’ along the vertical axes within the outline of the frame walls due to pattern scale to frame size dimensions; therefore, not symmetrically framed.

Although the IG unique quality is of infinite PD creations that 'extend beyond the frame' due to the continuous nature of its repetitive form, yet the IG patterns are centered within the frame (Ch. 2.2.4). The distribution of a PD's compositional elements (units of shape and its rhythmic transition that develops the pattern) are arranged to be centered evenly within the framing of the IG art creating a symmetrically framed infinite design composition. The alignment of a PD within the frame is essential to the cultural style of IG as it emphasizes symmetry; in addition, symmetry also plays a major role in the contemporary style of IKEA (Ch. 3.4).

Frame size ratio was specified to fit for a prototype production of an IKEA-IG style table-panel artifact to be measured in the evaluative study questionnaire (ESQ) for further evaluation and style analysis. As the IKEA LACK table was selected for the ESQ case study, the IKEA-IG table-panel artifact frame size, PD unit divisibility and pattern scale ratio were determined (Figure 3.17) fitting for IKEA's LACK table dimensions (Figure 3.16). With frame dimension divisibility ratio outcome of 1:2.5, the PD scale as well as shape grammars to frame a 'complete' PD must be taken into consideration due to the ratio not being a whole number. The number of SRAs made up of IS and SR repetitions (horizontal, vertical, and/or diagonal), are designed to fully cover the surface area intended to obtain a complete PD framing; one that extends beyond the frame. Meaning, that for a successful PD framing, the PD to be framed must be accurate to scale (one that holds 'complete PD units' within a given frame area dimension), created to go beyond the frame in order to frame the 'complete' caption of that PD, and centred within the surface area (horizontally and vertically) discarding what lies outside the frame (Figure 5.12).

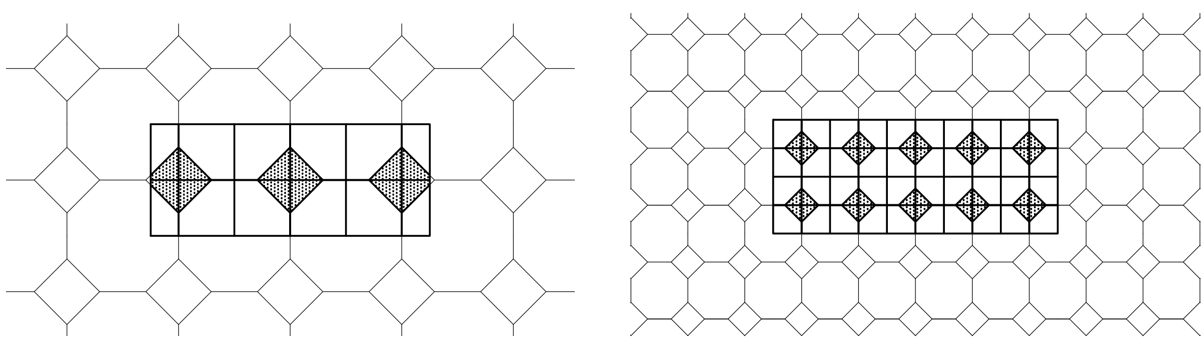
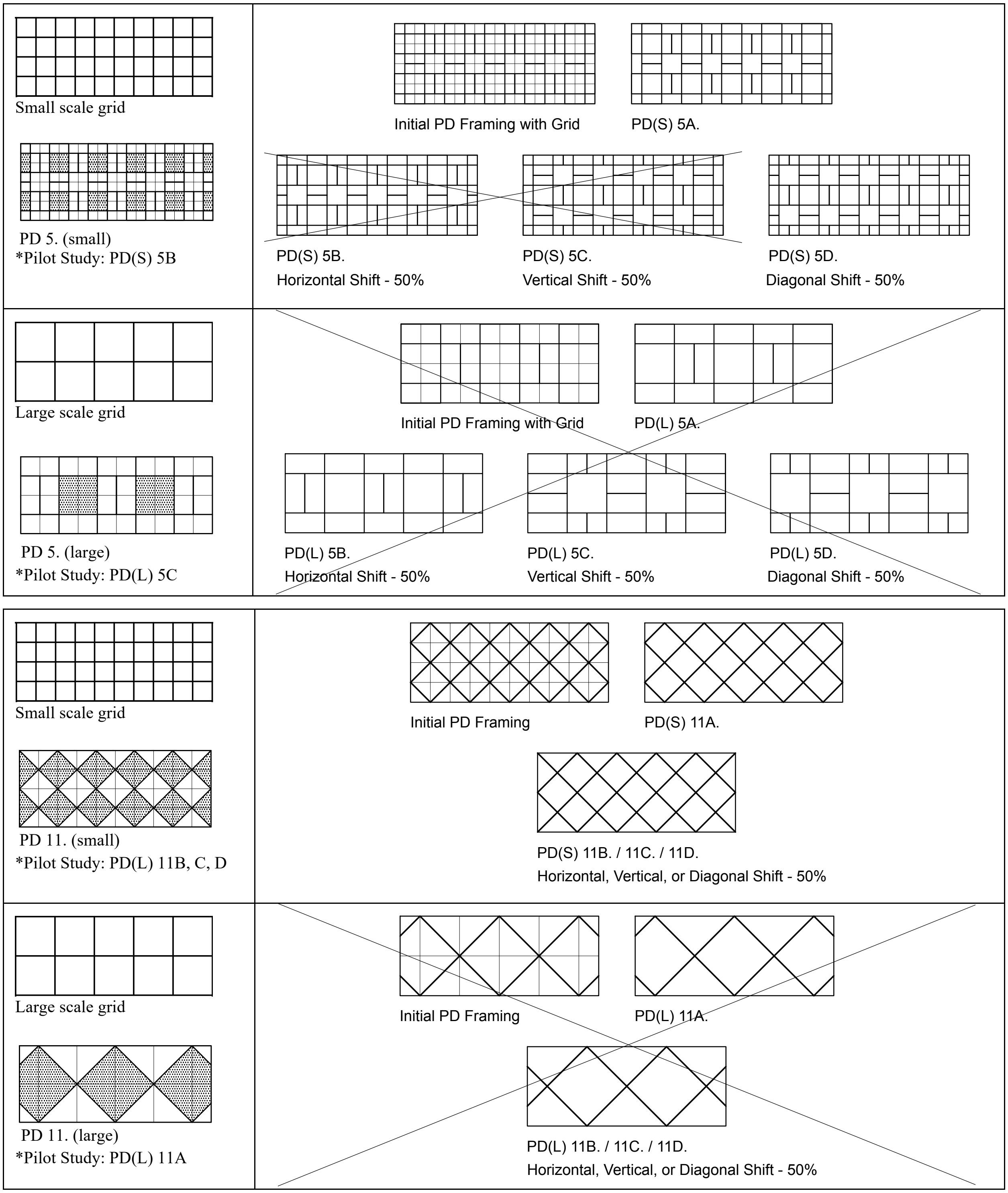


Figure 5.12 PD Framing Alignment.

In the two illustrations above (Figure 5.12), PD 19 large-scale and small-scale reflect how scale can affect the PD framing outcome. The large-scale PD 19 does not fit a complete PD within the framing outline (only centred vertically), while the small-scale PD 19 does (centred vertically and horizontally). Further ratio of PD scale to frame size observations were depicted in Figure 5.13 where both scale sizes of the top PD outcomes from the pilot study questionnaire (PSQ) are framed and investigated.



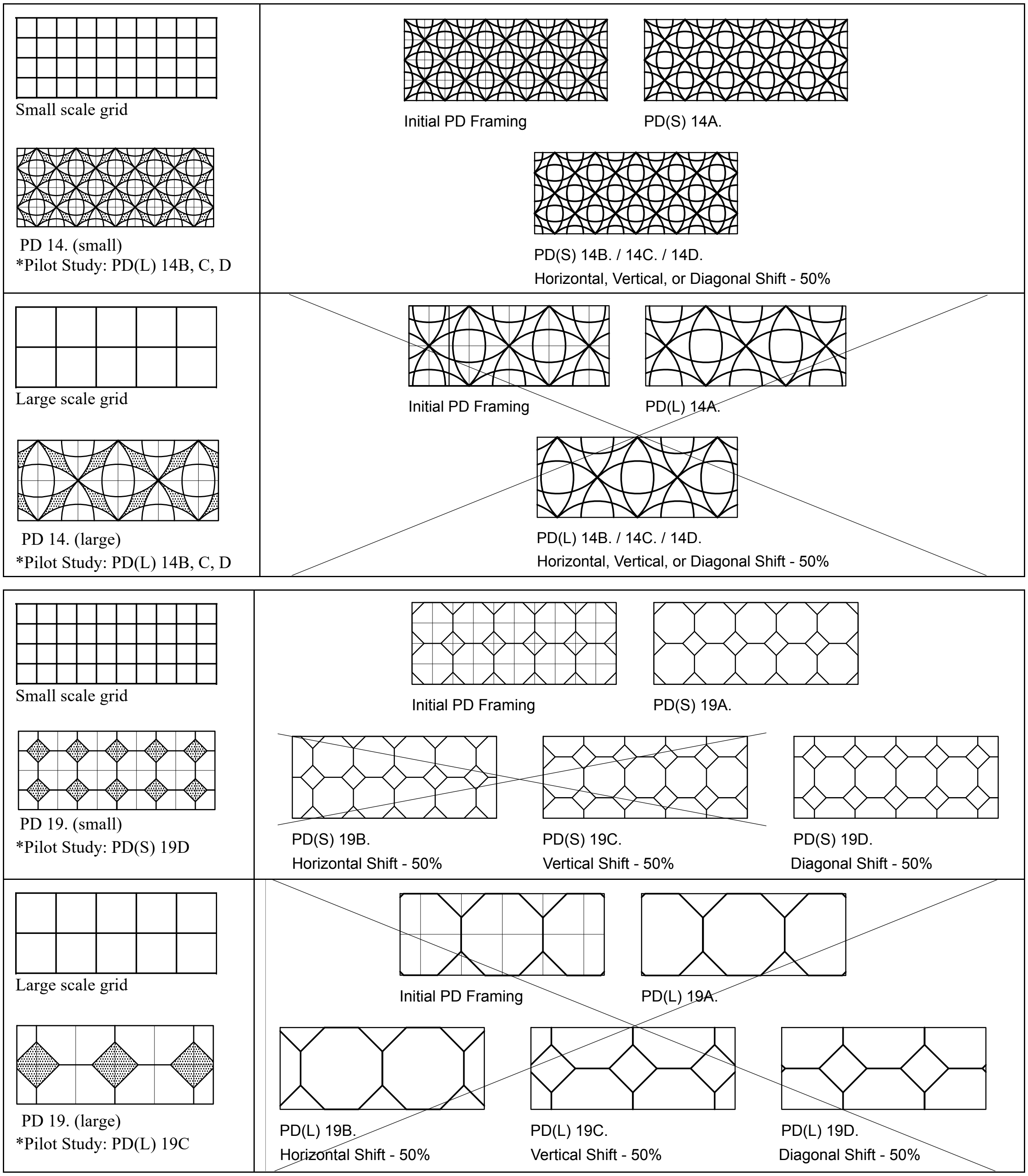


Figure 5.13 PD Framing Variations.

In Figure 5.13, each of the top PDs were framed within the frame size limitations; both in small and large-scale of the PDs. Each PD was centred within the frame in four different variations in each of the scale sizes; ex. PD(S) 5A, 5B, 5C, and 5D, where PD stands for Pattern Design, the

(S) for Small referring to scale size, the 5 is the PD number, and the letters A, B, C and D for the four different framing variation types of the PD.

Each framed PD was observed for symmetry within the plane's dimension. It was found that due to PD scale and frame size ratio of 1:2.5, none of the large-scale PDs could be centred within the frame, therefore eliminated; and some of the small-scale PDs could not be centred either within the frame, therefore also eliminated. Only the small-scale PD framing variations that fit symmetrically (vertically, horizontally, and diagonally) within the frame's outline were considered for further testing: PD(S) 5A and 5D; 11A, 11B, 11C and 11D; 14A, 14B, 14C and 14D; 19A and 19D. The considered PDs are symmetrical within the frame yet are not bound by the frame confinement as they hold the IG pattern quality of extending beyond the frame (Ch 2.2.4).

The PD geometries are infinitely repetitive in nature maintaining the ability to intensify or simplify design intensity; this flexibility lends itself to the IG artform. Yet to fit with the IKEA philosophy (Ch. 2.3), simplicity in design is fundamental. Simplicity does not only pertain to the PDs in the design study, but also to consistency of language of design, design processes and form. For instance, from the symmetrical outcome framing variations (Figure 5.13), all small-scale PDs of framing type A and D were valid in terms of PD scale and symmetry within the frame in addition to style identity or recognition based on the PSQ top IKEA, IG and LIKE construct PD results.

Refining the PDs and framing techniques also created a more defined set of SGs for the IKEA-IG style; one of geometric shapes and rules of symmetry. Initially, the PSQ results of the PDs were evaluated with a comparative outcome between small vs large-scale designs of the same IKEA-IG patterns. However, framing considerations and investigations revealed that only some of the small-scaled PDs were fitting for the PD framing size. This is because although in the art of the IG patterns are of infinite designs that go beyond the frame, yet they are complete designs within the frame (Ch 2.2.4). Also, uniformity of the PDs within the frame provides simplicity which is that of IKEA's design quality.

5.3.2 Style DNA and Framing

- SG investigation of creating and recreation top PDs from the PSQ result analysis:

The semiotic analysis of the shape grammar design investigation methodology defines the structural DNA of the IKEA-IG style. SG is the tool that enables the DNA extraction to set for the creation and recreation of different generations of the same style. Expressed in various PD form outcomes, SG uses a defined structural design language (from the semiotic analysis) of the IKEA-IG style DNA. This is because the SG is the mechanism with which different PD outcomes maintain the same design language. SG has the power to generate many concepts that are still within that style.

From Figure 5.13, it was found that not all PD scale sizes can be applied ‘centred’ on the given table-panel frame size. And, as demonstrated in Figure 5.10, different SRAs can lead to the same outcome of PDs. Considerations to IKEA-IG top PD scale size, framing style, SR and SRA were all taken for measure. Based on the outcome shown in Figure 5.13, the resulting PDs, SGs and framing were revisited and further investigated as demonstrated in Appendix H, p.304; and from the found IS, SRs and SRAs of Appendix H, p.304 - Table 5.4 highlights the SG coding of the PDs documenting the sequential process of the IKEA-IG style creations.

A few observations from Appendix H, p.304, reveal the set parameters to the SR and SRA used to create the PDs. For example, number of shape repetitions (or unit), rotation and mirror are identified including two framing variations of each of the PDs. The set of SRs and SRA create a PD surface layout for symmetrical framing outcome. Also noted, SR Glide and Mirror can be used interchangeably only if the number of PD-units needs to be doubled; for an odd number of PD-units, SR Glide is applied.

The confined coding of the IKEA-IG SGs made up of IS, SRs and SRAs (Table 5.4) were also investigated for further observations. It was found that SR (Mv.) was not used due to the odd number of vertical PD unit repetitions in the initial stage of PD creations for the framing of the PDs (3 vertical PD units). It was also noted that numerous possibilities of creating the same PD are at hand by using the SRs and SRAs interchangeably in a certain organized manner. SR RO.45 or RO.90 are only applied in step #1 of the SRAs. PD 5, 11, and 19 were created using 5 SRA variations resulting in the same PD outcome, while PD 14 had 18 SRA variations. A more in-depth examination of the SRAs between the PDs shows:

- PD 5, 11, and 19 hold 5 different SRAs, yet PD 5 includes SR RO.90 as step #1.
- PD 11 and 19 SRA sequential process starts from PD 5’s step #2 as step #1.
- PD 14 SRA 1 through 5 uses SR GdO.50 in step#1.
    - 2 SRA consisting of 3 steps; 3 SRA consisting of 4 steps.

- PD 14 SRA 6 through 10 uses SR GdO.50 in step#2.
    - 2 SRA consisting of 3 steps; 3 SRA consisting of 4 steps.
- PD 14 SRA 11 through 15 uses SR GdO.50 in step#3.
    - 2 SRA consisting of 3 steps; 3 SRA consisting of 4 steps.
- PD 14 SRA 16 through 18 uses SR GdO.50 in step#4.
    - 3 SRA consisting of 4 steps.

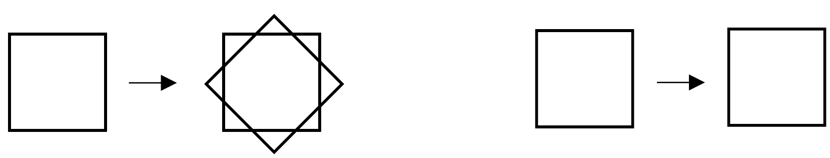
Found SRs and SRAs based on pilot study design investigation:

- PD 5: RO.90 , Gh/Mh, Gv.
- PD 11: Gh/Mh, Gv.
- PD 14: Gh/Mh, Gv, GdO.50.
- PD 19: Gh/Mh, Gv.

From the pilot study design outcome, it can be observed that all top PDs use SR Gh/Mh and Gv. PD 11 and 19 carry identical SR and SRAs. PD 5 is with the inclusion of SR RO.90°; and PD 14 is with the inclusion of SR GdO.50%. This leaves a total of three sets of SRs (Table 5.4):

- SR set #1: Gh/Mh, Gv.
- SR set #2: RO.90 (or) RO.45, Gh/Mh, Gv.
- SR set #3: Gh/Mh, Gv, GdO.50.

The three sets of SRs were applied in a specific order of arrangements depending on IS PD unit. In SR set #2 (Table 5.4), it was found that RO.90 or RO.45 can be used with sub-rule 90° or 45° depending on the IS used. For example, IS Square will have no change under SR RO.90, but will under RO.45 instead (Figure 5.14):



IS Square SR RO.45° (pattern creation)

IS Square SR RO.90° (no change)

Figure 5.14 IS Square and SR Rotate.

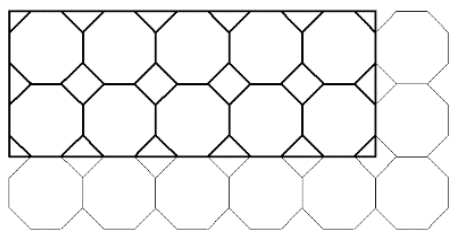
Both SR set #1 and set #2 have 5 possible combinations of SRAs; while SR set #3 has 18 SRAs in total (Table 5.4). With IS being the object from which the PD creations take form, SRs provide the tool from which the shape evolves, and the SRAs are the formula from which the IS and SR interact. Similar to how considerations were made towards how SR may be applied towards other IS than those of the top PDs from the pilot study, considerations must also be made towards the framing of other IS PD outcomes.

➢ Revisiting and refining the number of PD unit layout for framing the PDs:

Unlike the western world where the edge of canvas defines the borders of the artist content or creation, the art of the IG is not bound by the frame. The framing of the artwork is a balance of symmetry between the art and frame instead of being created to fit within the frame. Notice that in framing the 5 by 2 Unit PD outcomes, the PD creation process (of IS, SRs and SRAs) exceeds the framed PD by one PD unit horizontally and vertically; a 6 by 3 PD unit layout (such as in Figure 5.10). This enabled an outcome of two framing variations, one being a 50% shift framing from the other PD layout as demonstrated below (Figure 5.15):

Ex. (5 by 2 PD framing on a 6 by 3 PD layout).

100% PD Unit Framing -



50% shift PD Unit Framing –

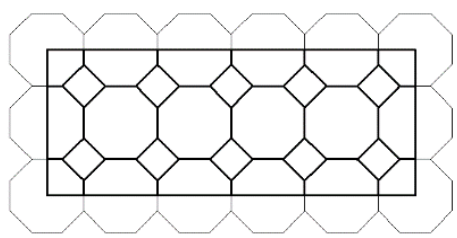


Figure 5.15 One PD Unit beyond the Frame, Framing A.

The example is of PD(S) 19A and 19D from Figure 5.13 PD outcomes and framing variation. Both PD framing variations are according to accurate symmetrical measures, yet further design investigations reveal that to frame a PD, the PD layout must exceed the frame by two units instead. With one unit extra on each end of the required framed PD layout, vertically and horizontally, ‘complete’ framing of all IS pattern outcomes was ensured for the repetitive quality of the IG artform of infinite geometries to be harnessed. This is particularly necessary because one PD unit beyond the frame may not be sufficient to frame a complete PD outcome in some cases. With the application of SGs to IS, some PD units may not maintain the continuum quality that is kept within a whole unit, resulting in an incomplete stagnant PD outcome. For that, only one PD unit beyond the frame will not be enough to frame an art of infinite design (Figure 5.16).

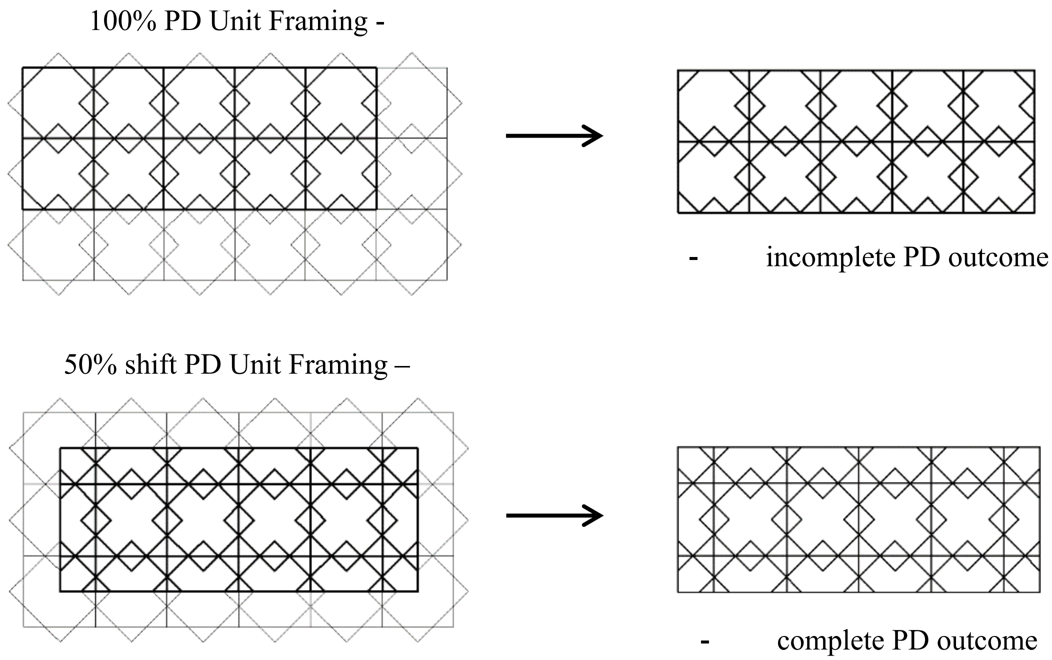


Figure 5.16 One PD Unit beyond the Frame, Framing B.

Notice that the top and left corners of the ‘100% PD Unit framing’ are incomplete with a non-symmetrical PD outcome (Figure 5.16). Whereas in the ‘50% shift PD Unit framing’ the outcome is a complete symmetrical PD. This is due to the extents of the PD layout (light grey lines) going beyond the frame, ensuring all parts of the PD are contained within the frame (bold black lines). In the ‘100% PD Unit framing’ outcome, the missing parts of the design are the extension of what would be adjacent units as they overlap and intersect as the PD is created with neighbouring units completing the pattern, such as the outcome of the ‘50% shift PD Unit framing’.

Therefore, PD units must exceed the framing by one PD unit on each side (top, bottom, right and left) to ensure a full PD within the frame (Figure 5.17). This quality lends itself to the art of IG of extending beyond the frame, to reach unification and symmetry. With the framing centred within the PD layout, all borders of the frame will maintain a symmetrical and continuous PD quality of the integrated IKEA-IG style.

Ex. (5 by 2 PD framing on a 7 by 4 PD layout).

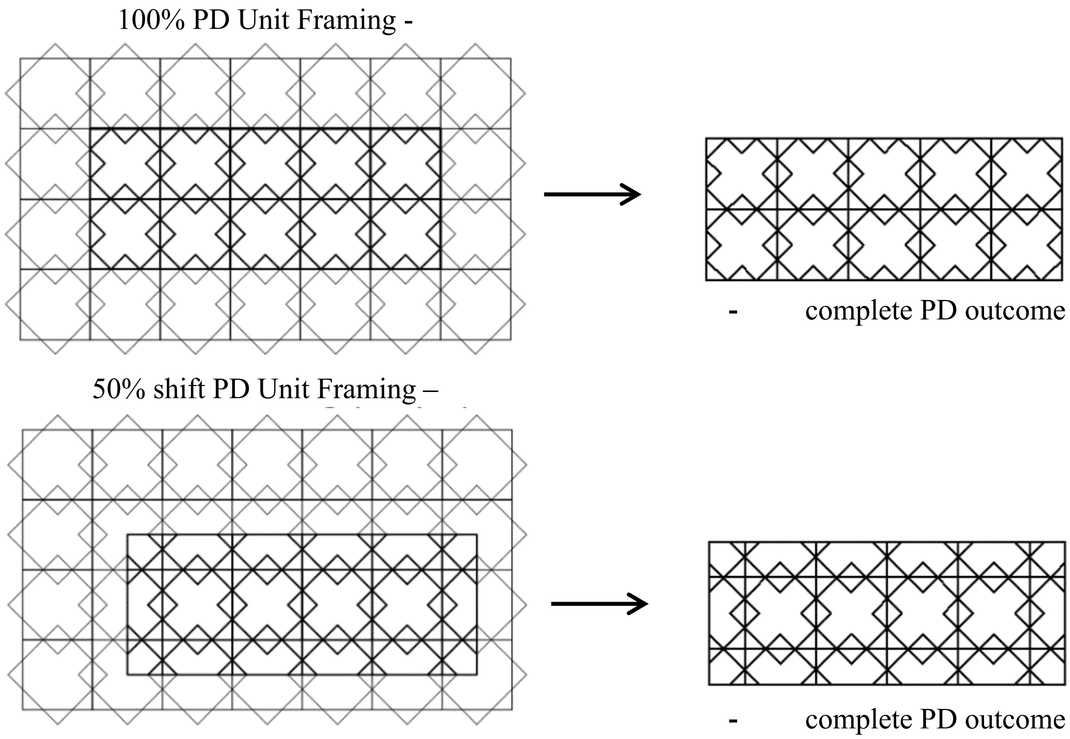


Figure 5.17 Two PD Units beyond the Frame.

By creating the PD layout to be one PD unit exceeding the intended framing on each side, the PD outcome is true to the symmetry nature of both the art of IG and IKEA. With a 7 by 4 PD unit layout to frame a 5 by 2 PD, both framing style varieties (100% and 50% framing) are completely within the extents of the PD layout, and thus complete PD outcomes (Figure 5.17).

Therefore, a total of two extra PD units (vertically and horizontally) are required for creating the layout to frame a PD. This method will ensure the framing of a complete design of symmetrical repetitive pattern. This means that in the SRA process, the number of vertical and horizontal repetitions must exceed the intended framed PD outcome by two PD units. The SGs were applied with the initial PD unit multiplied, two units more than the framed PD outcome (vertical and horizontal axes), in order to capture the quality of the art of the IG of ‘infinite design’; and to enable and ensure different framing styles that capture a complete and symmetrical representation of the infinite PD.

As the number of PD unit repetitions for proper framing was refined, the number of unit divisibility within the frame was also revisited. The table-panel (TP) prototype artifact fitting for the IKEA LACK side-table is demonstrated with its structural dimensions (Figure 5.18).

5.3.3 PD Unit Divisibility and the IKEA-IG Shape Grammar

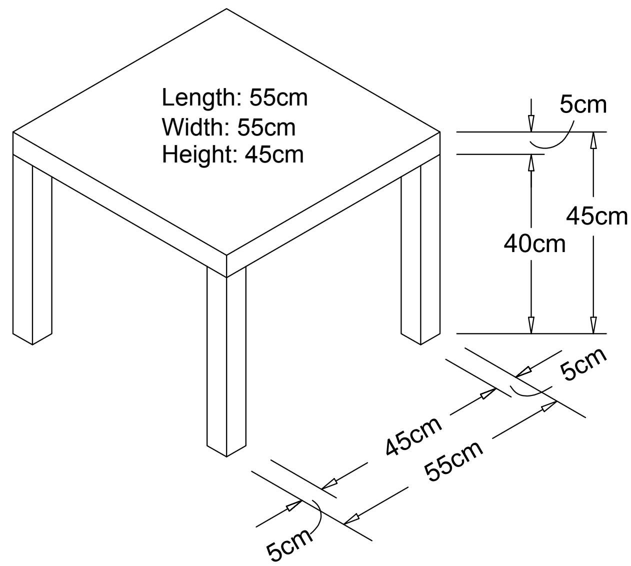


Figure 5.18 IKEA LACK Side Table Dimensions.

The IKEA LACK table dimensions (Figure 5.18) provide the fixed area in which the table-panel fitting can be adapted. Bound by the width between the table legs (45cm), the height of the TP was calculated in relation to symmetry, simplicity, PD unit divisibility within the TP, and the viable distance from ground height (fixed with IKEA's Shape Grammars). Revisiting the TP dimensions establishes a fixed PD unit to frame size ratio. Parameters and limitations of PD unit divisibility and framing the PD Table-Panel for IKEA's LACK side-table include:

1- PD Unit framing – 100% within the frame, and 50% PD shift framing.
   - Maintaining symmetry on all sides, horizontally and vertically.
2- Number of Table-Panels – allowing for a variety and flexibility of style.
   - One panel attachment
     - Simplicity and minimalist quality of IKEA's 'flat-pack empire'.
     - Creates more exposure of table legs.
   - Two panel attachments
     - More in tune with the IG furniture style of design.
     - Less exposure of the table legs.
3- Height between TP and ground.

Having the option of whether or not to add panels, choice of number of panel attachments and PD style is an IKEA aspect of furniture design. It provides flexibility for the customer in personalizing their furniture style selection within the IKEA design line. Even though the traditional furniture design of the Middle East is handmade and fixed (see Appendix A, p.265), providing the option of a double stack TP insertions to the IKEA LACK table provides the IG style more of a traditional structural style table appeal of the cultural arts of the IG (Figure 3.4).

Measurements of the framed PD TP for IKEA's LACK table are confined by the width between the table legs, and the height from ground to bottom of tabletop. Consideration to gap height (ground to TP) baseline was taken into account as well. The TP height was determined by the symmetrical divisibility of PD units within the TP (see Appendix O, p.383).

Reviewing the IKEA LACK table dimensions brought about the refinement of PD unit size and divisibility, framing the PD, and the ground-space clearing to fit the IKEA-IG table-panel artifact prototype (see Appendix O, p.383). Revisiting the table and assessing TP size for an ideal fit established an 8 by 6 PD unit divisibility layout for the PDs. With an even number of PD unit divisibility vertically and horizontally, an ideal distance between end of TP to ground of a 6.25cm gap opening remains. This height was also significant for its proportionality to IKEA's LACK Coffee table's lower deck height which allows for the TP to adapt to this IKEA product as well – as presented earlier in this study in Figure 3.19, therefore coinciding with IKEA's structural furniture dimensions, as well as to the IG table design form (Figure 3.4). Although PD units can be multiples of 8 by 6 (i.e., 16 by 12), but due to IKEA's simplistic design style, the smallest applicable number of workable minimalistic divisibility is required. Therefore, 8 by 6 PD units is the ideal ratio for the IKEA-IG TP design for the IKEA Lack table with consideration to the opening height from ground to TP floor gap (Figure 5.19).

8 by 6 PD Units: 8 by 6 PD Units (50% shift framing variation):

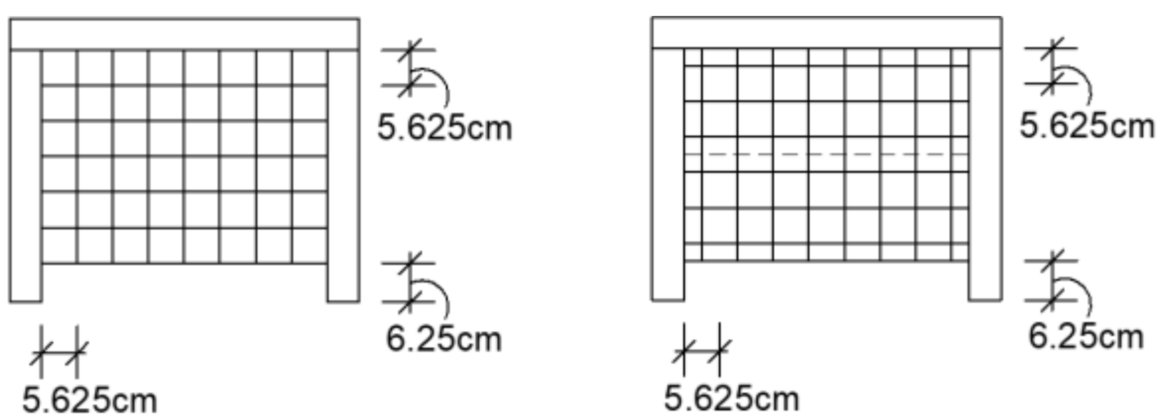


Figure 5.19 Table Panel PD Units and Panel Size.

The found 8 by 6 PD unit divisibility is the unit count for two TP attachments; one TP holds an 8 by 3 unit framed PD of the IKEA-IG style. With a 45cm width stretching from one table-leg to the next, each PD-unit measures 5.625cm x 5.625cm; totalling the whole width of the TP (45cm) and height (33.75cm for two-panels, and 16.875cm for one-panel). Figure 5.19 also demonstrates the framing variations of the PDs – one framing being a 50% vertical and horizontal shift from the other – still symmetrical on all ends of the TP. Symmetry provides the PD geometries a quality of 'extending beyond the frame' (IG quality); and, where the two-panels meet is the continuum, or extension, of the PD. Therefore, the installation of only one TP also allows for a symmetrical outcome.

As mentioned earlier, the number of units of PD layout for framing the PD outcome must exceed the required framed unit size by two units horizontally and vertically; 10 by 5. The PD layout is to go 'beyond the fame' to obtain a 'complete' PD within the frame. This also means that there is only one scale size for the PD creations (no small or large-scale PDs as there was in the PSQ); the PDs can only be the size of the 8 by 3 PD unit divisibility (see Appendix O, p.383). Shape Grammar applications are therefore implemented under the found unit divisibility of PD layout, TP size, and framing. The findings along with the defined SGs formulates a design methodology for the IKEA-IG TP for the IKEA LACK table. The prototype design investigation proposal for the revival of the cultural arts of IG was not intended to modify the existing IKEA language of design, but as an addition to its existing style. Identifying filters and parameters lead to a practical design solution, one of a cultural-contemporary design language and style.

From the investigation and finding of SRs and its applications in addition to PD unit layout and accurate framing strategies, the refined set of DNA coding composed of IS, SR and SRA of the design process arrangement for the IKEA-IG PDs and their outcomes are defined. With set parameters, applying the found sequential order of SRs and SRAs – including number of repetitions and steps under the rules of symmetry as well as the refined PD unit divisibility and framing, each of the initial shapes (IS) are illustrated and taken through the IKEA-IG design processes of the TP prototype. The following table denotes the sets of SRs - 'the tools', and the sequential coding of SRA steps - 'the formula' (Table 5.4) followed by a sample of the structured formula of IS, SRs and SRAs of the IKEA-IG PD formations (Figure 5.20).

SR set #1. Gh/Mh, Gv.	
- SRA 1) Gh(x9), Gv(x4). - SRA 2) Gv(x4), Gh(x9). - SRA 3) Gh(x4), Gh/Mh, Gv(x4).	- SRA 4) Gv(x4), Gh(x4), Gh/Mh. - SRA 5) Gh(x4), Gv(x4), Gh/Mh.

SR set #2. RO.90/45, Gh/Mh, Gv.	
- SRA 1) RO.90/45, Gh(x9), Gv(x4). - SRA 2) RO.90/45, Gv(x4), Gh(x9). - SRA 3) RO.90/45, Gh(x4), Gh/Mh, Gv(x4).	- SRA 4) RO.90/45, Gv(x4), Gh(x4), Gh/Mh. - SRA 5) RO.90/45, Gh(x4), Gv(x4), Gh/Mh.

SR set #3. Gh/Mh, Gv, GdO.50	
- SRA 1) GdO.50, Gh(x9), Gv(x4). - SRA 2) GdO.50, Gv(x4), Gh(x9). - SRA 3) GdO.50, Gh(x4), Gh/Mh, Gv(x4). - SRA 4) GdO.50, Gv(x4), Gh(x4), Gh/Mh. - SRA 5) GdO.50, Gh(x4), Gv(x4), Gh/Mh. - SRA 6) Gh(x9), GdO.50, Gv(x4). - SRA 7) Gv(x4), GdO.50, Gh(x9). - SRA 8) Gh(x4), GdO.50, Gh/Mh, Gv(x4). - SRA 9) Gv(x4), GdO.50, Gh(x4), Gh/Mh.	- SRA 10) Gh(x4), GdO.50, Gv(x4), Gh/Mh. - SRA 11) Gh(x4), Gh/Mh, GdO.50, Gv(x4). - SRA 12) Gv(x4), Gh(x4), GdO.50, Gh/Mh. - SRA 13) Gh(x4), Gv(x4), GdO.50, Gh/Mh. - SRA 14) Gh(x9), Gv(x4), GdO.50. - SRA 15) Gv(x4), Gh(x9), GdO.50. - SRA 16) Gh(x4), Gh/Mh, Gv(x4), GdO.50. - SRA 17) Gv(x4), Gh(x4), Gh/Mh, GdO.50. - SRA 18) Gh(x4), Gv(x4), Gh/Mh, GdO.50.

Table 5.4 Sequential Rule DNA Coding.

The defined SR and systematic applications were coded and categorized into three sets of configurations (Table 5.4). Notice that there is a total of 9 horizontal moves; in addition to the IS/PD unit, applying SR Gh(x9) implies 9 moves in the horizontal axes leaving a total of a 10 PD unit layout. This is to cover the extra two PD units 'beyond the frame' required to ensure a complete PD framing (Ch. 5.3.2). Likewise, the vertical axes PD layout holds a total of 5 PD units – the initial PD unit and SR Gv(x4); leaving a total of a 5 PD unit layout in order to frame the 3 units vertically.

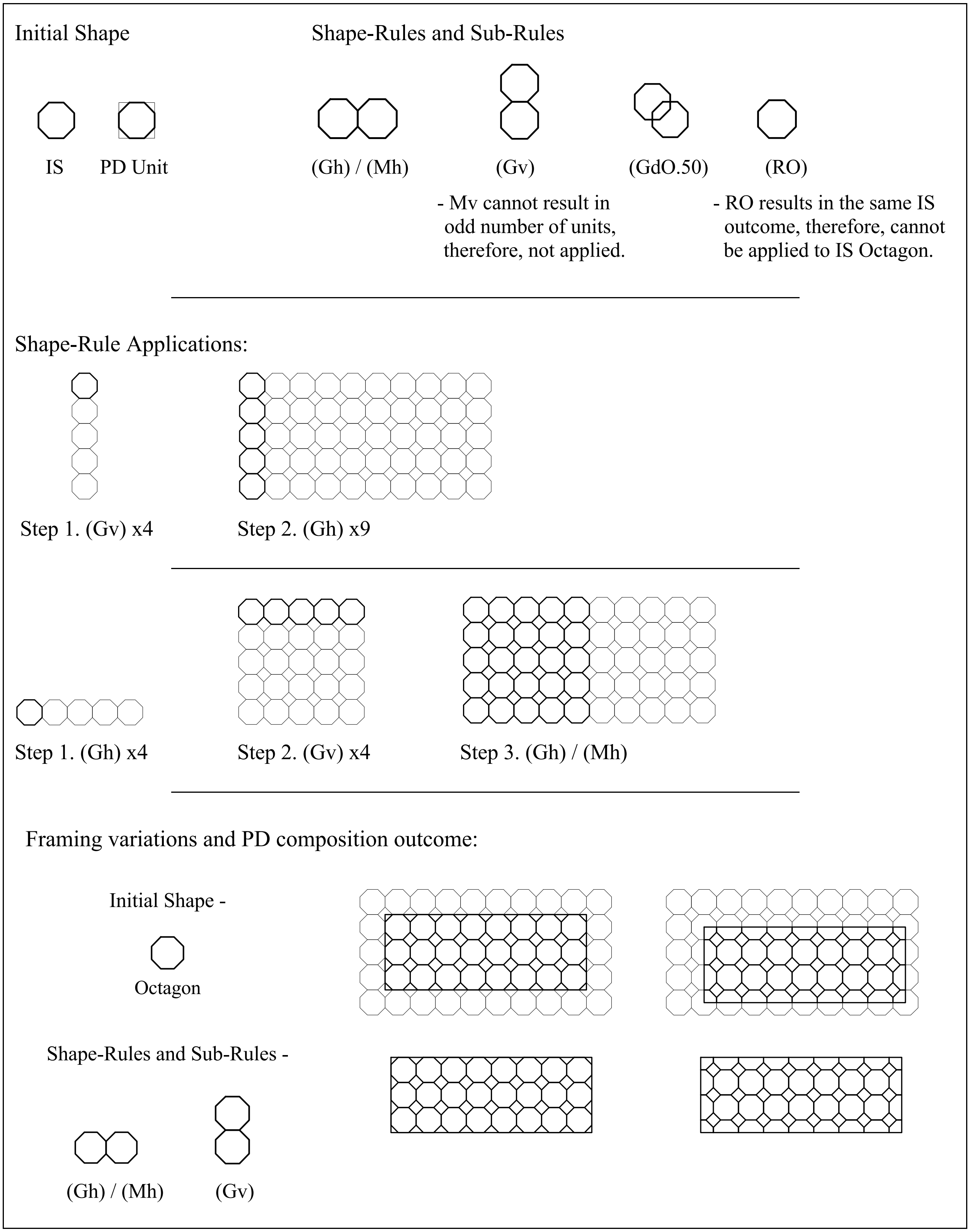


Figure 5.20(a) PD Formation: IS, SR (set#1) and SRA.

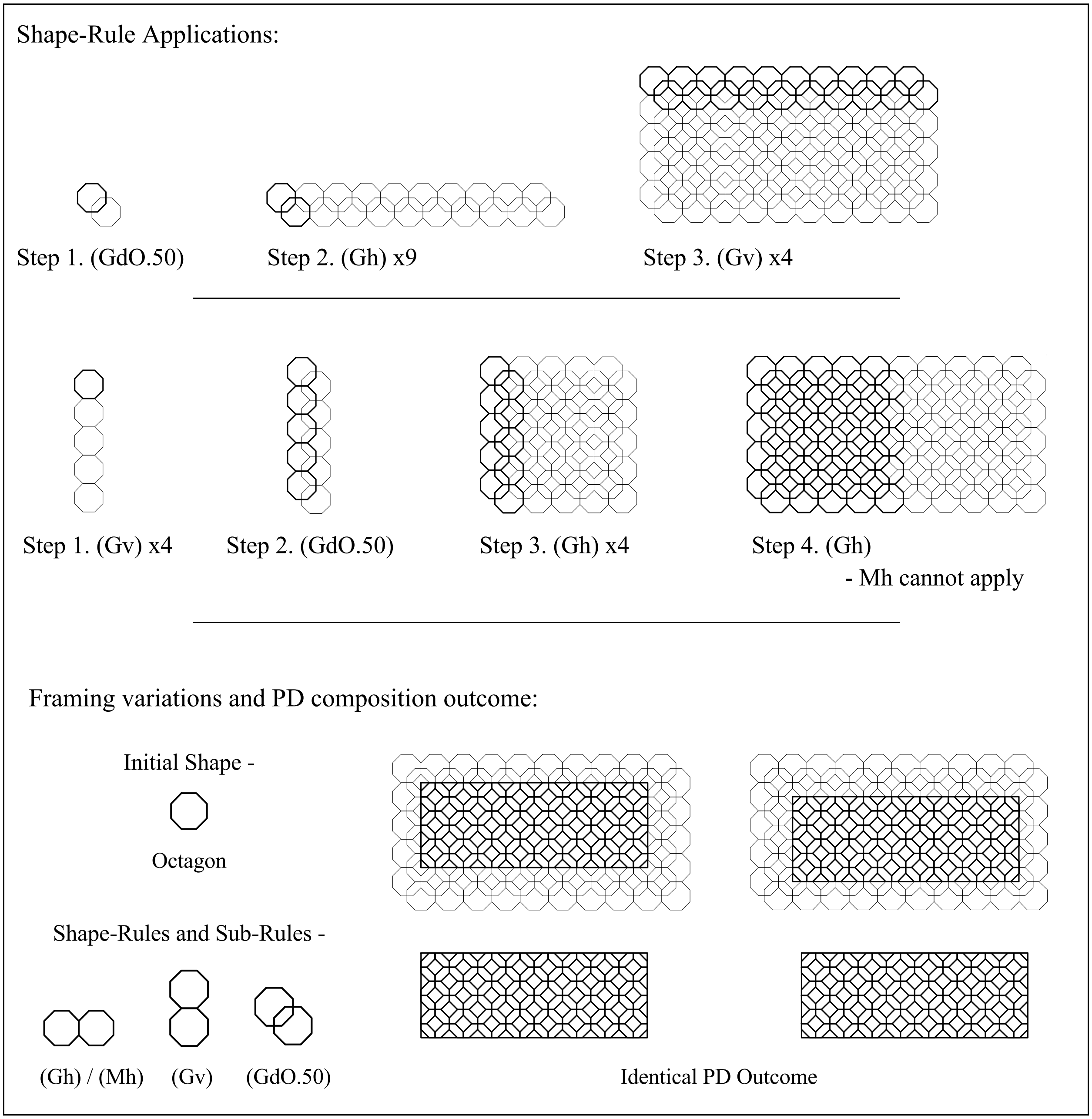
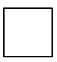
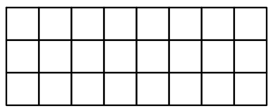
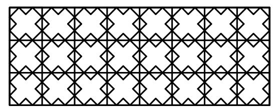
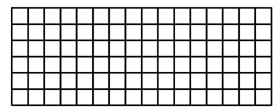
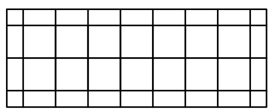
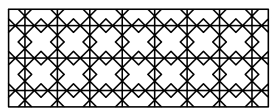
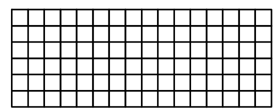
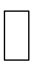
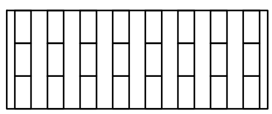
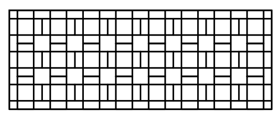
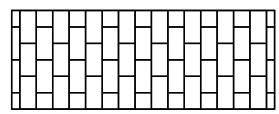
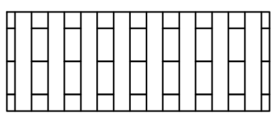
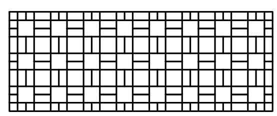
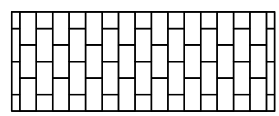
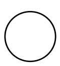
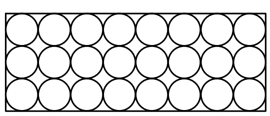
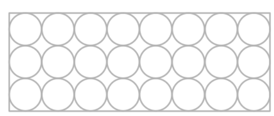
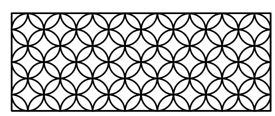
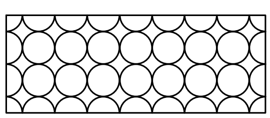
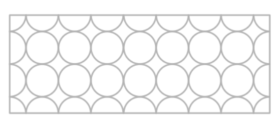
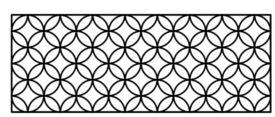
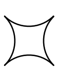
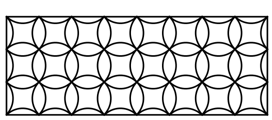
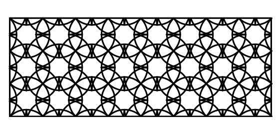
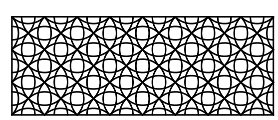
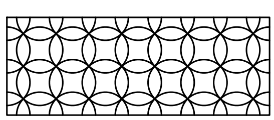
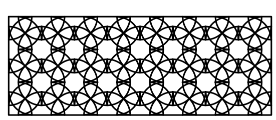
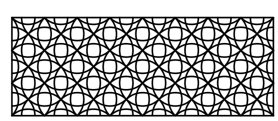


Figure 5.20(b) PD Formation: IS, SR (set#3) and SRA.

The above, Figure 5.20(a) and (b), presented a sample of the initial shape Octagon as it multiplied, evolved and transformed from which a pattern design expanded, derived and formed. The sample presents the PD formation of IS Octagon undergoing some of the SRAs from SR set #1 in Figure 5.20(a) and set #3 in Figure 5.20(b) of Table 5.4; SR set #2 does not apply to IS Octagon. A full structured formula illustration of IS Octagon is presented in Appendix P, p.388 - Figure P1. Consisting of Shape, SR, and SRAs, a PD layout was formed. The PD layout was then framed with the TP dimensions for the final PD outcomes. Following a set of rule applications, all IS were taken through a sequential process of SR, Sub-Rule, and SRAs producing the integrated IKEA-IG PD illustrations (see Appendix P, p.388 - Figure P2). Sequential SRs and SRAs were applied to each of the IS's; the 3 sets of SRs (Table 5.4) applied to the 7 geometric IS's. Two framing variations of each PD outcome results – (A) being 100% PD Unit framing, and (B) being 50% shift in PD Unit framing (Figure 5.17). The table below illustrates each of the IS's framed PD outcomes in the 2 framing variations under the 3 sets of SRs applied: Figure 5.21.

Initial Shape	Framing Variation	Application of SR set #1	Application of SR set #2	Application of SR set #3
 Initial Shape Square	(A)			
	(B)			 Identical Outcome
 Initial Shape Rectangle	(A)			
	(B)			 Identical Outcome
 Initial Shape Circle	(A)			
	(B)		 SR (RO) cannot be applied	 Identical Outcome
 Initial Shape Arched-Square	(A)			
	(B)			 Identical Outcome

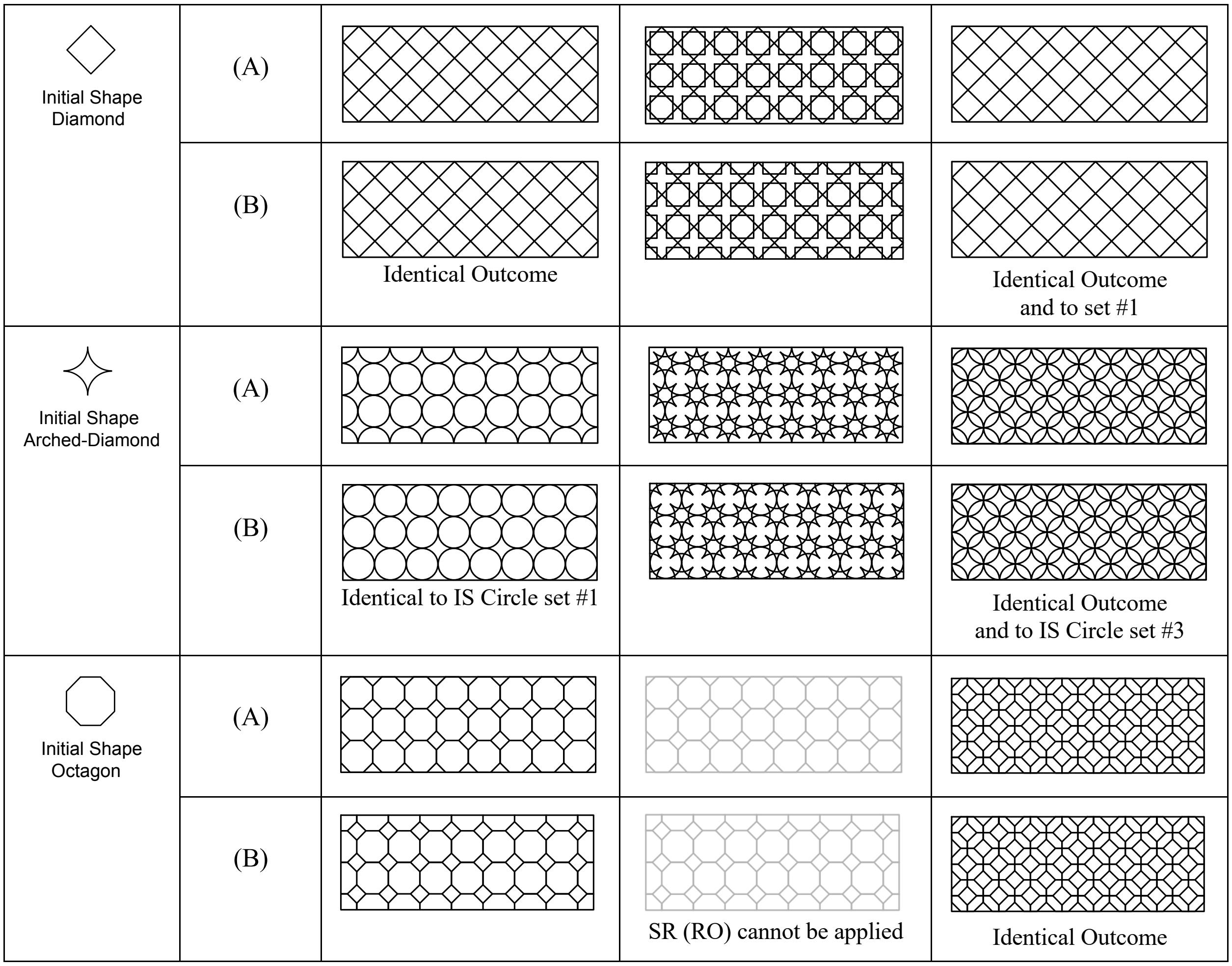


Figure 5.21 Framed PD outcomes of SRA to IS.

Out of the seven Initial Shapes, a total of 42 PDs were produced (Figure 5.21). Further review and observation of the PD outcomes reveal:

- Identical PD outcomes –
  - IS Square: set #3 (A) and (B).
  - IS Rectangle: set #3 (A) and (B).
  - IS Circle: set #3 (A) and (B); IS Arched-Diamond: set #3 (A) and (B).
  - IS Circle: set #1 (A) and IS Arched-Diamond: set #1 (B).
  - IS Circle: set #1 (B) and IS Arched-Diamond: set #1 (A).
  - IS Arched-Square: set #3 (A) and (B).
  - IS Diamond: set #1 (A) and (B); set #3 (A) and (B).
  - IS Octagon: set #3 (A) and (B).

- Eliminated PD outcomes –
    - IS Circle: set #2 (A) and (B) – SR RO.45/.90 cannot apply to IS Circle.
    - IS Octagon: set #2 (A) and (B) – SR RO.45/.90 cannot apply to IS Octagon.
- Observations –
    - PD outcomes of each of the 7 IS in application of SR set #3 are all identical.
    - Identical PD outcomes will only be used once for the MSQ.
    - IS Rectangle is the only IS that uses SR RO.90.

With the application of SR to the 7 IS, only 26 PDs out of the 42 PD outcomes were used for further testing (see Appendix P, p.388 - Figure P2); this is due to eliminating identical PD outcomes. The final outcomes illustrations were measured in the Main Study Questionnaire (see Appendix J, p.353).

Using shape grammar applications (SGA), each of the 7 IS was developed into PDs; some resulting with multiple identical outcomes within the same IS (such as IS Diamond in SRA set #1 and 3, and in both framing variations A. and B.), and some identical to other IS PD outcomes (such as IS Circle and Arched-Diamond set #3, A. and B.). PD outcomes are considered for further investigation provided that identical PDs are presented only once. Therefore, Appendix P, p.388, presents the PD outcomes with no identical or repeated designs.

After establishing the IKEA-IG PDs, line-weight investigation was applied taking place in two evaluative study questionnaires (ESQ) following the MSQ. Line-weight application was measured using 3/16” and 1/4” for the PD line width (Figure 5.22) where it was determined that the 3/16” line-weight will be applied to the PDs for the ESQs; this is due to the pattern detail being denser and more obscured as the line width increases. The line-weight investigation took part in the implementation of the PD illustrations into production processes to also find out if the pattern detail is still maintained in the translation of line-drawings to actual artifact prototype production. The developed prototype was also evaluated for structural durability and adequacy for installation in addition to the outcome of the pattern design production detail.

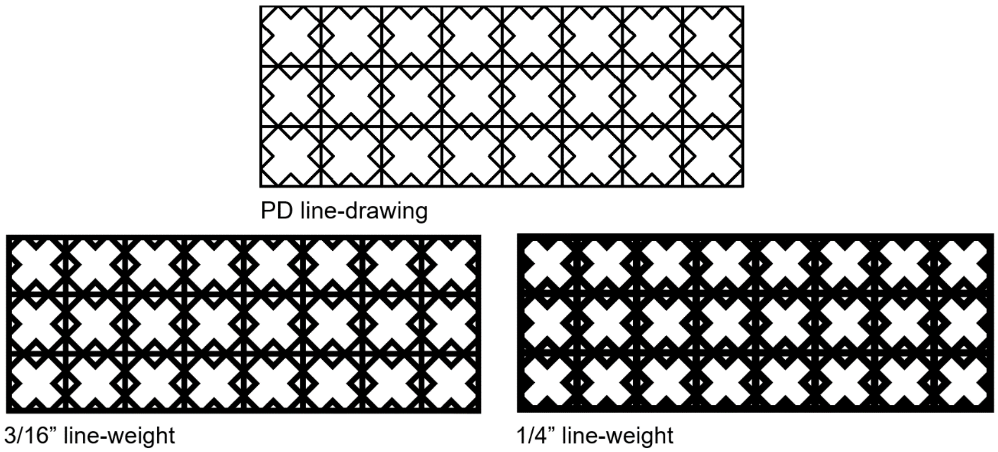


Figure 5.22 PD Line-weight example.

Illustrating the PDs with line-weight was necessary in order to demonstrate the thickness of pattern lines as intended for the IKEA-IG table-panel prototype artifacts to be measured in the ESQs (see Appendix BB, p.480). With each PD carrying systematic codes of SRs, identical scale uniformity, line-weight modifications and engraving, the finding of the *ideal* IKEA-IG design language was enabled and reached with further testing on the design style for refining and defining the outcome. The MSQ investigated the IKEA-IG line drawings to focus the style evaluation on the integrated pattern for assessment from which the top cultural-contemporary PDs are taken for a *real* and *reflective* evaluation of the style in the ESQs.

5.4 Main Study Results and Statistical Analysis

An in-depth analysis of the MSQ was in efforts to answer the research questions and to accept or reject the research hypothesis. Similar to the PSQ layout, the main research study included the participants information sheet, aim of the research and brief background, purpose of conducting this questionnaire, and guideline of answering the survey (see Appendix J, p.353). The questionnaire was designed in three parts: Part 1 presents the 26 PDs illustrations accompanied by three main questions, one for each of the 3 constructs, to be answered using a Likert scale rating from strongly agree to strongly disagree for each PD; if the design style most likely represents IKEA, IG, and style preference. Part 2 presented questions about preference to IKEA’s furniture, and to the inclusion of the IKEA-IG style into IKEA’s line of furniture; and Part 3 was the participants’ demographic data (see Appendix J, p.353).

Conducted in Kuwait on the 24th of March 2019 (Ch. 4.8), data collection was developed using a snowball technique (Ch. 4.5). SPSS was used for data coding and statistical analysis, from which deeper design investigations unfold to reveal the *ideal* style synthesis of cultural and contemporary language of design; one that revives and embraces cultural identity within contemporary society.

5.4.1 Main Study Reliability and Validity

Before examining the proposed hypothesis of the study, reliability testing was performed by the researcher to check the consistency of the data. The results of the overall reliability tests revealed a calculated value of Cronbach's alpha for complete dataset as 0.966 which indicates highly reliable and consistent data. Each of the three constructs was also tested for reliability. The overall reliability for IKEA construct items revealed a Cronbach's alpha value of 0.941 indicating that the questionnaire items for the IKEA construct were highly reliable and consistent.

Table 5.5 represents the validity test results for items in the IKEA construct. The column labelled as 'Corrected Item-Total Correlation' shows the correlation between a particular item and the sum of the rest of the items. If any value in this column is less than 0.20, then the corresponding item should be removed from the questionnaire because in this case it is not measuring the same thing as the rest of the items. The values in the column labelled as 'Cronbach's Alpha if Item Deleted' are the values of overall alpha if that item is not included in the calculation. If any value in this column is greater than the value of overall reliability statistics value then the researcher should remove the corresponding item, because in this case removing that item from the questionnaire can increase the overall reliability of the data.

Part 1 of the main study questionnaire (MSQ) holds a coding system for the study investigation to identify specific items within the questionnaire. The items were coded as follow for the analysis:

- (DS_PD#_Q#).
    - DS or Design Style refers to the construct IKEA, IG, or LIKE.
    - PD# or Pattern Design number refers to the specific PD illustration.
    - Q# or Question number refers to the specific question in the main study survey.

Therefore, as an example, item IKEA_13_37 refers to the IKEA design style, pattern design 13, of question number 37.

From Table 5.5 it can be seen from the results that the most correlated item was IKEA_14_40, with an item-total correlation of $r = 0.68$. The item with the least item-total correlation was IKEA_1_1 ($r = 0.41$). It can also be noted that none of the items in the 'Cronbach's Alpha if Item

Deleted' had a greater value than the overall 0.94 reliability statistics value, therefore all these items were considered in the study.

IKEA construct Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IKEA_1_1	82.02	379.957	0.416	0.941
IKEA_2_4	82.24	378.452	0.483	0.940
IKEA_3_7	82.51	375.068	0.569	0.939
IKEA_4_10	82.52	374.165	0.564	0.939
IKEA_5_13	82.21	375.807	0.536	0.940
IKEA_6_16	82.10	373.954	0.576	0.939
IKEA_7_19	82.02	376.453	0.567	0.939
IKEA_8_22	82.06	371.564	0.653	0.938
IKEA_9_25	82.11	373.136	0.622	0.938
IKEA_10_28	82.04	374.412	0.607	0.939
IKEA_11_31	81.85	375.750	0.590	0.939
IKEA_12_34	81.97	373.222	0.629	0.938
IKEA_13_37	82.09	371.470	0.650	0.938
IKEA_14_40	82.00	370.674	0.685	0.938
IKEA_15_43	82.15	370.855	0.668	0.938
IKEA_16_46	82.30	370.076	0.630	0.938
IKEA_17_49	82.37	368.792	0.637	0.938
IKEA_18_52	82.43	371.923	0.630	0.938
IKEA_19_55	81.82	376.760	0.561	0.939
IKEA_20_58	82.24	368.909	0.644	0.938
IKEA_21_61	82.36	372.655	0.576	0.939
IKEA_22_64	82.40	369.842	0.664	0.938
IKEA_23_67	82.43	372.384	0.633	0.938
IKEA_24_70	81.92	373.935	0.648	0.938
IKEA_25_73	81.99	373.952	0.610	0.939
IKEA_26_76	82.08	371.002	0.640	0.938

Overall Cronbach's Alpha = 0.941

Table 5.5 Item-Total Statistics for IKEA construct.

The results of overall reliability test for Islamic Geometry (IG) construct items revealed the value of Cronbach's Alpha as 0.92 indicating that the questionnaire items for the IG construct were highly reliable and consistent. Table 5.6 represents the validity test results for items in the IG construct. It can be observed from the results obtained that the most correlated item was IG_8_23, with an item-total correlation of $r = 0.66$. The item with the least item-total correlation was IG_20_59 ($r = 0.31$). It can also be noted that none of the items in the 'Cronbach's Alpha if Item Deleted' had a greater value than the overall 0.92 reliability statistics value, therefore all these items were considered in the study.

IG construct Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IG_1_2	82.21	245.083	0.402	0.917
IG_2_5	82.17	244.786	0.407	0.917
IG_3_8	81.41	240.010	0.576	0.914
IG_4_11	81.27	239.082	0.591	0.914
IG_5_14	82.09	243.061	0.465	0.916
IG_6_17	82.12	243.182	0.495	0.915
IG_7_20	82.01	243.251	0.475	0.916
IG_8_23	81.45	235.946	0.660	0.912
IG_9_26	81.41	237.354	0.640	0.913
IG_10_29	81.91	243.351	0.494	0.915
IG_11_32	81.80	240.228	0.568	0.914
IG_12_35	81.68	238.625	0.636	0.913
IG_13_38	81.03	240.100	0.588	0.914
IG_14_41	81.15	239.299	0.620	0.913
IG_15_44	81.33	239.227	0.613	0.913
IG_16_47	80.88	242.752	0.508	0.915
IG_17_50	80.81	241.674	0.536	0.915
IG_18_53	81.11	239.662	0.558	0.914
IG_19_56	81.74	240.585	0.551	0.914
IG_20_59	80.58	250.117	0.306	0.918
IG_21_62	80.66	248.435	0.332	0.918
IG_22_65	81.29	241.609	0.476	0.916
IG_23_68	81.37	241.836	0.474	0.916
IG_24_71	81.32	240.064	0.587	0.914
IG_25_74	81.26	239.695	0.584	0.914
IG_26_77	80.99	239.764	0.604	0.913

Overall Cronbach's Alpha = 0.918

Table 5.6 Item-Total Statistics for IG construct.

The results of overall reliability test for LIKE construct items revealed the value of Cronbach's Alpha as 0.93 indicating that the questionnaire items for the LIKE construct were highly reliable and consistent. Table 5.7 represents the validity test results for items in the LIKE construct. It can be observed from the results obtained that the most correlated item was LIKE_9_27, with an item-total correlation of r = 0.64. The item with the least item-total correlation was LIKE_1_3 (r = 0.42). It can also be noted that none of the items in the 'Cronbach's Alpha if Item Deleted' had a greater value than the overall 0.93 reliability statistics value, therefore all these items were considered in the study.

LIKE construct Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
LIKE_1_3	82.01	303.169	0.421	0.926
LIKE_2_6	81.98	299.756	0.502	0.925
LIKE_3_9	81.54	297.858	0.559	0.924
LIKE_4_12	81.31	298.183	0.552	0.924
LIKE_5_15	81.90	297.720	0.538	0.924
LIKE_6_18	81.74	298.663	0.533	0.924
LIKE_7_21	81.74	298.713	0.544	0.924
LIKE_8_24	81.33	297.062	0.589	0.923
LIKE_9_27	81.27	295.644	0.641	0.922
LIKE_10_30	81.64	299.039	0.546	0.924
LIKE_11_33	81.56	296.766	0.601	0.923
LIKE_12_36	81.48	298.425	0.574	0.923
LIKE_13_39	80.98	300.370	0.571	0.924
LIKE_14_42	81.18	299.321	0.559	0.924
LIKE_15_45	81.34	298.078	0.580	0.923
LIKE_16_48	81.11	299.162	0.531	0.924
LIKE_17_51	81.04	295.496	0.609	0.923
LIKE_18_54	81.30	296.465	0.578	0.923
LIKE_19_57	81.53	299.832	0.512	0.924
LIKE_20_60	80.99	299.741	0.521	0.924
LIKE_21_63	81.06	298.943	0.509	0.924
LIKE_22_66	81.51	298.023	0.535	0.924
LIKE_23_69	81.50	298.515	0.542	0.924
LIKE_24_72	81.32	299.302	0.576	0.923
LIKE_25_75	81.29	299.957	0.548	0.924
LIKE_26_78	81.10	299.950	0.534	0.924

Overall Cronbach's Alpha = 0.926

Table 5.7 Item-Total Statistics for LIKE construct.

Part 2 of the MSQ held two short questions, one towards the IKEA style and one towards the IKEA-IG design addition. The two were coded as ‘Like_IKEA_Furniture_79’ for the question asking about liking IKEA’s furniture – question number 79 in the questionnaire, and ‘See_IKEA-IG_80’ for the question asking about preference to see the IKEA-IG design in the IKEA furniture line – question number 80 in the questionnaire. Table 5.8 shows the results of descriptive statistics for the two dependent variables. The mean value for both the variables was 3.95 with standard deviation 0.89 and 1.03 respectively.

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Like_IKEA_Furniture_79	379	4	1	5	3.95	0.893
See_IKEA-IG_80	379	4	1	5	3.95	1.025

Table 5.8 Descriptive Statistics of the two dependent variable study items.

Part 3 of the MSQ consisted of eight demographic variables (gender, age, province, ethnicity, religion, education, occupation and organization). Frequencies and percentages were calculated for these demographic variables. Table 5.9 shows the frequency distribution of the data. It can be seen from Table 5.9 that 57% (n = 217) of the participants in the survey were female while 43% (n = 162) were male. Among these 41% (n = 155) of the participants were from age group 19-29 followed by participants from age group 30-39 (n = 112, 30%). Most of the participants were from Capital (n=141, 37%) and Hawalli (n=94, 25%). The minimum number of participants were from Jahara province 4% (n=14).

It was also seen that 70% (n = 265) of the participants were Arabian and 30% (n = 114) were non-Arabian. The results also showed that the majority of participants in the survey were Muslim (n = 357, 94%) and only 6% (n=22) were non-Muslim. With respect to education qualification, the majority of participants had obtained a bachelor’s degree (n = 176, 46%) followed by diploma (n = 74, 19%) and high school degree (n = 64, 17%). Among all the participants 56% (n=213) were employed and 27% (n= 103) were students. Under organization category 43% (n=162) were from public sectors government and 23% (n=87) were from private sectors.

		n	n%
Gender	Male	162	42.7%
	Female	217	57.3%
Age	19 - 29	155	40.9%
	30 - 39	112	29.6%
	40 - 49	76	20.1%
	≥ 50	36	9.5%
Province	Capital	141	37.2%
	Hawalli	94	24.8%
	Farwania	50	13.2%
	Ahmadi	46	12.1%
	Jahra	14	3.7%
	Mubarak Al-Kabeer	34	9.0%
	Not Sure	0	0.0%
Ethnicity	Arabian	265	69.9%
	Non-Arabian	114	30.1%
Religion	Muslim	357	94.2%
	Non-Muslim	22	5.8%
Education	Below High School	9	2.4%
	High School	64	16.9%
	Diploma	74	19.5%
	Bachelor	176	46.4%
	Higher Education	56	14.8%
Occupation	Student	103	27.2%
	Employ	213	56.2%
	Retired	32	8.4%
	Other	31	8.2%
Organization	Public Sector (gov)	162	42.7%
	Private Secor	87	23.0%
	Other	57	15.0%
	Not Applicable	73	19.3%

n=379

Table 5.9 Demographic frequency distribution and percentages.

5.4.2 Descriptive Statistics

Descriptive statistics provided the outcome for each of the items of this study revealing the top-ranking PDs for constructs IKEA, IG and LIKE. Further investigations were also presented by considering the average of all three IKEA, IG and LIKE constructs (denoted as ALL), as well as the average of the two combined constructs IKEA and IG (denoted as II). While constructs IKEA and IG measure participants recognition of the PD to style, the LIKE construct measures participants preference (or likability) to the PDs. Therefore, the II construct does not include construct LIKE in its combination as it is subjective - of a personal preference or an opinion. Descriptive statistics for PD items in the IKEA, IG and LIKE constructs are presented in Appendix Q, p.395, respectively. The following tables demonstrate the data results and PD ranking outcomes of all constructs arranged from highest to lowest. Presented side-by-side for result comparison, Table 5.10 displays the result outcomes of the IKEA, IG and LIKE constructs; while Table 5.11 displays the result outcomes of the combined ALL and II constructs with PDs arranged from highest to lowest in ranking order.

IKEA			**IG**			**LIKE**		
Item	Mean	S.D.	Item	Mean	S.D.	Item	Mean	S.D.
PD19	3.47	1.120	PD20	4.03	0.979	PD13	3.693	1.039
PD11	3.44	1.112	PD21	3.95	1.056	PD20	3.680	1.162
PD24	3.37	1.094	PD17	3.81	1.064	PD17	3.635	1.199
PD12	3.32	1.147	PD16	3.74	1.056	PD21	3.607	1.226
PD25	3.29	1.153	PD26	3.63	1.052	PD26	3.568	1.126
PD14	3.28	1.158	PD13	3.59	1.061	PD16	3.560	1.170
PD1	3.27	1.284	PD18	3.51	1.135	PD14	3.495	1.111
PD7	3.27	1.121	PD14	3.47	1.050	PD9	3.396	1.139
PD10	3.25	1.139	PD25	3.36	1.090	PD25	3.382	1.101
PD8	3.23	1.174	PD4	3.35	1.108	PD18	3.369	1.211
PD26	3.22	1.213	PD22	3.33	1.188	PD4	3.359	1.179
PD13	3.20	1.184	PD24	3.30	1.066	PD24	3.353	1.083
PD6	3.19	1.212	PD15	3.29	1.064	PD8	3.341	1.163
PD9	3.18	1.161	PD23	3.25	1.176	PD15	3.326	1.133
PD15	3.13	1.178	PD3	3.21	1.084	PD12	3.189	1.127
PD5	3.08	1.208	PD9	3.20	1.114	PD23	3.165	1.183
PD2	3.06	1.199	PD8	3.18	1.149	PD22	3.155	1.219
PD20	3.05	1.287	PD12	2.94	1.059	PD19	3.137	1.174
PD16	3.00	1.267	PD19	2.88	1.098	PD3	3.133	1.181
PD21	2.93	1.269	PD11	2.82	1.088	PD11	3.113	1.155
PD17	2.92	1.305	PD10	2.71	1.046	PD10	3.027	1.147
PD22	2.90	1.216	PD7	2.60	1.087	PD7	2.935	1.167
PD23	2.86	1.175	PD5	2.53	1.118	PD6	2.927	1.192
PD18	2.85	1.199	PD6	2.50	1.053	PD5	2.771	1.229
PD3	2.79	1.179	PD2	2.45	1.136	PD2	2.691	1.198
PD4	2.77	1.224	PD1	2.35	1.132	PD1	2.665	1.191

Table 5.10 Mean and S.D. for IKEA, IG and LIKE – MSQ.

Results of the top 5 PD items of each of the three constructs were as follows:

- IKEA construct: PD 19, PD 11, PD 24, PD 12 and PD 25.
- IG construct: PD 20, PD 21, PD 17, PD 16 and PD 26.
- LIKE construct: PD 13, PD 20, PD 17, PD 21 and PD 26.

It can be noted that amongst the three constructs, the outcome of PD items between IG and LIKE constructs were very similar. Illustrations and further analysed of the top PDs are presented in section 5.7.1 of this chapter.

All (average of IKEA, IG and LIKE)			**II (average of IKEA and IG)**		
Item	Mean	S.D.	Item	Mean	S.D.
PD20	3.587	0.791	PD20	3.542	0.808
PD21	3.497	0.881	PD21	3.441	0.891
PD13	3.495	0.775	PD26	3.423	0.913
PD26	3.473	0.869	PD13	3.393	0.845
PD17	3.457	0.886	PD14	3.380	0.838
PD16	3.434	0.862	PD16	3.368	0.886
PD14	3.420	0.806	PD17	3.367	0.901
PD25	3.346	0.874	PD24	3.332	0.863
PD24	3.340	0.823	PD25	3.326	0.923
PD9	3.259	0.848	PD15	3.211	0.909
PD15	3.251	0.880	PD8	3.203	0.922
PD8	3.247	0.885	PD9	3.190	0.881
PD18	3.243	0.914	PD18	3.179	0.925
PD19	3.164	0.875	PD19	3.177	0.897
PD4	3.162	0.876	PD12	3.132	0.886
PD12	3.151	0.842	PD11	3.131	0.891
PD11	3.128	0.856	PD22	3.112	0.946
PD22	3.128	0.937	PD4	3.059	0.911
PD23	3.092	0.929	PD23	3.054	0.939
PD3	3.045	0.872	PD3	2.997	0.883
PD10	2.997	0.860	PD10	2.979	0.894
PD7	2.939	0.878	PD7	2.938	0.882
PD6	2.876	0.873	PD6	2.848	0.895
PD5	2.790	0.948	PD1	2.813	0.943
PD1	2.763	0.917	PD5	2.803	0.942
PD2	2.733	0.908	PD2	2.753	0.928

Table 5.11 Mean and Standard Deviation between ALL and II constructs – MSQ.

Results of top 5 PD items of each of the combined constructs were as follows:

- ALL construct: PD 20, PD 21, PD 13, PD 26 and PD 17.
- II construct: PD 20, PD 21, PD 26, PD 13 and PD 14.

It can be noted that both constructs display very similar outcomes in PD ranking order. Illustrations and further analysis of the top PDs in constructs ALL and II are presented in section 5.7.1 of this chapter.

5.4.3 Pearson Correlation Analysis

Further data analysis of the top 5 PD resulting outcomes from Part 1 of the MSQ were also documented in relation to each other, as well as to Part 2 of the questionnaire consisting of the study's two dependent variables 'Like_IKEA_Furniture' and 'See_IKEA-IG'. Here, Pearson correlation analysis was conducted (see Appendix K, p.362 - Table K1, K2, K3) to check the associations between the top 5 PD items in each of the constructs IKEA, IG, and LIKE; associations between the top 5 IKEA PD items with 'Like_IKEA_Furniture'; and associations between the top 5 IG PDs with 'See_IKEA-IG'.

Results of the Pearson correlation among the top 5 IKEA items revealed a highly significant correlation as p value was less than 0.001. A highly significant correlation was also found between 'Like_IKEA_Furniture' with IKEA_12 and with IKEA_24 as $p<0.001$ for both outcomes. Associations between 'Like_IKEA_Furniture' with IKEA_11 ($p = 0.003$), with IKEA_19 ($p = 0.009$), and with IKEA_25 ($p = 0.008$) were also found to be statistically significant as $p<0.05$. For the IG items, results revealed a highly significant correlation between the top 5 IG items as $p<0.001$. A highly significant correlation was also found between 'See_IKEA-IG' with all top 5 IG items as $p<0.001$. For the LIKE items, results revealed a highly significant correlation between all top 5 LIKE items as $p<0.001$.

5.4.4 Linear Regression Analysis

A linear regression analysis was also conducted to assess if the top 5 IKEA construct items significantly predicted 'Like_IKEA_Furniture', if the top 5 IG items predicted 'See_IKEA-IG', and if the top 5 LIKE items predicted 'Like_IKEA_Furniture' and 'See_IKEA-IG' (see Appendix K, p.362 - Table K4, K5, K6, K7). The variable selection method was chosen for the linear regression model, which includes all the selected predictors.

The top 5 IKEA items concerning preference to IKEA's furniture was investigated by relating the items to dependent variable 'Like_IKEA_Furniture'. Results revealed the linear regression for the IKEA items as significant ($p<0.001$), indicating that approximately 7% of the variance in 'Like_IKEA_Furniture' was explainable by the selected predictors. The result analysis show that IKEA_12 and IKEA_24 significantly predicted 'Like_IKEA_Furniture' as $p<0.05$. It can be concluded from the results obtained that on average, a unit increase of IKEA_12 and IKEA_24 increases the value of 'Like_IKEA_Furniture' by 0.11 and 0.21 units respectively.

The top 5 IG items concerning preference to the inclusion of the IKEA-IG PDs was investigated by relating the items to dependent variable 'See_IKEA-IG'. Results revealed the linear regression for the IG items as significant ($p<0.001$), indicating that approximately 12% of the variance in 'See_IKEA-IG' was explainable by the selected predictors. The result analysis show that IG_26 significantly predicted 'See_IKEA-IG' as $p<0.05$. It can be concluded from the results obtained that on average, a unit increase of IG_26 increases the value of 'See_IKEA-IG' by 0.16 units.

The top 5 LIKE items concerning preference to IKEA's furniture was investigated by relating the items to dependent variable 'Like_IKEA_Furniture'. Results revealed the linear regression for the LIKE items as significant ($p<0.001$), indicating that approximately 5% of the variance in 'Like_IKEA_Furniture' was explainable by the selected predictors. The result analysis show that LIKE_20 and LIKE_26 significantly predicted 'Like_IKEA_Furniture' as $p<0.05$. It can be concluded from the results obtained that on average, a unit increase of LIKE_20 and LIKE_26 increases the value of 'Like_IKEA_Furniture' by 0.16 and 0.10 units respectively. Additionally, the top 5 LIKE items concerning preference to the inclusion of the IKEA-IG PDs was also investigated by relating the items to dependent variable 'See_IKEA-IG'. Results revealed the linear regression for the LIKE items as significant ($p<0.001$), indicating that approximately 15% of the variance in 'See_IKEA-IG' was explainable by the selected predictors. The result analysis show that LIKE_13 significantly predicted 'See_IKEA-IG' as $p<0.05$. It can be concluded from the results obtained that on average, a unit increase of LIKE_13 increases the value of 'See_IKEA-IG' by 0.17 units.

The top 5 LIKE items concerning preference to IKEA's furniture was investigated by relating the items to dependent variable 'Like_IKEA_Furniture'. Results revealed the linear regression for the LIKE items as significant ($p<0.001$), indicating that approximately 5% of the variance in

‘Like_IKEA_Furniture’ was explainable by the selected predictors. The result analysis show that LIKE_20 and LIKE_26 significantly predicted ‘Like_IKEA_Furniture’ as $p<0.05$. It can be concluded from the results obtained that on average, a unit increase of LIKE_20 and LIKE_26 increases the value of ‘Like_IKEA_Furniture’ by 0.16 and 0.10 units respectively. Additionally, the top 5 LIKE items concerning preference to the inclusion of the IKEA-IG PDs was also investigated by relating the items to dependent variable ‘See_IKEA-IG’. Results revealed the linear regression for the LIKE items as significant ($p<0.001$), indicating that approximately 15% of the variance in ‘See_IKEA-IG’ was explainable by the selected predictors. The result analysis shows that LIKE_13 significantly predicted ‘See_IKEA-IG’ as $p<0.05$. It can be concluded from the results obtained that on average, a unit increase of LIKE_13 increases the value of ‘See_IKEA-IG’ by 0.17 units.

5.4.5 Top Ranking PDs and Demographic Data

Further data analysis of the top 5 PD resulting outcomes from Part 1 of the MSQ were also documented in relation to the demographic data in Part 3 of the questionnaire. Each of the individual IKEA, IG and LIKE constructs, as well as the combined II and ALL constructs, were related to the demographic data and presented in Appendix L, p.365 - Table L1, L2, L3, L4, L5. Starting with the top 5 PDs in the IKEA construct in relation to demographics, results revealed significance in the demographic ‘Province’ where p-value = 0.010. In the IG construct, results revealed significance in demographic ‘Gender’ with p-value 0.006, and ‘Province’ with p-value of 0.042. In the LIKE construct, results reveal no significance in any of the demographics as all p-values are greater than 0.05. Similarly, results of combined constructs II and ALL also reveal no significance in any of the demographics as all p-values are greater than 0.05.

Furthermore, a more detailed analysis of each of the top 5 PD items individually within constructs IKEA, IG, and LIKE in relation to demographics are documented in Appendix L, p.365. Results reveal significance in IKEA_24 in relation to demographic ‘Province’ where $p = 0.036$ (Table L8), IKEA_12 to ‘Ethnicity’ with $p = 0.010$ and to ‘Organization’ with $p = 0.020$ (Table L9); IG_20 to ‘Province’ with $p = 0.006$ (Table L11), IG_17 to ‘Gender’ with $p = 0.003$ and to ‘Province’ with $p = 0.026$ (Table L13), IG_16 to ‘Gender’ with $p = 0.032$ (Table L14), and IG_26 to ‘Gender’ with $p = 0.006$ (Table L15); LIKE_13 to ‘Age’ with $p = 0.030$ (Table L16), LIKE_20 to ‘Age’ with $p = 0.017$ (Table L17), LIKE_17 to ‘Age’ with $p = 0.023$ (Table L18), and LIKE_26 to ‘Age’ with p = 0.041 (Table L19). Moreover, detailed analysis investigating each demographic item individually in relation to each of the top 5 PD items in construct ALL are documented in Appendix M, p.373. Results reveal significance in ALL_17 in relation to demographic 'Ethnicity' where p = 0.033, and ALL_21 where p = 0.030 (Table M7).

5.4.6 Factor Analysis

Further statistical analysis of the data was also conducted to classify all of the 26 components (or PDs) into family groups using factor analysis method. The results categorized the PDs into 4 family groups. Components are significant because the automated grouped results, or family groups, reflect similarities within the PD illustration grouping. The validity and adequacy of the grouping was measured (Table 5.12) revealing a KMO result of 0.934, which is greater than 0.5, indicating the validity of the sample used, or grouping, and that the factor analysis could be useful for the data (Kaiser 1974). Further, Barlett's measure was less than 0.05 indicating significance and that the data was not identical yet there was a relationship among the variables (Hair et al., 2013). An extraction method was also used (see Appendix R, p.398) revealing no value less than 0.5 indicating valid results.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.934
Bartlett's Test of Sphericity	Approx. Chi-Square	7536.801
	df	325
	Sig.	0.000

Table 5.12 KMO and Bartlett's Test.

The following table of total variance explained (Table 5.13) revealed the eigenvalues of each of the four groupings, as higher than 1 indicating they are all reliable. The table also revealed, under 'rotation sums of squared loadings', a higher percentage for group A (22% variance) than the other groups; indicating more acceptance towards this group than the others. The 'cumulative percentage' results also indicate that all groups are reliable as the range should be no less than 60% and no more than 80% to be reliable (Field, 2018).

Family Group	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
A	12.642	48.622	48.622	12.642	48.622	48.622	5.761	22.157	22.157
B	2.259	8.689	57.310	2.259	8.689	57.310	4.705	18.095	40.253
C	1.271	4.889	62.199	1.271	4.889	62.199	3.446	13.256	53.508
D	1.065	4.095	66.294	1.065	4.095	66.294	3.324	12.785	66.294

Table 5.13 Total Variance Explained.

Below, Table 5.14 shows the grouping of the 26 PDs within the four family groups of Table 5.13.

Components	Family Group			
	A	B	C	D
PD 2	0.823			
PD 5	0.807			
PD 1	0.760			
PD 6	0.734			
PD 7	0.718			
PD 10	0.658			
PD 11	0.586			
PD 12	0.544			
PD 19	0.524			
PD 8	0.500			
PD 3	0.450			
PD 16		0.794		
PD 14		0.751		
PD 15		0.739		
PD 13		0.724		
PD 17		0.710		
PD 18		0.549		
PD 9		0.507		
PD 25			0.781	
PD 24			0.778	
PD 26			0.591	
PD 20			0.468	
PD 22				0.704
PD 23				0.692
PD 4				0.486
PD 21				0.481

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.a, a. Rotation converged in 9 iterations.

Table 5.14 Component Transformation Matrix.

With the family groups translated into a design investigation, it was revealed that the groupings had similar characteristics within the PD illustrations and IS category. Group A PDs are of simple design geometries, predominantly 'square' shape; Group B are denser (SR Overlap used for dense designs) intricate curved-line designs of Circle shape; Group C are simple and dense straight-line designs of Octagon shape; and Group D are dense designs (SR Rotate and Overlap) using both straight and curved-lines of hexagon shape outcome.

Cross-referencing between PDs in family groups to Top 5 PDs in all the category constructs IKEA, IG, LIKE, II, and ALL revealed common PDs in both as follow:

PDs from both Group A and top PDs:
- PD 19 (IKEA)
- PD 11 (IKEA)
- PD 12 (IKEA)

PDs from both Group B and top PDs:
- PD 13 (LIKE + ALL + II)
- PD 17 (IG + LIKE + ALL)
- PD 16 (IG)
- PD 14 (II)

PDs from both Group C and top PDs:
- PD 20 (IG + LIKE + ALL + II)
- PD 26 (IG + LIKE + ALL + II)
- PD 24 (IKEA)
- PD 25 (IKEA)

PDs from both Group D and top PDs:
- PD 21 (IG + LIKE + ALL + II)

The PDs in both 'Group A' and top PDs were all of the top IKEA construct PDs. The factor analysis categorization of family groups was interesting because it reflected the SG grouping of the PDs. Additionally, breakdown of each of the family groups was documented in Appendix S, p.399, where each of the IKEA, IG, and LIKE items were investigated using Factor Analysis. Furthermore, Appendix T, p.403, documents the correlation analysis of family group PDs of each of the constructs, their general linear model (GLM) between dependent variables in Part 2 of the questionnaire, and their comparison under each of the demographics.

5.5 Evaluative Study Results and Statistical Analysis

Two Evaluative Study Questionnaires (ESQ) were conducted (see Appendix U, p.411) following the MSQ; the first study was in Kuwait, Middle East (ESQ-1), and the second in Southampton, UK (ESQ-2). The top PD outcomes of the MSQ were presented in the ESQs in an artifact form.

The PDs entailed a transformation of translating the 2D illustrations into physical applications investigating production methods with considerations to material and construction methods under the IKEA standards of furniture design (IKEA: Products and Materials, 2017).

The ESQs were undertaken to further evaluate, assess and confirm the MSQ results, as well as compare result outcomes of two different demographic groups to see if cultural background influences the resulting outcome. Both ESQ studies were conducted inside of IKEA store locations (in Kuwait and UK) for IKEA customer feedback. Both group participants are particularly familiar with the contemporary design style of IKEA (as they are both customers of IKEA); IKEA Kuwait customers are of the IG cultural art background or are familiar with the Middle Eastern design style, while IKEA Southampton customers are of a different cultural background to that of the art of IG for comparison as the study's control group.

The layout of the ESQ was in the same format as the MSQ except for a few adjustments. In Part 1 of this study, only 12 PDs were measured. The 12 PDs are those resulting top within the constructs from the MSQ and presented to the participants in the ESQs as prototype table-panel artifacts instead of illustrations. Part 1 is to identify and evaluate each of the IKEA and IG styles, their synthesis, and style preference. Part 2 is short questions to measure participant preference to IKEA's furniture (or brand), their familiarity with the IG style, preference to the IKEA-IG style, and if they like the IKEA LACK table as is or with the addition of the IKEA-IG table-panel attachment. The familiarity to IG style question is because the ESQ was conducted in the Middle East and outside the Middle East as well (UK) where participants might not be familiar to the IG style; the preference question of with or without the table-panel further evaluates the cultural-contemporary integration and affirm whether or not the cultural art of IG can successfully be revived by evolving with and within contemporary design.

Both the original LACK table and the LACK tables holding the IKEA-IG PD table-panels were displayed to participants for direct comparison. This measures the workability of the design methodology of merging the two style cultures where both languages are still maintained and identifiable in their synthesis, and if the proposed integrated style is accepted or liked. Part 3 is the demographic data of participants. By having the ESQ conducted in two different geographical locations, the UK participants are the control group from which further demographic analysis can be derived to study if cultural background, ethnicity, and geographical location effects the resulting outcome of measuring the style. If the results for both ESQs from the Kuwait and UK groups come out similar when compared, then the style integration is successful, if only participants from the Kuwait group study like the IKEA-IG style then it still works yet more specifically for that region.

5.5.1 Demographic Data – Kuwait and UK

Stratified sampling (Ch. 4.6) was used in order to analyse the two groups (Kuwait and UK) of the ESQs and investigate the demographics, or strata, amongst the two sampling studies in relation to the resulting outcomes. Of the two group resulting outcomes of the study, regional preference was also investigated within the two demographic populations. Each demographic data was further analysed and investigated for prevalence and interpretations among the PD outcomes.

Demographic data results corresponding to the Kuwait (KWT) and UK groups for the ESQ-1 and ESQ-2 respectively, are presented in Table 5.15. Frequency and percentages for 33 KWT group participants and 30 UK group participants were run for all the demographic data. Under the demographic 'Gender', there was a close ratio of male to female participants in the KWT group (55% male and 46% female) compared to the UK group where the majority of participants were female (30% male and 70% female). Under 'Age' demographic, the majority of participants in both groups were of age group 30-39 (52% of the KWT group and 70% of UK). The rest of the UK participants, 30%, were of the 19-29 age group with zero participants in the 40-49 and ≥ 50 age groups, while only 6% of the KWT group was of or more than 50 years of age.

It was also noted that the maximum number of participants in the KWT group were Arabian while the UK group were non-Arabian. With respect to 'Education', the KWT group maximum number of respondents obtained a bachelor's degree, while the UK group a Higher Education. Additionally, similarly to 'Age', 'Education' has some categories where there were zero participants: 'Below High School' in the UK group as well as 'Diploma' in the KWT group. The 'Occupation' demographic also had zero participants that were 'Retired' within the UK group as most of the respondents in both groups were 'Employed' working in 'Private Sectors'.

		KWT Group		UK Group	
		Count	**Column N %**	**Count**	**Column N %**
Gender	Male	18	54.5%	9	30.0%
	Female	15	45.5%	21	70.0%
	Total	33	100.0%	30	100.0%
Age	19 – 29	7	21.2%	9	30.0%
	30 – 39	17	51.5%	21	70.0%
	40 – 49	7	21.2%	0	0.0%
	≥ 50	2	6.1%	0	0.0%
Ethnicity	Arabian	30	90.9%	0	0.0%
	Non-Arabian	3	9.1%	30	100.0%
Religion	Muslim	30	90.9%	0	0.0%
	Non-Muslim	3	9.1%	30	100.0%
Education	Below High School	1	3.0%	0	0.0%
	High School	8	24.2%	5	16.7%
	Diploma	0	0.0%	6	20.0%
	Bachelor	18	54.5%	9	30.0%
	Higher Education	6	18.2%	10	33.3%
Occupation	Student	4	12.1%	1	3.3%
	Employed	25	75.8%	26	86.7%
	Retired	3	9.1%	0	0.0%
	Other	1	3.0%	3	10.0%
Organization	Public Sector (gov)	10	30.3%	2	6.7%
	Private Sector	20	60.6%	17	56.7%
	Other	1	3.0%	10	33.3%
	Not Applicable	2	6.1%	1	3.3%

Table 5.15 Demographic details of respondents.

5.5.2 Reliability and Validity

Table 5.16 shows the reliability analysis results. When all the constructs were taken into consideration the Cronbach's alpha coefficient was calculated to be 0.92 and 0.81 for KWT and UK groups respectively. It can also be seen that the values of Cronbach's alpha for KWT group under IKEA, IG and LIKE constructs are 0.93, 0.87 and 0.89 respectively and for the UK group 0.81, 0.76 and 0.82 respectively. These values of Cronbach's alpha indicate good reliability in both groups which shows that the questionnaire was reliable.

Group	Constructs						Overall	
	IKEA		IG		LIKE			
	Cronbach's Alpha	N of PDs	Cronbach's Alpha	N of PDs	Cronbach's Alpha	N of PDs	Cronbach's Alpha	N of PDs
KWT	0.926	12	0.865	12	0.888	12	0.918	36
UK	0.807	12	0.761	12	0.818	12	0.81	36

Table 5.16 Group Reliability of the constructs with overall reliability.

The validity test results for the IKEA, IG and LIKE construct PDs under KWT and UK groups are presented in Appendix V, p.427, respectively. From the results obtained for the IKEA construct of KWT group correspondents (see Appendix V, p.427 - Table V1), all the PDs had a value of more than 0.20 for 'corrected item-total correlation' indicating that the IKEA construct PDs within the KWT group are consistent. It was also found that the most correlated PD within the KWT group was IKEA_26, with an item-total correlation of $r = 0.85$, whereas the least correlated PD was IKEA_11, where $r = 0.45$ (Table V1). Moreover, the value of Cronbach's alpha corresponding to the IKEA construct for KWT group was 0.93 (Table 5.16), and none of the PDs in the 'Cronbach's alpha if item deleted' column (see Appendix V, p.427 - Table V1) was of a value greater than 0.93 for KWT group; therefore, reasonable to consider all the PDs in the study.

Further, from the results obtained for the IKEA construct of UK group (see Appendix V, p.427 - Table V1), the most correlated PD was also IKEA_26, with an item-total correlation of $r = 0.63$, whereas the least correlated PDs were IKEA_19 where $r = 0.004$, and PD IKEA_11 where $r = 0.09$ (Table V1). Due to both least correlated PDs having lesser value of 0.20 for 'corrected item-total correlation', the results indicated the two PDs were not related with other PDs within the IKEA construct for UK group. Moreover, the value of 'Cronbach's alpha if item deleted' for IKEA_11 as well as IKEA_19 was greater than the overall Cronbach's alpha value of 0.81 (Table 5.16) for UK group indicating that the elimination of these two PDs from the IKEA construct UK group will give a slight change in the overall Cronbach's alpha value, i.e., it would change the value from 0.81 to 0.82.

From the results obtained for the IG construct of KWT group (see Appendix V, p.427 - Table V2), all the PDs had a value of more than 0.20 for 'corrected item-total correlation' indicating that all the PDs under IG construct were consistent. The most correlated PD within the KWT group was

IG_25, with an item-total correlation of $r = 0.76$, whereas the least correlated was IG_16 where $r = 0.30$ (Table V2). It was also found that the value of Cronbach's alpha corresponding to the IG construct for KWT group was 0.87 (Table 5.16), and none of the PDs in the 'Cronbach's alpha if item deleted' column were of a value greater than 0.87 for KWT group, therefore all PDs could be considered in the study.

Moreover, for the IG construct UK group, all PDs except for IG_13 had a value of 'corrected item-total correlation' of more than 0.20 (see Appendix V, p.427 - Table V2), this suggests that all PDs under the IG construct, except for IG_13, were correlated indicating internal consistency. The most correlated PD within the UK group was IG_21 with an item-total correlation of $r = 0.61$, whereas the least correlated was IG_13 where $r = 0.12$ (Table V2). The elimination of IG_13 would increase the overall value of Cronbach's alpha (Table 5.16) of the IG construct UK group from 0.76 to 0.77.

From the results obtained for the LIKE construct under KWT and UK groups (see Appendix V, p.427 - Table V3), all the PDs had a value of more than 0.20 for 'corrected item-total correlation' indicating good internal consistency. The most correlated PD within the LIKE construct for KWT group was LIKE_25, with an item-total correlation of $r = 0.82$, whereas the least correlated was LIKE_16, where $r = 0.33$ (Table V3). The most correlated PD within the LIKE construct for UK group was LIKE_11, where $r = 0.60$, whereas the least correlated PD was LIKE_26 where $r = 0.29$ (Table V3). Further, it was also found that the deletion of any PD from both groups would not alter the overall value of Cronbach's alpha for LIKE construct. The value of Cronbach's alpha for the KWT and UK group was 0.89 and 0.82 respectively (Table 5.16), and none of the PDs in the 'Cronbach's alpha if item deleted' column were of a value greater than 0.89 and 0.82 for KWT and UK groups respectively.

5.5.3 Independent Sample T-test Analysis

For the data analysis, an independent sample t-test was used to check the mean difference for each PD between KWT and UK groups for the IKEA, IG and LIKE constructs; as well as the combined IKEA and IG (II) construct, and the combined IKEA, IG and LIKE (ALL) construct. Independent sample t-test was also conducted to check the mean difference of the studied variables between the KWT and UK groups. Graphical representations of the mean difference were also presented for each of the resulting outcomes.

➢ Comparison between KWT and UK groups – IKEA construct:

On average, the participants of the KWT and UK groups equally identified the PDs under the IKEA construct as IKEA style PDs (see Appendix W, p.429 - Table W1), with $p \geq 0.05$; except for PD IKEA_16. The result of the two-tailed independent samples *t*-test was significant based on an alpha value of -0.05, $t(61) = -2.02$, and $p = .048$, indicating the null hypothesis can be rejected due to p-value being less than 0.05. This finding suggests that the mean of IKEA_16 was significantly different between the KWT and UK groups. Appendix W, p.429 - Table W2 presents the two-tailed independent samples t-test for IKEA_16 by Group; and Appendix W, p.429 - Figure W1 presents a bar plot of the means. The following figure illustrates the graphical representation of the mean difference between KWT and UK groups for the IKEA construct (Figure 5.23).

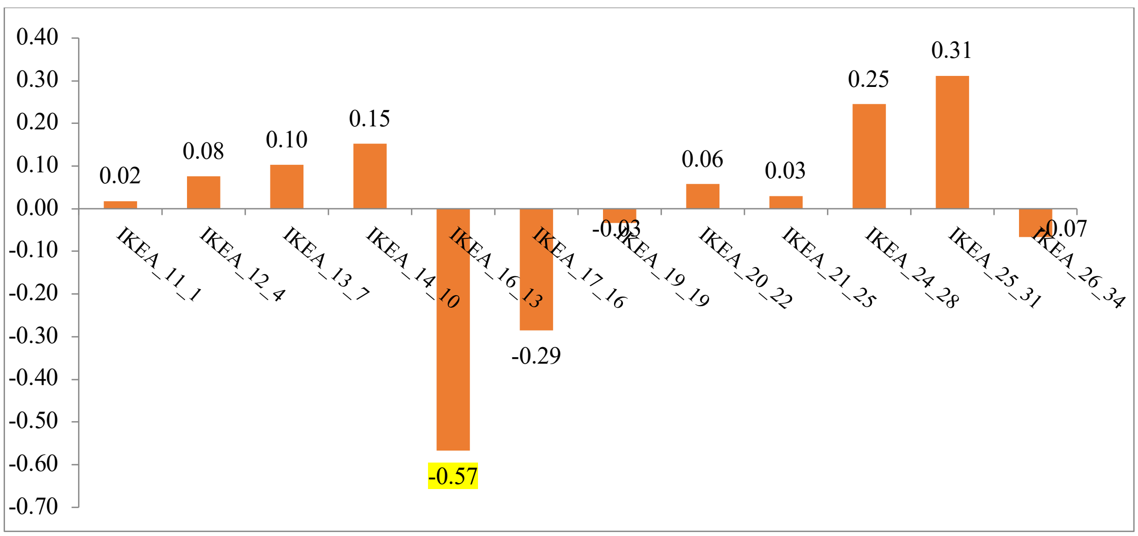


Figure 5.23 Group Mean difference of IKEA construct.

Furthermore, Appendix W, p.429 - Table W3 also presents the descriptive statistics results of IKEA construct PDs for KWT and UK groups in the form of mean, standard deviation (SD) and standard error (SE). The results revealed that the mean of IKEA construct PDs for KWT group varies from 2.00 to 4.00, while the UK group varies from 2.47 to 4.03.

➢ Comparison between KWT and UK groups – IG construct:

Results of independent sample t-test were also conducted to check the difference between KWT and UK groups for the IG construct PDs (see Appendix W, p.429 - Table W4). The results revealed statistically significant difference between KWT and UK groups for six PDs: IG_13, IG_16, IG_17, IG_20, IG_21 and IG_24. The results indicated that the participants of the KWT group identified the PDs as IG style more than the UK group participants, under the IG construct. The lowest significant mean difference corresponding to the IG construct PDs was 0.38 for IG_13, whereas the highest significant mean difference was 0.78 for IG_21. Presented in Appendix W, p.429 - Table W5, IG_13 resulted with $p = .018$, and Figure W2 (of Appendix W, p.429) presented a bar plot of the means; Table W6 shows IG_16 where $p < .001$, with bar plot in Figure W3; Table W7 shows IG_17 where $p = .005$, with bar plot in Figure W4; Table W8 shows IG_20 where $p = .001$, with bar plot in Figure W5; Table W9 shows IG_21 where $p < .001$, with bar plot in Figure W6; Table W10 shows IG_24 where $p = .040$, with bar plot of means presented in Figure W7 indicating the null hypothesis can be rejected. The findings suggest that the means of these six PDs within the IG construct were significantly different between the KWT and UK groups. The following figure illustrates the graphical representation of the mean difference (Figure 5.24).

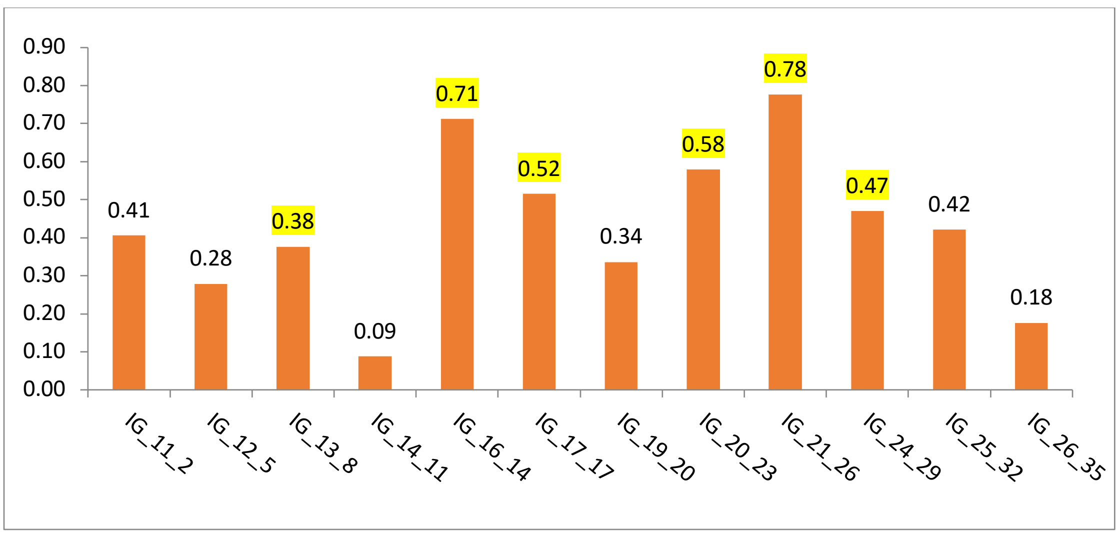


Figure 5.24 Group Mean difference of IG construct.

Furthermore, Appendix W, p.429 - Table W11 also presents the descriptive statistics results of IG construct PDs for KWT and UK groups. The results revealed that the mean for KWT group varies from 2.97 to 4.58, while the UK group varies from 2.63 to 4.20.

- Comparison between KWT and UK groups – LIKE construct:

Results of independent sample t-test conducted for the LIKE construct PDs (see Appendix W, p.429 - Table W12) revealed statistically significant difference between KWT and UK groups for four PDs; LIKE_11, LIKE_20, LIKE_21 and LIKE_24. The lowest significant mean difference was 0.53 for LIKE_24, whereas the highest significant mean difference was 0.90 for LIKE_21. Presented in Appendix W, p.429 - Table W13, LIKE_11 resulted with $p = .009$, and Figure W8 of presented a bar plot of the means; Table W14 shows LIKE_20 where $p = .010$, with bar plot in

Figure W9; Table W15 shows LIKE_21 where $p < .001$, with bar plot in Figure W10; Table W16 shows LIKE_24 where $p = .022$, with bar plot presented in Figure W11 indicating the null hypothesis can be rejected. The findings suggest that the means of these four PDs within the LIKE construct were significantly different between the KWT and UK groups. The following figure illustrates the graphical representation of the mean difference (Figure 5.25).

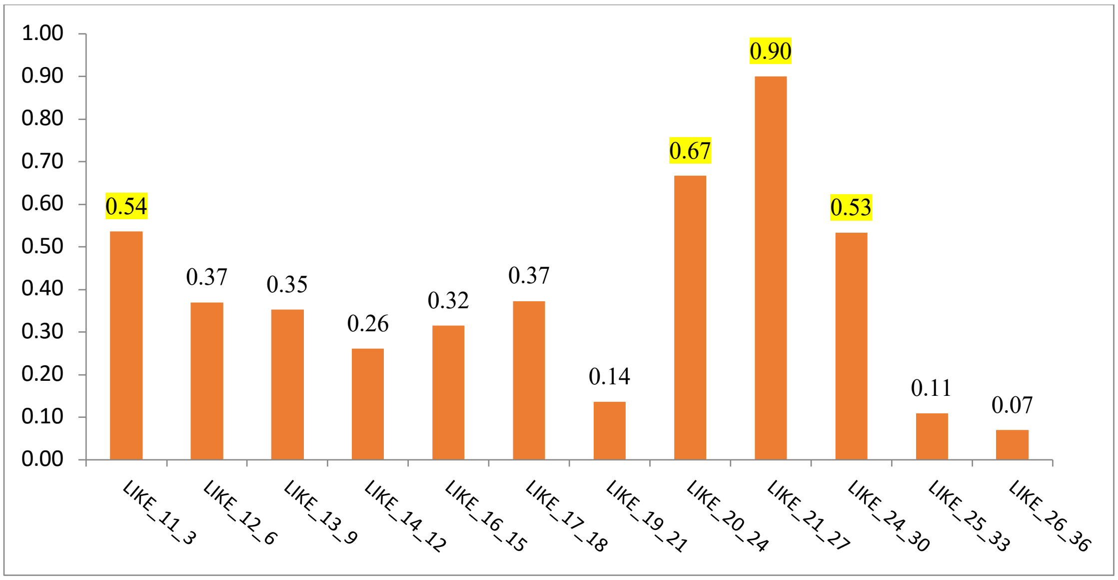


Figure 5.25 Group Mean difference of LIKE construct.

Furthermore, Appendix W, p.429 - Table W17 also presents the descriptive statistics results of LIKE construct PDs for KWT and UK groups. The results revealed that the mean for KWT group varies from 3.43 to 4.23, while the UK group varies from 3.64 to 4.48.

- Comparison between KWT and UK groups – II construct:

Results of independent sample t-test conducted to check the difference between KWT and UK groups (see Appendix W, p.429 - Table W18) by considering both the IKEA and IG constructs simultaneously (construct II) revealed statistically significant difference for three PDs: II_21 ($p = .023$), II_24 ($p = .025$) and II_25 ($p = .033$). The lowest significant mean difference was 0.36 for II_24, whereas the highest was 0.40 for II_21. The following figure illustrates the graphical representation of the mean difference (Figure 5.26).

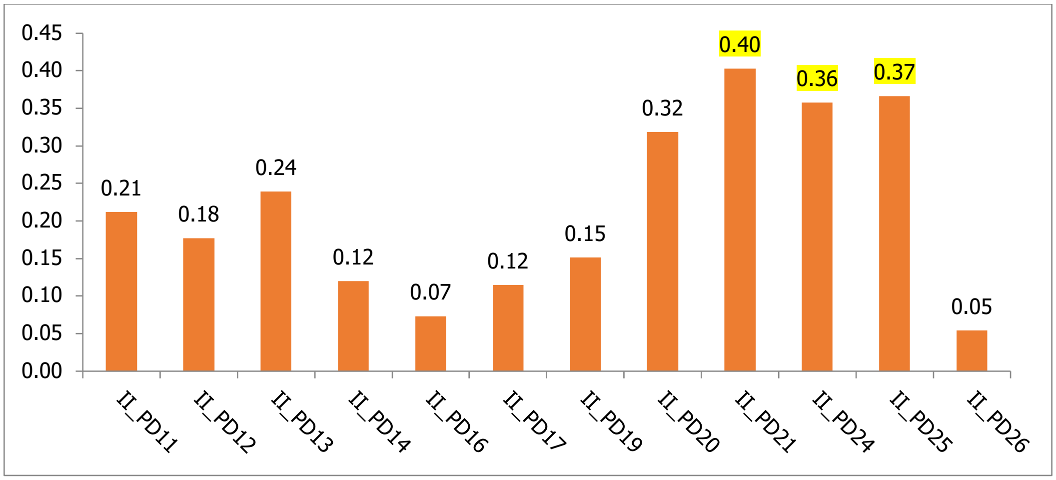


Figure 5.26 Group Mean difference of II construct.

Furthermore, Appendix W, p.429 - Table W19 also presents the descriptive statistics results of II construct PDs for KWT and UK groups. The results revealed that the mean for KWT group varies from 3.27 to 3.77, while the UK group varies from 3.17 to 3.57.

➢ Comparison between KWT and UK groups – ALL construct:

Results of independent sample t-test conducted to check the difference between KWT and UK groups (see Appendix W, p.429 - Table W20) by considering all three IKEA, IG and LIKE constructs simultaneously (construct ALL) revealed statistically significant difference for PDs; ALL_11 (p = .004), ALL_13 (p = .010), ALL_16 (p = .003), ALL_17 (p = .018), ALL_20 (p = .002), ALL_21 (p = .000) and ALL_24 (p = .008). The lowest significant mean difference was 0.36 for ALL_13, whereas the highest was 0.84 for ALL_21. The following figure illustrates the graphical representation of the mean difference (Figure 5.27).

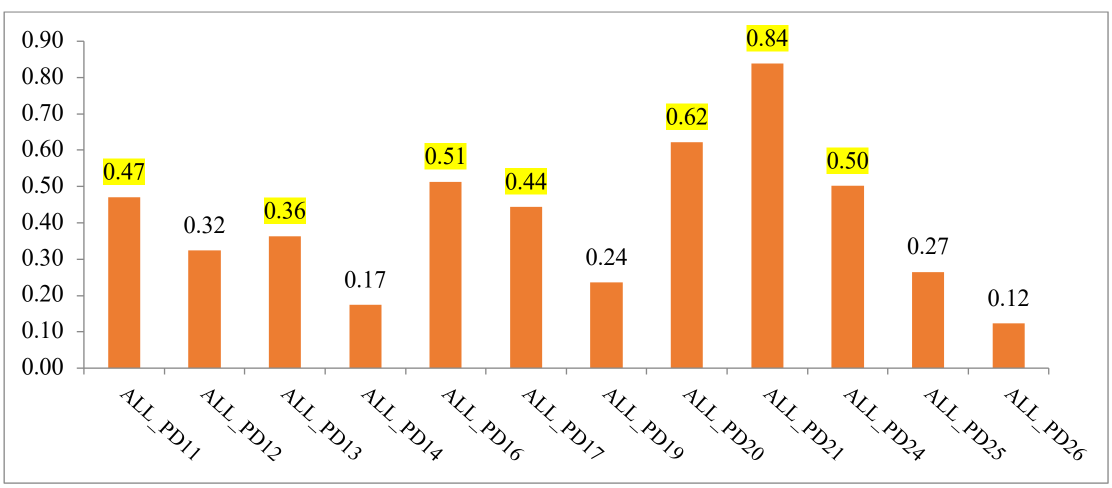


Figure 5.27 Group Mean difference of ALL construct.

Furthermore, Appendix W, p.429 - Table W21 also presents the descriptive statistics results of ALL construct PDs for KWT and UK groups. The results revealed that the mean for KWT group varies from 3.30 to 4.53, while the UK group varies from 3.07 to 4.17.

5.5.4 Dependent Variables Outcome

Four dependent variables were measured in the ESQs: familiarity to the IG style, likability or preference to IKEA's furniture, preference to the IKEA-IG style, and preference to the inclusion of the IKEA-IG into IKEA's product line. Starting with familiarity to the IG style, consideration towards the level of participant familiarity was addressed as the ESQs took place in both the Middle East and the UK due to practicality of location for data distribution and collection, and for a cultural comparison of two different cultural styles by two different cultural background participants. However, the level of familiarity and recognition to which the participants possess towards the style being measured comes into question, and whether that could have influenced perceptions and inter-rater reliability. Presumably, the UK group participants were not as familiar as the KWT group participants to the IG style based on cultural background and geographical location; noting that this does not apply to the IKEA style construct as both the UK and KWT participants were IKEA customers familiar to its style. In such case, a limitation could arise concerning familiarity to both design styles (IKEA and the IG), not to one or the other, in order to ensure a more precise style identification and cultural comparison. Nevertheless, that was why the level of familiarity of UK participants to the IG style was measured (Figure 5.28) confirming that they were familiar to the style, and therefore a fair and justifiable cultural comparison to the style.

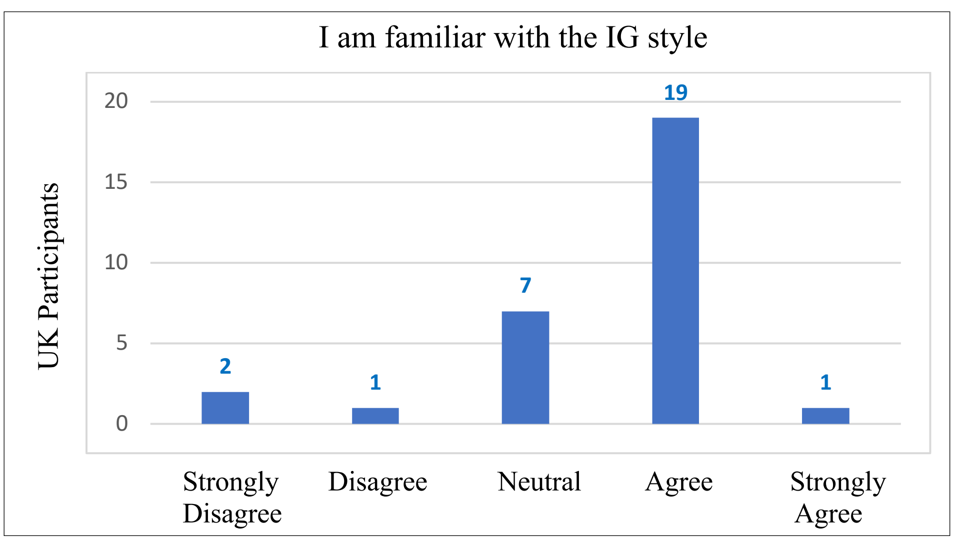


Figure 5.28 Familiarity to IG style – UK group participants.

An independent sample t-test was also conducted to check the difference between KWT and UK groups in correspondence to the rest of the dependent variables of the study questionnaire (see Appendix X, p.440 - Table X1). The results show statistically significant difference between the KWT and UK correspondence to the variables ‘I like the IKEA_IG style’ ($p = 0.00$) and ‘I prefer no additional design’ ($p = 0.00$). The following figure illustrates the graphical representation of the mean of the remaining studied variables for KWT and UK groups (Figure 5.29).

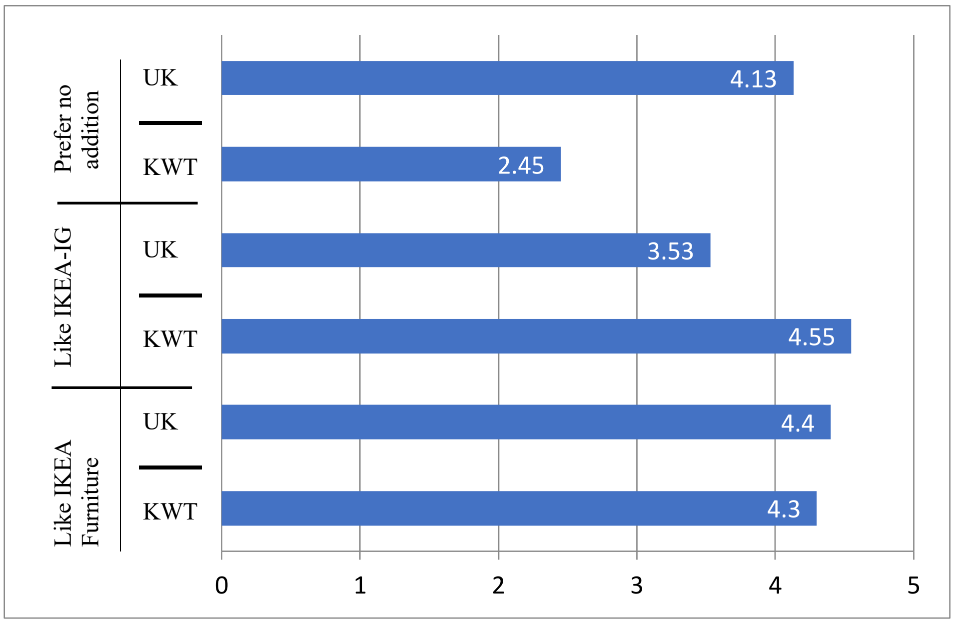


Figure 5.29 Group Mean of Dependent Variables.

Furthermore, Appendix X, p.440 - Table X2 presents the descriptive statistics results for the dependent variables corresponding to the KWT and UK groups. The results revealed that the mean of ‘Like IKEA Furniture’ for KWT (mean = 4.30) and UK (mean = 4.40) groups were almost equivalent, which indicates that both group respondents almost equally prefer the IKEA furniture. The results also reveal that respondents of the KWT group (mean = 4.55) prefer to see more IKEA-IG PDs compared to the UK group respondents (mean = 3.53). Moreover, it can be seen that UK group respondents preferred no additional design (mean = 4.13) compared to KWT group respondents (mean = 2.45).

As results show, the KWT group participants (whether they are of that cultural background or not) did like the cultural-contemporary style and prefer the IKEA-IG table-panel attachments as an addition to IKEA’s LACK table. As for the UK group participants, they also did like the IKEA-IG table-panels yet prefer the LACK table without the attachment inclusion. Both groups were familiar to the IG style and identified the same PDs relating to it, as well as both liking the IKEA-IG style; yet, when it comes to wanting the IKEA-IG table-panel as an attachment inclusion to the IKEA LACK table, only the KWT group did. More UK group participants preferred the IKEA item without the addition than those who did.

In addition to the four dependent variable questions pertaining to Part 2 section of the ESQ survey, an optional sub-question 'Why?' under 'I prefer no additional design' was presented. Here, again focusing on the UK group results as more participant do not prefer the table-panel inclusion to the IKEA LACK table than those who do, were addressed. Mixed responses were obtained varying from liking the style inclusion as 'it adds diversity and personalization', to liking the style yet it 'does not suit LACK's basic design' style. Some commented on how unique and interesting the IKEA-IG designs are, and how this enables customers to modify their furniture selection in transforming an existing IKEA product into a 'new look' with 'strong cultural connotations'. Another response was how the table-panels give the LACK table an 'interesting innovative way' of presenting the iconic IKEA item giving it a 'high-quality look' to its basic plain design. On the contrary, a few of the responses were not preferring the addition because (although they like the integrated style) they 'feel some of the patterns are not fitting with the Scandinavian style' and seems foreign to its designs; as the LACK table had been in IKEA's product range for a substantial amount of time, the majority do like the configuration, yet because it is 'not what is used to' as an IKEA item, would probably see it as a 'collector's item' or a 'limited edition collection' that compliments its furniture selection. While the majority commented on the LACK item as being 'too plain' and how this attachment presents a unique variety to the product other than a different colour selection, the overall Likert scale results still indicated that more of the UK participants prefer no addition. Ultimately, the cultural comparison between UK and KWT participants was also to measure the adaptability of cultural-contemporary style in a different cultural background to the arts identity. This can help in indicating the success of cultural integration outside the parameters of the cultural art being evolved and into a global scope.

From the written responses and feedback, the UK participants are leaning towards having the IKEA-IG style as limited edition, while the KWT participants want its inclusion as an 'IKEA-cultural product range'. Of the 12 PDs, four top designs resulted that were highly associated to the IKEA style, the IG styles, and liked. Since IKEA is looking for cultural art integrations as part of its global industry, the IKEA-IG style table-panel prototype investigation outcomes offer a style that maintains both style DNAs in an attachment strategy technique in which the artifact does not change the existing IKEA products but compliments them as an optional personalized addition. This enables customers to stick with IKEA's original designs or add cultural identity that coincides with the IKEA brand and design language harmoniously. The synergy both evolves cultural arts into mainstream design and allows contemporary design to embrace and celebrate cultural art identity.

The outcome also shows that the level of cultural relativity to style affects desirability (preference) towards the inclusion of the cultural integrated style. Although they both like the IKEA-IG style, yet that does not mean they both would like it as an addition to the IKEA LACK table. For some, adapting to change is also a factor towards preference to style. Participant's liking the style was not the reason behind wanting its inclusion, rather it was cultural relativity and connectivity with the style that effects preference for the style's inclusion – this ultimately strengthens the argument of developing cultural integration and serves to fulfil the aim of this research – the revival of the cultural art of IG into contemporary design.

5.5.5 Regression Analysis

A multivariate ANOVA analysis was conducted considering the dependent variables of the study. Appendix Y, p.441 - Table Y1 reveals statistically significant results for dependent variable 'I_like_IKEA_IG' and 'I_prefer_no_additional_design' holding R^2 values of 0.41 and 0.49 respectively. This indicates that 41% and 49% of the variation in the dependent variables are explainable by independent variables. Additionally, the demographic variable 'Religion' has a significant effect on the dependent variable 'I_like_IKEA_IG', while 'Group' demographic has a significant effect on 'I_prefer_no_additional_design'. The effect of the rest of the demographic variables on dependent variables was found to be statistically insignificant.

Appendix Y, p.441 - Table Y2 reveals the parameter estimates of the regression equation analysis. Results show that the independent variables 'Gender', 'Religion' and 'Group' had a significant effect on the dependent variables 'Like_IKEA_Furniture', 'I_like_IKEA_IG' and 'I prefer no additional design' respectively. From the results obtained, it was observed that one unit increase in 'Religion' will decrease the value of 'I_like_IKEA_IG' by 1.12 units, whereas one unit increase in 'Group' decreases the value of 'I prefer no additional design' by 1.542 units.

Appendix Y, p.441 - Table Y3 presents the estimated marginal means for the three variables 'Like IKEA Furniture 79', 'I_like_IKEA_IG' and 'I prefer no additional design' as 4.35 (S.E. = 0.08), 4.06 (S.E. = 0.10) and 3.29 (S.E. = 0.14) respectively. In addition, Appendix Y, p.441 - Table Y4 presents the estimated means for the three variables within each of the KWT and UK groups. For dependent variable 'Like IKEA Furniture', the results show an almost equivalent average value for both the KWT (mean = 4.42, S.E. = 0.21) and UK (mean=4.27, S.E. = 0.23) groups. Similarly, the average value of the dependent variable 'I_like_IKEA_IG' had an almost equivalent outcome for the KWT (mean = 4.08, S.E. = 0.25) and UK (mean = 4.05, S.E. = 0.28) groups. Whereas for dependent variable 'I prefer no additional design' the average for the UK group (mean = 4.06, S.E. = 0.41) was high compared to the KWT group (mean = 2.52, S.E. = 0.38). A graphical representation of the estimated mean is presented for the dependent variable 'I prefer no additional design' for the KWT and UK groups (Figure 5.30) as the other two variables 'Like IKEA Furniture' and 'I_like_IKEA_IG' were statistically insignificant.

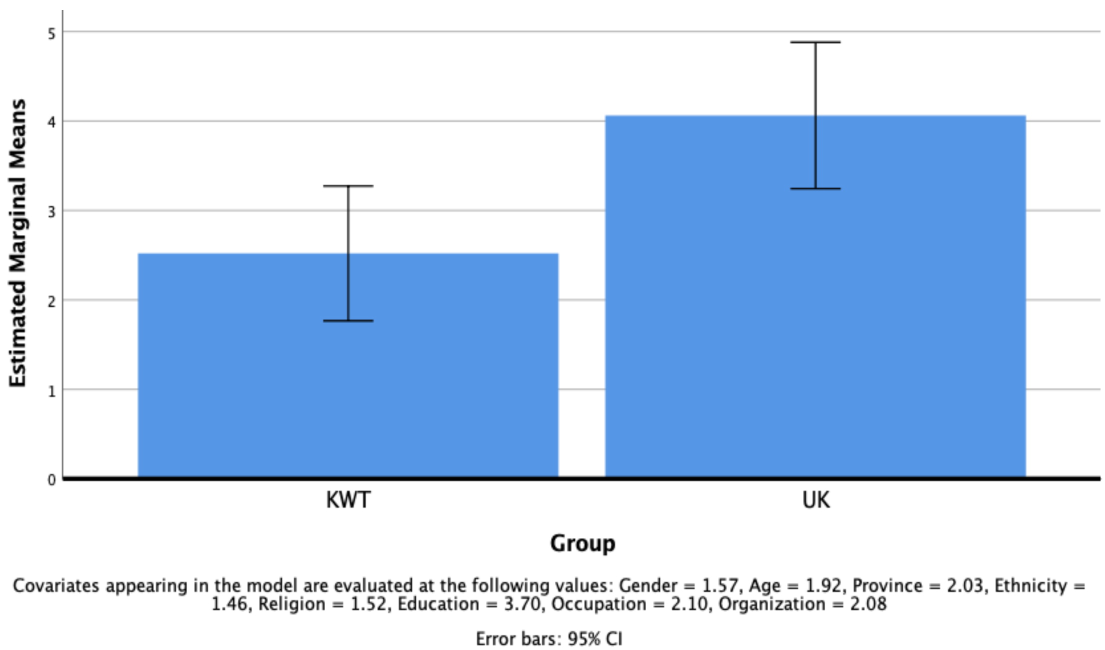


Figure 5.30 Estimated marginal means of 'I_prefer_no_additional_design'.

Post-hoc analysis was also conducted to check whether the mean difference between KWT and UK groups are significant for the studied variables (see Appendix Y, p.441 - Table Y5). Results show that only dependent variable 'I_prefer_no_additional_design' was significant ($p = 0.04$); whereas the mean difference for 'Like_IKEA_Furniture' and 'I_like_IKEA_IG' were found to be statistically insignificant ($p > 0.05$).

5.5.6 Top Ranking PDs – Kuwait and UK

As part of the data analysis, a summary of the statistical results (mean and standard deviation) of the top PDs in constructs IKEA, IG and LIKE from both ESQs was carried out. The top PDs in combined constructs ALL and II was also considered and presented for both study groups and presented in the following tables.

Starting with the KWT group participants (ESQ-1), Table 5.17 results show that under IKEA construct, PDs IKEA_19, IKEA_25, IKEA_24, IKEA_11 and IKEA_12 ranked top 5 respectively. Under IG construct, PDs IG_21, IG_13, IG_20, IG_16 and IG_17 ranked top 5. While under LIKE construct, PDs LIKE_13, LIKE_20, LIKE_21, LIKE_26 and LIKE_17 ranked top 5 based on mean and standard deviation outcomes.

IKEA			**IG**			**LIKE**		
PDs	**Mean**	**SD**	**PDs**	**Mean**	**SD**	**PDs**	**Mean**	**SD**
IKEA_19	4.00	0.97	IG_21	4.58	0.61	LIKE_13	4.48	0.80
IKEA_25	3.55	1.15	IG_13	4.58	0.61	LIKE_20	4.33	0.96
IKEA_24	3.55	1.03	IG_20	4.55	0.67	LIKE_21	4.33	0.96
IKEA_11	3.48	1.18	IG_16	4.55	0.56	LIKE_26	4.30	0.85
IKEA_12	3.24	1.15	IG_17	4.52	0.67	LIKE_17	4.27	0.98
IKEA_14	3.15	1.09	IG_26	4.24	0.66	LIKE_16	4.18	0.73
IKEA_26	3.00	1.17	IG_25	3.79	1.02	LIKE_14	4.06	0.70
IKEA_13	2.97	1.16	IG_14	3.79	0.89	LIKE_24	4.00	0.87
IKEA_20	2.76	1.23	IG_24	3.64	0.96	LIKE_12	3.97	0.95
IKEA_21	2.70	1.21	IG_12	3.55	1.06	LIKE_11	3.97	0.64
IKEA_17	2.18	1.19	IG_11	3.27	1.07	LIKE_25	3.91	1.10
IKEA_16	2.00	1.25	IG_19	2.97	1.38	LIKE_19	3.64	1.03

Table 5.17 Mean and S.D. for IKEA, IG and LIKE - KWT group (n = 33).

Table 5.18 presents the top-ranking PDs for the KWT group in combined constructs ALL and II. In the ALL construct, results show PDs ALL_13, ALL_21, ALL_20, ALL_17 and ALL_16 ranked top 5. As for the II construct, results show II_13, II_25, II_20, II_21 and II_26 ranked top 5 PDs respectively based on mean and standard deviation outcomes.

ALL			II		
PDs	Mean	SD	PDs	Mean	SD
ALL_13	4.53	0.60	II_13	3.77	0.69
ALL_21	4.45	0.68	II_25	3.67	0.76
ALL_20	4.44	0.75	II_20	3.65	0.68
ALL_17	4.39	0.76	II_21	3.64	0.68
ALL_16	4.36	0.56	II_26	3.62	0.64
ALL_26	4.27	0.69	II_24	3.59	0.65
ALL_14	3.92	0.70	II_19	3.48	0.76
ALL_25	3.85	0.92	II_14	3.47	0.76
ALL_24	3.82	0.80	II_12	3.39	0.88
ALL_12	3.76	0.93	II_11	3.38	0.80
ALL_11	3.62	0.61	II_17	3.35	0.59
ALL_19	3.30	1.04	II_16	3.27	0.69

Table 5.18 Mean and S.D. for ALL and II - KWT group (n = 33).

The summary of the statistical results for the UK group participants (ESQ-2) were also carried out and presented in Table 5.19 to find the top PDs of the IKEA, IG, and LIKE constructs. The results show that under IKEA construct, PDs IKEA_19, IKEA_11, IKEA_24, IKEA_25 and IKEA_12 ranked top 5 respectively. Under IG construct, PDs IG_13, IG_26, IG_17, IG_20 and IG_16 ranked top 5. While under LIKE construct, LIKE_26, LIKE_13, LIKE_17, LIKE_16 and LIKE_25 ranked top 5 based on mean and standard deviation outcomes.

IKEA			IG			LIKE		
PDs	Mean	SD	PDs	Mean	SD	PDs	Mean	SD
IKEA_19	4.03	0.72	IG_13	4.20	0.61	LIKE_26	4.23	0.68
IKEA_11	3.47	0.86	IG_26	4.07	0.58	LIKE_13	4.13	0.68
IKEA_24	3.3	0.88	IG_17	4.00	0.74	LIKE_17	3.90	0.85
IKEA_25	3.23	0.90	IG_20	3.97	0.67	LIKE_16	3.87	0.82
IKEA_12	3.17	0.87	IG_16	3.83	0.95	LIKE_25	3.80	0.93
IKEA_26	3.07	1.08	IG_21	3.80	0.71	LIKE_14	3.80	0.81
IKEA_14	3.00	0.91	IG_14	3.70	0.70	LIKE_20	3.67	1.03
IKEA_13	2.87	1.07	IG_25	3.37	0.81	LIKE_12	3.60	0.86
IKEA_20	2.70	1.06	IG_12	3.27	0.87	LIKE_19	3.50	0.97
IKEA_21	2.67	1.09	IG_24	3.17	0.79	LIKE_24	3.47	0.94
IKEA_16	2.57	0.94	IG_11	2.87	0.73	LIKE_21	3.43	1.10
IKEA_17	2.47	1.01	IG_19	2.63	0.85	LIKE_11	3.43	0.94

Table 5.19 Mean and S.D. for IKEA, IG and LIKE - UK group (n = 30).

Moreover, Table 5.20 demonstrates the top 5 PD results of the UK group for the combined ALL and II constructs. In the ALL construct, results show PDs ALL_13, ALL_26, ALL_17, ALL_16 and ALL_20 ranked top 5. As for the II construct, results show II_26, II_13, II_14, II_19 and II_20 ranked top 5 respectively based on mean and standard deviation outcomes.

ALL			**II**		
PDs	**Mean**	**SD**	**PDs**	**Mean**	**SD**
ALL_13	4.17	0.48	II_26	3.57	0.58
ALL_26	4.15	0.46	II_13	3.53	0.57
ALL_17	3.95	0.69	II_14	3.35	0.62
ALL_16	3.85	0.76	II_19	3.33	0.53
ALL_20	3.82	0.75	II_20	3.33	0.58
ALL_14	3.75	0.64	II_25	3.30	0.55
ALL_21	3.62	0.75	II_24	3.23	0.57
ALL_25	3.58	0.68	II_17	3.23	0.63
ALL_12	3.43	0.68	II_21	3.23	0.69
ALL_24	3.32	0.64	II_12	3.22	0.43
ALL_11	3.15	0.62	II_16	3.20	0.66
ALL_19	3.07	0.68	II_11	3.17	0.51

Table 5.20 Mean and S.D. for ALL and II - UK group (n = 30).

5.6 Comparing Main Study to Evaluative Study Results

Data results for the top IKEA-IG pattern design (PD) outcomes of all three questionnaires were compared. The MSQ top PD outcomes within each of the constructs were compared to that of the ESQ-1 outcomes. This comparison is in efforts to validate the PD outcomes as both questionnaires took place in Kuwait in which the participants are of, or familiar with, the same cultural background where the art of IG is rooted. Then, the ESQ-1 and ESQ-2 top PD outcomes within each of the constructs were also compared to investigate if cultural diversity, identity, background, or familiarity to the IG art influences participant responses; both group participants of the ESQs, Kuwait and UK, are familiar with IKEA's style as they were both conducted in an IKEA store by IKEA customers.

5.6.1 MSQ and ESQ-1 Top PD Comparison

Data results for the top PD outcomes of constructs IKEA, IG and LIKE from the MSQ (section 5.4) were compared to that of the ESQ-1 (section 5.5). In the MSQ, the top 5 PDs resulting for IKEA construct by the respondents were items PD 19, PD 11, PD 24, PD 12 and PD 25 ranking top 1 to 5 (Table 5.10). These results are equivalent to the top 5 PDs resulting from the ESQ-1 for IKEA construct (Table 5.17), yet in ranking order 1, 4, 3, 5 and 2 respectively. Thus, it can be concluded that in both the MSQ and ESQ-1, the top 5 PD items selected by the respondents for the IKEA construct were identical with slight variation in ranking order.

Under IG construct, the MSQ results of the top 5 PDs show items PD 20, PD 21, PD 17, PD 16 and PD 26 ranking top 1 to 5 (Table 5.10). These results are equivalent to the top PDs resulting from the ESQ-1 for IG construct (Table 5.17), yet in ranking order 3, 1, 5, 4 and 6 respectively. In 2nd place for the top PD of IG construct in the ESQ-1 was PD 13 (Table 5.17) which ranked 6th place in the MSQ PD outcome (Table 5.10). Thus, it can be concluded that the ESQ-1 top PD outcomes of the IG construct were very similar to that of the MSQ, with 80% identical top PD items and slight variation in the ranking order.

Under LIKE construct in the MSQ, items PD 13, PD 20, PD 17, PD 21 and PD 26 ranked top 1 to 5 (Table 5.10). These results are equivalent to the top PDs resulting from the ESQ-1 for LIKE construct (Table 5.17), yet in ranking order 1, 2, 5, 3 and 4 respectively. Thus, it can be concluded that in both the MSQ and ESQ-1, the top 5 PD items selected by the respondents for the LIKE construct were identical with slight variation in ranking order.

Furthermore, data results for the top PD outcomes of combined constructs ALL and II from both the MSQ and ESQ-1 were also compared for further analysis. The top 5 PDs resulting from the ALL construct of the MSQ were items PD 20, PD 21, PD 13, PD 26 and PD 17 ranking top 1 to 5 (Table 5.11). These results are equivalent to the top 5 PDs resulting from ESQ-1 for the ALL construct (Table 5.18), yet in ranking order 3, 2, 1, 6 and 4 respectively. In 5th place for construct ALL from the ESQ-1 was PD 16 (Table 5.18) which ranked 6th place for the MSQ PD outcome (Table 5.11). Thus, it can be concluded that the ESQ-1 top PD outcomes of the ALL construct were very similar to that of the MSQ, with 80% identical top PD items and slight variation in ranking order.

As for construct II, the top-ranking PD items were found by considering the average value of the combined constructs IKEA and IG. Based on the average value, the top PDs resulting from the II construct of the MSQ were items PD 20, PD 21, PD 26, PD 13 and PD 14 ranking top 1 to 5 (Table 5.11). These results are equivalent to the top PDs resulting from ESQ-1 for the II construct (Table 5.18), yet in ranking order 3, 4, 5, 1 and 8 respectively. In 2nd place for the top PD of II construct in the ESQ-1 was PD 25 (Table 5.18) which ranked 9th place for the MSQ PD outcome (Table

5.11). Thus, it can be concluded that the ESQ-1 top PD outcomes of the II construct were similar to that of the MSQ, with 80% identical top PD items and slight variation in ranking order.

5.6.2 ESQ-1 and ESQ-2 Top PD Comparison

Data results for the top PD outcomes of constructs IKEA, IG and LIKE from both ESQ-1 and ESQ-2 (section 5.5) were compared. In the ESQ-1, the top 5 PDs resulting for IKEA construct by the respondents were items PD 19, PD 25, PD 24, PD 11 and PD 12 ranking top 1 to 5 (Table 5.17). These results are equivalent to the top 5 PDs resulting from the ESQ-2 for IKEA construct (Table 5.19), yet in ranking order 1, 4, 3, 2 and 5 respectively. Thus, it can be concluded that both ESQ outcomes of top 5 PD items for the IKEA construct were identical with slight variation in ranking order.

Under IG construct, the ESQ-1 results of the top 5 PDs show items PD 21, PD 13, PD 20, PD 16 and PD 17 ranking top 1 to 5 (Table 5.17). Most of these results are equivalent to the top PDs resulting from the ESQ-2 for IG construct (Table 5.19), yet in ranking order 6, 1, 4, 5 and 3 respectively. In 2nd place for the top PD of IG construct in ESQ-2 was PD 26 (Table 5.19) which ranked 6th place in ESQ-1 PD outcome (Table 5.17). Thus, it can be concluded that both ESQ outcomes of top PD items for the IG construct were very similar, with 80% identical top PD items and slight variation in the ranking order.

Under LIKE construct, ESQ-1 results of the top 5 PDs show items PD 13, PD 20, PD 21, PD 26 and PD 17 ranked top 1 to 5 (Table 5.17). Some of these results are equivalent to the top PDs resulting from ESQ-2 for LIKE construct (Table 5.19), yet in ranking order 2, 7, 11, 1 and 3 respectively. In 4th place for the top PD of LIKE construct in ESQ-2 was PD 16 (Table 5.19) which ranked 6th place in ESQ-1 PD outcome (Table 5. 17); and in 5th place top PD in ESQ-2 was PD 25 (Table 5.19) which ranked 11th place in Study 1 PD outcome (Table 5.17). Thus, it can be concluded that both ESQ outcomes of top PD items for the LIKE construct were 60% identical top PD items with variations in the ranking order.

Furthermore, data results for the top PD outcomes of combined constructs ALL and II from both ESQs were also compared for further analysis. The top 5 PDs resulting from the ALL construct in ESQ-1 were items PD 13, PD 21, PD 20, PD 17 and PD 16 ranking top 1 to 5 (Table 5.18). Most of these results are equivalent to the top 5 PDs resulting from ESQ-2 for the ALL construct (Table 5.20), yet in ranking order 1, 7, 5, 3 and 4 respectively. In 2nd place for the top PD of ALL construct in ESQ-2 was PD 26 (Table 5.20) which ranked 6th place in Study 1 PD outcome (Table 5.18). Thus, it can be concluded that both ESQ outcomes of top PD items for the ALL construct were very similar, with 80% identical top PD items and slight variation in the ranking order.

As for construct II, the top-ranking PD items in ESQ-1 were items PD 13, PD 25, PD 20, PD 21 and PD 26 ranking top 1 to 5 (Table 5.18). Some of these results are equivalent to the top PDs resulting from ESQ-2 for the II construct (Table 5.20), yet in ranking order 2, 6, 5, 9 and 1 respectively. In 3rd place for the top PD of II construct in Study 2 was PD 14 (Table 5.20) which ranked 8th place in ESQ-1 PD outcome (Table 5.18); and in 4th place top PD in ESQ-2 was PD 19 (Table 5.20) which ranked 7th place in ESQ-1 PD outcome (Table 5.18). Thus, it can be concluded that both ESQ outcomes of top PD items for the II construct were 60% identical top PD items with variations in the ranking order.

5.7 Comparisons of the Study Results

From the data results of all three questionnaires, this section presents the top IKEA-IG pattern design (PD) illustrations and comparisons. Each of the MSQ, ESQ-1 and ESQ-2 top PDs were presented, then compared to each other.

5.7.1 MSQ top IKEA-IG PDs

From the 26 PDs tested in the MSQ, the following figures illustrate the top 5 PD outcomes from the MSQ results of section 5.4 of this chapter. Figure 5.31 covers the top-ranking PDs of each of the three constructs IKEA, IG and LIKE; Figure 5.32 covers the top PDs of the combined construct IKEA, IG and LIKE (ALL), and of the combined construct IG and IKEA (II).

MSQ top IKEA-IG PDs of each of the constructs are:

IKEA – PD 19, PD 11, PD 24, PD 12 and PD 25.
IG – PD 20, PD 21, PD 17, PD 16 and PD 26.
LIKE – PD 13, PD 20, PD 17, PD 21 and PD 26.

The PD results were arranged from highest to lowest in ranking order (Figure 5.31). From the top 5 PDs of each of the constructs, there was no common PDs in Top 5 IKEA to any other construct; IG nor LIKE. Yet, there was a significant number of shared PD outcomes amongst the IG and LIKE constructs. Since the top 5 LIKE construct items were predominantly similar to IG, then it can be determined that most participants favoured the IG style more than IKEA's (this reflects the majority of participants demographic data background being of the cultural art of IG showing familiarity and acceptance towards the cultural art identity) and its IKEA-IG engagement. However, the overall results did not show significance towards their preference to the IKEA-IG style and inclusion.

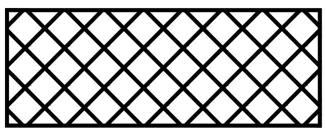
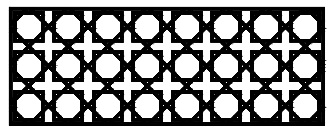
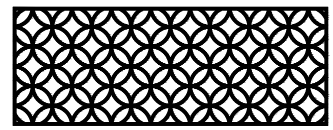
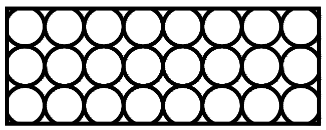
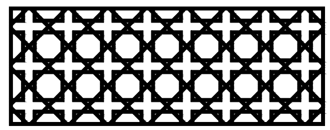
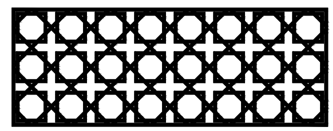
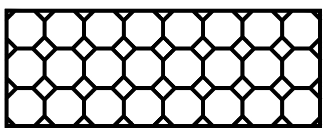
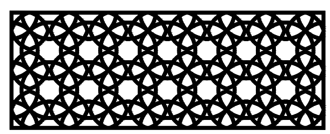
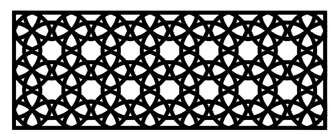
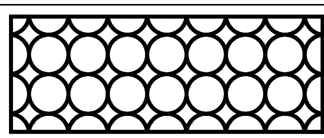
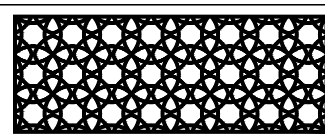
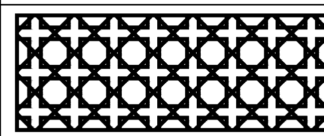
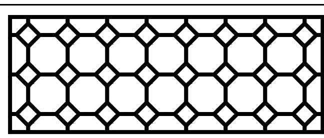
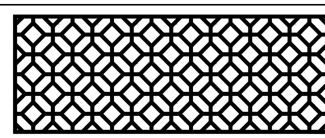
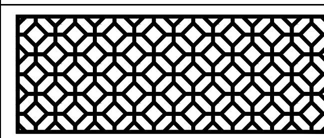
MSQ Top 5 PDs	IKEA Construct	IG Construct	LIKE Construct
1.	 PD 19.	 PD 20.	 PD 13.
2.	 PD 11.	 PD 21.	 PD 20.
3.	 PD 24.	 PD 17.	 PD 17.
4.	 PD 12.	 PD 16.	 PD 21.
5.	 PD 25.	 PD 26.	 PD 26.

Figure 5.31 MSQ top 5 PDs in constructs IKEA, IG and LIKE.

Observational similarities within IKEA, IG and LIKE construct PDs (Figure 5.31):

IKEA: (PD 11 and 12), (PD 24 and 25) – same PD but different framing variation.

IG: (PD 20 and 21), (PD 16 and 17) – same PD but different framing variation.

LIKE: (PD 20 and 21) – same PD but different framing variation.

(PD 13 and 26) – similar PD outcome; curve-line vs straight-line respectively.

- Top 5 PDs in both IG and LIKE – PD 20, 21, 17, 26 (differences: PD 16 in IG; PD 13 in LIKE).

For the combined constructs ALL and II, the average mean value of the construct combinations results in their PD ranking outcome. The ALL construct involves combining constructs IKEA, IG and LIKE; the II construct involves combining constructs IKEA and IG.

Top IKEA-IG PDs of each of the combined constructs ALL and II (Figure 5.32):

ALL – PD 20, PD 21, PD 13, PD 26 and PD 17.

II – PD 20, PD 21, PD 26, PD 13 and PD 14.

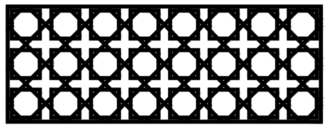
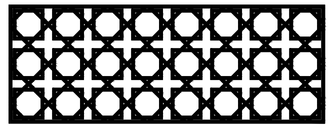
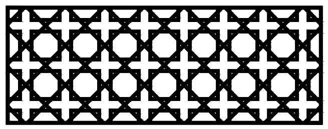
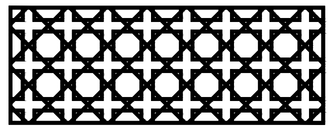
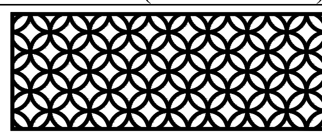
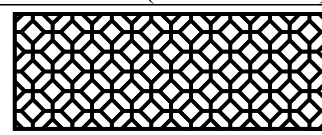
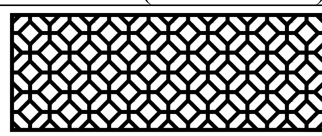
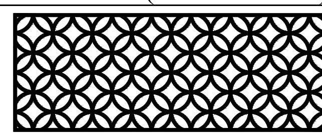
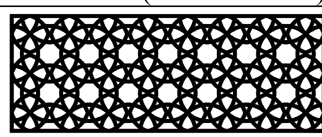
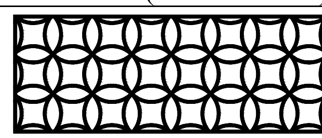
MSQ Top 5 PDs	ALL Construct (IKEA, IG and LIKE)	II Construct (IKEA and IG)
1.	 PD 20. (av. mean 3.59)	 PD 20. (av. mean 3.54)
2.	 PD 21. (av. mean 3.50)	 PD 21. (av. mean 3.44)
3.	 PD 13. (av. mean 3.49)	 PD 26. (av. mean 3.42)
4.	 PD 26. (av. mean 3.47)	 PD 13. (av. mean 3.39)
5.	 PD 17. (av. mean 3.46)	 PD 14. (av. mean 3.38)

Figure 5.32 MSQ top 5 PDs in constructs ALL and II.

Observational similarities within ALL and II construct PDs:

(PD 20 and 21) – same PD but different framing variation.

(PD 13 and 26) – similar PD outcome; curve-line vs straight-line respectively.

- Top 5 PDs in both ALL and II – PD 20, 21, 13, 26 (differences: PD 17 in ALL; PD 14 in II).

PD 20 ranked top PD in both the ALL and II constructs followed by PD 21 in 2nd. PD 13 was 3rd in construct ALL while 4th in II, and PD 26 ranked 3rd in II while 4th in ALL. The only outcomes that differ between ALL and II constructs are PD 17 and PD 14 ranking in 5th place respectively, yet it is interesting to note that PD 17 ranked 7th in II construct with average mean value of 3.366 closely following PD 16 (same PD but different framing) in 6th place (3.368 average mean value).

Although LIKE construct is subjective, the researcher is looking for PDs that are of IKEA, IG and are liked. The focus is to investigate the merging of the styles as well as their acceptability. Hence, PD 14 which was only top 5 in the II construct was still considered in the ESQs for further analysis. It might be preferred by UK participants in other constructs for example, or even have a different outcome in Kuwait when demonstrated as an artifact instead of an illustration as in the MSQ. If the results are the same for Kuwait participants, yet preferred in UK, this could mean that it is Liked by the western world but not Middle Easterners. With that, PD 14 was included in the ESQs.

The following (Table 5.21) highlights the top PDs of the MSQ within the IKEA, IG, LIKE, ALL and II constructs; from which multi-construct Composite PDs were derived. While 'Combined' construct PDs resulted from the average mean of combining constructs IKEA, IG and LIKE to form construct ALL, and IKEA and IG to form construct II, 'Composite' PDs are those that are top in more than one construct. Top PD outcomes that resulted in multiple constructs, be it in more than one of the three individual constructs of this study (IKEA, IG, LIKE), top in a combined construct (ALL, II), or a combination, are categorized as Composite PDs.

MSQ top PDs	**Construct/s**
PD 11	IKEA
PD 12	IKEA
PD 13	LIKE, ALL, II
PD 14	II
PD 16	IG
PD 17	IG, LIKE, ALL
PD 19	IKEA
PD 20	IG, LIKE, ALL, II
PD 21	IG, LIKE, ALL, II
PD 24	IKEA
PD 25	IKEA
PD 26	IG, LIKE, ALL, II

Composite PDs
PD 13 – LIKE, ALL, II
PD 14 – II
PD 17 – IG, LIKE, ALL
PD 20 – IG, LIKE, ALL, II
PD 21 – IG, LIKE, ALL, II
PD 26 – IG, LIKE, ALL, II

Table 5.21 MSQ top PD outcomes.

Notice that none of individual IKEA construct PDs were in the Composite PD pile, which indicates that the MSQ participants leaned more towards the IG style rather than IKEA. All top PDs from constructs LIKE, ALL and II were Composite PDs. Also, PD 13 was found to be significant because it was top only in constructs LIKE, II and ALL yet not specifically in either individual style of the integration by itself (construct IG nor IKEA); meaning, PD 13 is a top PD as a combination of both IG and IKEA (construct II), a combination of IG, IKEA and LIKE (construct ALL), and is liked (construct LIKE).

Among the top PDs were similar outcomes where a PD would be of the same design yet of a different framing variation (50% shift):

(PD 11 and PD 12), (PD 24 and PD 25) –in top IKEA.

(PD 16 and PD 17) – both in top IG; PD17 in LIKE and ALL.

(PD 20 and PD 21) – both in top IG, LIKE, ALL and II.

Notice that although PD 16 and PD 17 were of the same PD outcome only framed differently, only PD 17 was a Composite PD. Nevertheless, generally PDs of the same design yet are of a different framing variation mainly resulted within the same construct and ranked close to its framing variation PD outcome. Additionally, although PD 13 and 26 are not of the same design yet they hold a similar design outcome; PD 13 using curved-lines while PD 26 is straight-lines.

All 12 of the MSQ top PDs were taken into the ESQs for further testing and comparisons.

5.7.2 ESQs Top IKEA-IG PDs

The top 12 PDs resulting from the MSQ were measured in two ESQs, one in Kuwait, Middle East (ESQ-1) and one in England, UK (ESQ-2). This section covers the PDs of the ESQs, section 5.7.3 covers the ESQ-1, while section 5.7.4 covers the ESQ-2. Below, Figure 5.33 illustrates the IKEA-IG PDs taken into the ESQs:

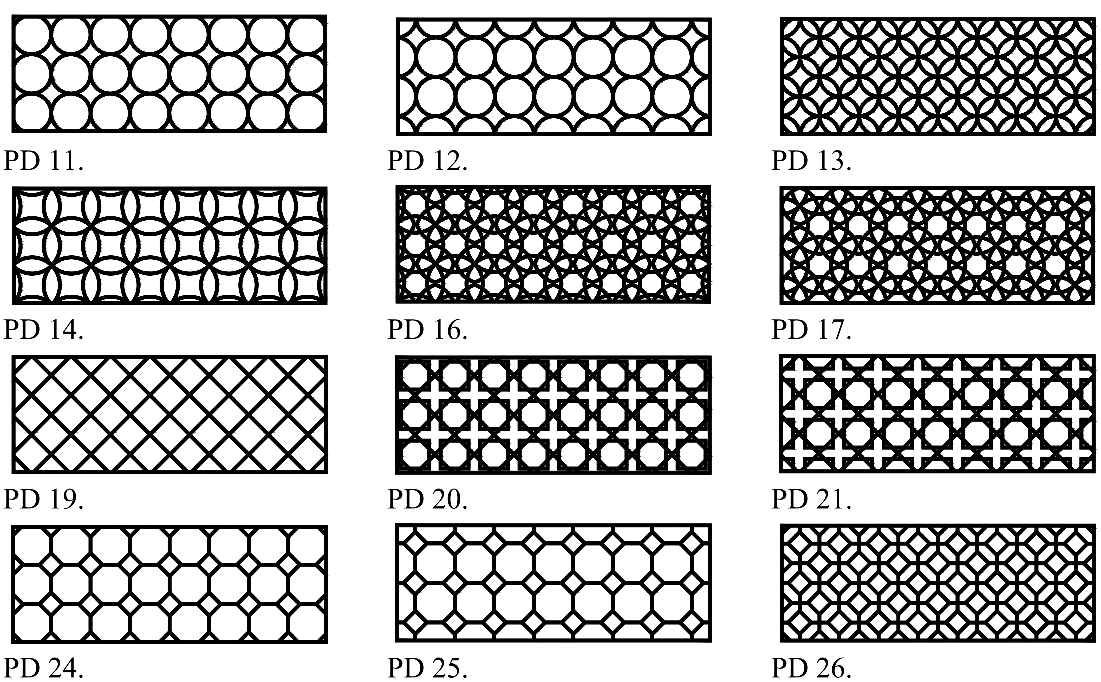


Figure 5.33 ESQ IKEA-IG PDs.

The PD numbering for both the ESQs was the same as in the MSQ for PD identification and comparison. Of the 12 PDs resulting from the MSQ and taken into the ESQs (Figure 5.33), it can be noted that some PDs are of the same design grammar components (IS and SRA) yet are of a different framing variation (50% shift). Those PDs are:

PD 11 and 12, PD 16 and 17, PD 20 and 21, as well as PD 24 and 25.

Additionally, PD 13 and 26 are also visually similar PDs yet are not of the same design. This could be due to the PDs maintaining the same SRAs although they are of different IS. With PD 13 holding IS ‘circle, and PD 26 holding IS ‘octagon’ the pattern outcomes are of similar design, yet one is a curved-line PD and the other a straight-line PD respectively. With that, the remaining of the 12 PDs are PD 14 and 19 which are also of curved-line and straight-line PDs respectively yet are not similar to any of the 12 measured PDs. It is also interesting to note that of the 12 PDs resulting from the MSQ and remeasured in the ESQs, 50% were curve-line to straight-line PDs:

Curve-line PDs – PD 11, 12, 13, 14, 16 and 17.

Straight-line PDs – PD 19, 20, 21, 24, 25 and 26.

The 12 PDs also vary from simple design forms to intense. For instance, of the resulting outcomes of the MSQ, it can be noted that PDs that ranked top in the IKEA construct were of simple geometries, while the IG and LIKE construct PDs were of intricate geometries. As the ESQs carry a more practical application technique of measuring the style, where PD illustrations were tested as product prototypes in two geographical locations, the resulting outcomes were compared to that of the MSQ and to that of the different cultural backgrounds. In conducting the ESQs, the MSQ results were further validated, the top PDs of the IKEA-IG style further refined, and whether cultural background effects the resulting PD outcomes was investigated.

5.7.3 ESQ-1 Top IKEA-IG PDs

Of the 12 PDs measured in the ESQs (Figure 5.33), the following figures illustrate the top PD outcomes of the ESQ-1 results from section 5.5. Illustrating the top 5 PDs of each of the IKEA, IG, and LIKE constructs is Figure 5.34; illustrating the top 5 PDs of the combined ALL construct (holding the combined average mean of all three of the IKEA, IG and LIKE constructs), and the combined II construct (holding the average mean of the IG and IKEA constructs) is Figure 5.35.

ESQ-1 top IKEA-IG PDs of each of the constructs are:

IKEA – **PD 19**, PD 25, **PD 24**, PD 11, and PD 12.

IG – PD 21, PD 13, PD 20, **PD 16**, and PD 17.

LIKE – **PD 13**, **PD 20**, PD 21, PD 26, and PD 17.

*** Identical ranking order to top PDs of the MSQ results.**

The PD results were arranged from highest to lowest in ranking order for each of the constructs. The following figure illustrates the IKEA, IG and LIKE construct top ranking PDs (Figure 5.34).

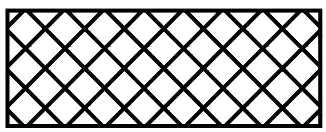
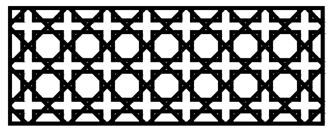
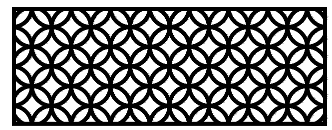
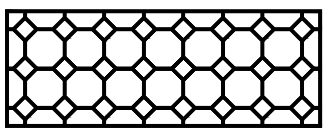
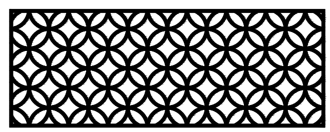
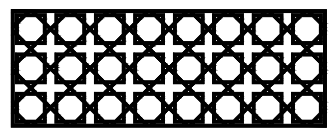
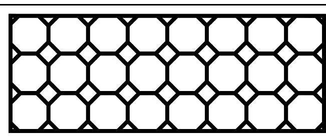
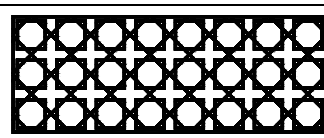
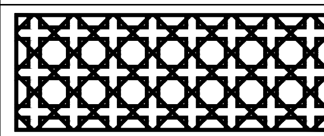
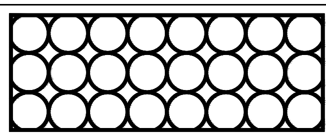
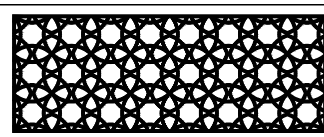
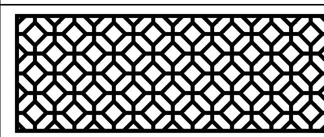
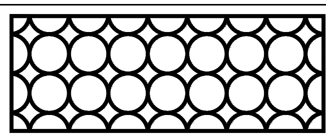
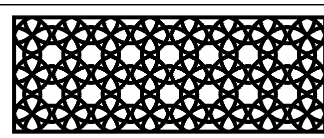
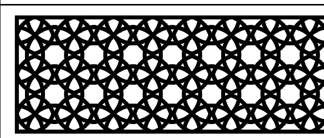
ESQ-1 Top 5 PDs	IKEA Construct	IG Construct	LIKE Construct
1.	 PD 19.	 PD 21.	 PD 13.
2.	 PD 25.	 PD 13.	 PD 20.
3.	 PD 24.	 PD 20.	 PD 21.
4.	 PD 11.	 PD 16.	 PD 26.
5.	 PD 12.	 PD 17.	 PD 17.

Figure 5.34 ESQ-1 top 5 PDs in constructs IKEA, IG and LIKE.

Observational similarities within IKEA, IG and LIKE construct PDs (Figure 5.34):

IKEA: (PD 11 and 12), (PD 24 and 25) – same PD but different framing variation.

IG: (PD 20 and 21), (PD 16 and 17) – same PD but different framing variation.

LIKE: (PD 20 and 21) – same PD but different framing variation.

(PD 13 and 26) – similar PD outcome; curve-line vs straight-line respectively.

- Top 5 PDs in both IG and LIKE – PD 20, 21, 17, 13 (differences: PD 16 in IG; PD 26 in LIKE).

The same as in the MSQ top PD outcomes, there was no commonalities in the ESQ-1 between top PDs from the IKEA construct with that of the IG or LIKE. Yet, most of the IG and LIKE PDs are identical in outcome between the two constructs sharing four out of the five top PDs (PD 13, 17, 20 and 21). This signifies that the participants preferred the IG style more than IKEA's. Having that this questionnaire was also conducted in the Middle East where participants are predominantly of the IG background (demographic data in Table 5.15), these results provide that the participants lean more towards their cultural art heritage. In comparing the top PDs of the ESQ-1 to that of the MSQ, observational similarities within the IKEA, IG, and LIKE constructs reveal:

IKEA: PD 19, 25, 24, 11 and 12 (all same as MSQ).

IG: PD 21, 13, 20, 16 and 17 (all same as MSQ except for PD 13; PD 26 in MSQ).

LIKE: PD 13, 20, 21, 26 and 17 (all same as MSQ).

An exceptional number of PD similarities arise from the resulting outcomes between the MSQ and ESQ-1. The extent of identical outcomes within the constructs can be associated to both questionnaires being conducted in the same geographical location, in addition to cultural associations or connectivity to style as participants are familiar to both the IG and IKEA styles. Furthermore, demographic data specifications of the participants were also investigated in relation to the top PD outcomes as a possible factor of the resulting PD similarities (Ch. 5.7.6).

For the combined constructs ALL and II, the IKEA-IG top 5 PD outcomes of the ESQ-1 are:

ALL – PD 13, **PD 21**, PD 20, PD 17 and PD 16.

II – PD 13, PD 25, PD 20, PD 21 and PD 26.

*** Identical ranking order to top PDs of the MSQ results.**

Both the ALL and II constructs resulted in PD 13 for the top PD ranking outcome and PD 20 ranking in 3rd place. PD 21 ranked 2nd in the ALL construct while 4th in II. When compared to the individual constructs IKEA, IG and LIKE, no common PD outcomes are found between either of the combined constructs to that of IKEA. Yet, all other constructs (IG, LIKE, ALL and II) resulted with PD 13, 20 and 21; constructs IG, LIKE and ALL with PD 17; constructs IG and ALL with PD 16; and constructs LIKE and II with PD 26. This outcome of PD 26 resulting as a top PD in both the LIKE and II constructs is specifically interesting because combined construct II does not include LIKE construct PDs yet resulted with the same PD outcome.

The common PD outcomes among the ALL and II constructs of the ESQ-1 (PD 13, PD 21 and PD 20) are also the same as that of the MSQ except that the MSQ also has PD 26 in common between its top 5 combined ALL and II construct PD outcomes as well.

The following (Figure 5.35) illustrates the top-ranking PDs of constructs ALL and II PDs:

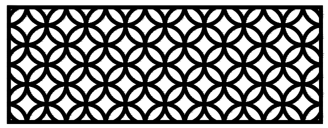
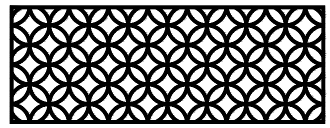
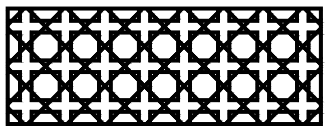
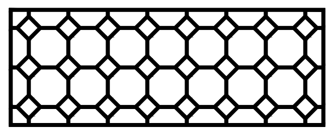
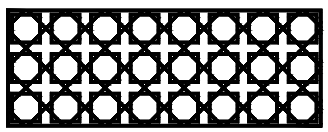
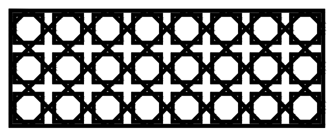
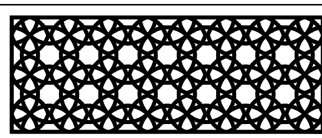
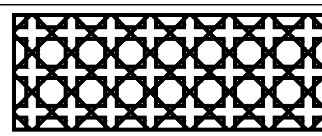
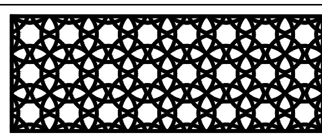
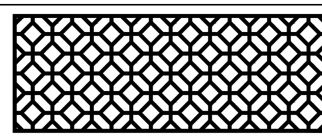
ESQ-1 Top5 PDs	ALL Construct (IKEA, IG and LIKE)	II Construct (IKEA and IG)
1.	 PD 13. (av. mean 4.53)	 PD 13. (av. mean 3.77)
2.	 PD 21. (av. mean 4.45)	 PD 25. (av. mean 3.67)
3.	 PD 20. (av. mean 4.44)	 PD 20. (av. mean 3.65)
4.	 PD 17. (av. mean 4.39)	 PD 21. (av. mean 3.64)
5.	 PD 16. (av. mean 4.36)	 PD 26. (av. mean 3.62)

Figure 5.35 ESQ-1 top 5 PDs in constructs ALL and II.

Observational similarities within ALL and II construct PDs (Figure 5.35):

ALL: (PD 20 and 21), (PD 16 and 17) – same PD but different framing variation.

II: (PD 20 and 21) – same PD but different framing variation.

(PD 13 and 26) – similar PD outcome; curve-line vs straight-line respectively.

In comparing the top PDs of the ESQ-1 to that of the MSQ, observational similarities within the ALL and II constructs reveal:

ALL: PD 13, 21, 20 and 17 (differences: PD 16 in ESQ-1, PD 26 in MSQ).

II: PD 13, 20, 21 and 26 (differences: PD 25 in ESQ-1, PD 14 in MSQ).

In both the ESQ-1 and the MSQ, four of the five top PD outcomes from each of the ALL and II construct results were identical. The following table highlights the ESQ-1 top PDs resulting within each of the constructs. The table also highlights PDs that ranked top PDs within more than one, or multiple, constructs – Composite PDs (Table 5.22).

ESQ-1 top PDs	Construct/s
PD 11	IKEA
PD 12	IKEA
PD 13	IG, LIKE, ALL, II
PD 16	IG, ALL
PD 17	IG, LIKE, ALL
PD 19	IKEA
PD 20	IG, LIKE, ALL, II
PD 21	IG, LIKE, ALL, II
PD 24	IKEA
PD 25	IKEA, II
PD 26	LIKE, II

Composite PDs
PD 13 – IG, LIKE, ALL, II
PD 16 – IG, ALL
PD 17 – IG, LIKE, ALL
PD 20 – IG, LIKE, ALL, II
PD 21 – IG, LIKE, ALL, II
PD 25 – IKEA, II
PD 26 – LIKE, II

Table 5.22 ESQ-1 top PD outcomes.

All top PDs from construct IG, LIKE, ALL and II are Composite PDs. While none of the IKEA PDs of the MSQ were Composite PDs, yet PD 25 (top in IKEA) was in the Composite PD pile of the ESQ-1. Another comparison observation between the MSQ PD outcomes to ESQ-1 was PD 14, PD 16 and PD 25. PD 14 ranked as a top PD only in the MSQ (construct II) yet not in any construct of the ESQ-1; PD 16 and PD 25 were top PDs within the IG and IKEA constructs respectively in both the MSQ and ESQ-1 yet are also Composite PDs in the ESQ-1 (within constructs ALL and II respectively).

Similar PD outcomes of the same design yet of a different framing variation (50% shift):

(PD 11 and PD 12), (PD 24 and PD 25) – in top IKEA; PD 25 also in II.

(PD 16 and PD 17) – both in top IG and ALL; PD 17 also in LIKE.

(PD 20 and PD 21) – both in top IG, LIKE, ALL and II.

Although PD 24 and PD 25 were of the same design outcome only framed differently, PD 25 was the only Composite PD of the two (also in construct II).

As this section covered the top PD investigations of the ESQ conducted in Kuwait (ESQ-1), the following section covers the ESQ conducted in the UK (ESQ-2).

5.7.4 ESQ-2 Top IKEA-IG PDs

Of the 12 PDs measured in the ESQs (Figure 5.33), the following figures illustrate the top 5 PD outcomes of the ESQ-2 results from section 5.5. Illustrating the top 5 PDs of each of the three constructs IKEA, IG, and LIKE is Figure 5.36; illustrating the combination constructs IKEA, IG and LIKE (ALL) and combination constructs IG and IKEA (II) is Figure 5.37.

ESQ-2 top IKEA-IG PDs of each of the constructs are:

IKEA – **PD 19**, PD 11, **PD 24**, PD 25, and **PD 12**.

IG – PD 13, PD 26, PD 17, PD 20, and PD 16.

LIKE – PD 26, PD 13, PD 17, PD 16, and PD 25.

*** PD 19 and PD 24 identical to ESQ-1 and MSQ PD ranking order.**
*** PD 12 identical to ESQ-1 PD ranking order.**

Arranged highest to lowest in ranking order, Figure 5.36 illustrates the top 5 PD outcomes:

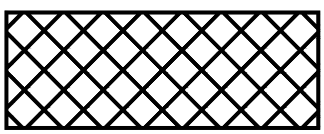
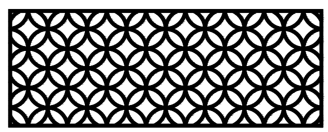
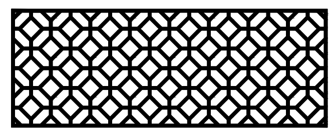
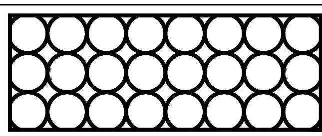
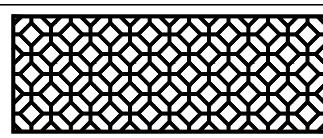
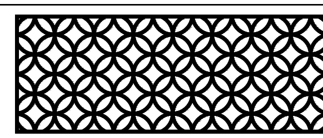
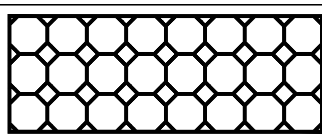
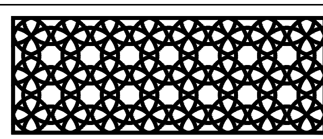
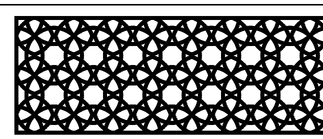
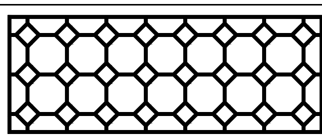
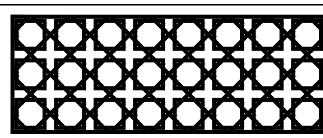
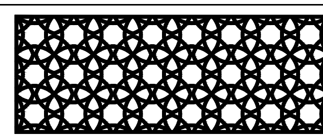
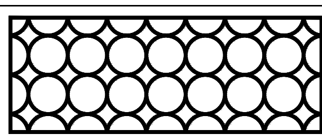
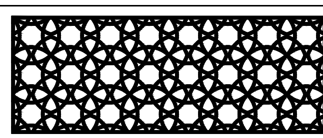
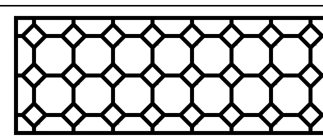
ESQ-2 Top 5 PDs	IKEA Construct	IG Construct	LIKE Construct
1.	 PD 19.	 PD 13.	 PD 26.
2.	 PD 11.	 PD 26.	 PD 13.
3.	 PD 24.	 PD 17.	 PD 17.
4.	 PD 25.	 PD 20.	 PD 16.
5.	 PD 12.	 PD 16.	 PD 25.

Figure 5.36 ESQ-2 top 5 PDs in constructs IKEA, IG and LIKE.

Observational similarities within IKEA, IG and LIKE construct PDs (Figure 5.36):

IKEA: (PD 11 and 12), (PD 24 and 25) – same PD but different framing variation.

IG and LIKE: (PD 16 and 17) – same PD but different framing variation.

(PD 13 and 26) – similar PD outcome; curve-line vs straight-line respectively.

- Top 5 PDs in both IG and LIKE – PD 26, 13, 17, 16 (differences: PD 20 in IG; PD 25 in LIKE).
- Top 5 PDs in both IKEA and LIKE – PD 25.

Interestingly, while there were no common top PD outcomes of the IKEA construct to that of the IG or LIKE constructs in both the MSQ and ESQ-1, the ESQ-2 did have a top PD outcome resulting in both the IKEA and LIKE constructs – PD 25. Yet, similar to the MSQ and ESQ-1, the majority of the top PDs of the IG construct are also top in the LIKE construct signifying those participants (although of different cultural background to that of the MSQ and ESQ-1 participants) preferred the IG PDs more than they did IKEA's. Also, notice that in all three questionnaires, the top PDs in the IKEA constructs all are of simple geometric designs in line with the IKEA design style; none were dense PDs. In comparing the top PDs of the ESQ-2 to that of the ESQ-1, observational similarities within the IKEA, IG, and LIKE constructs reveal:

IKEA: PD 19, 11, 24, 25 and 12 (all same as ESQ-1).

IG: PD 13, 26, 17, 20 and 16 (all same as ESQ-1 except for PD 26; PD 21 in ESQ-1).

LIKE: PD 26, 13, 17, 16 and 25 (all same as ESQ-1 except for PD 16 and PD 25; PD 20 and PD 21 in ESQ-1).

For the combined constructs ALL and II, the IKEA-IG top 5 PD outcomes of the ESQ-2 are:

ALL – **PD 13**, PD 26, PD 17, PD 16 and PD 20.

II – PD 26, PD 13, PD 14, PD 19 and PD 20.

*** Identical ranking order to top PDs of the ESQ-1 results.**

Both the ALL and II constructs resulted in PD 13, PD 26 and PD 20 (with PD 20 ranking 5^{th} in both constructs). Different PD outcomes between the two constructs were PD 17 and 16 for construct ALL, and PD 14 and 19 for construct II. In comparing all three questionnaires of this study, PD 13 and PD 20 ranked amongst the top 5 PDs in constructs ALL and II in the MSQ, ESQ-1 and ESQ-2. The following figure illustrates the top PDs of the ESQ-2 in constructs ALL and II (Figure 5.37).

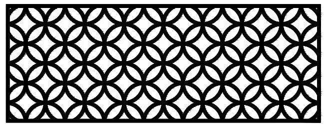
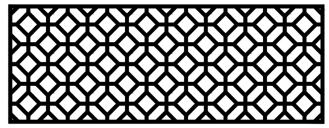
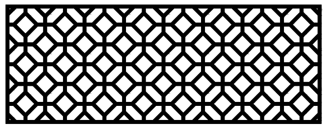
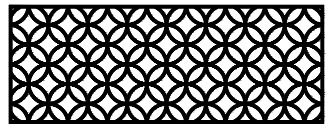
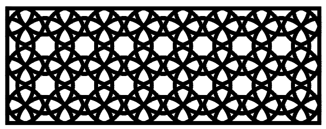
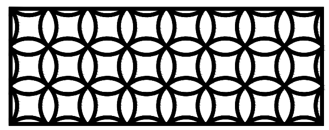
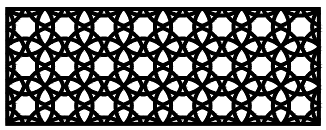
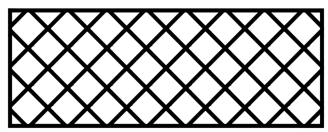
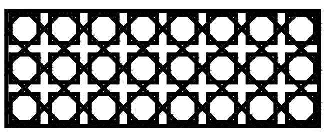
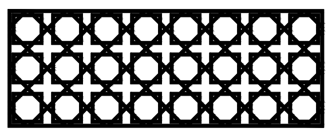
ESQ-2 Top5 PDs	ALL Construct (IKEA, IG and LIKE)	II Construct (IKEA and IG)
1.	 PD 13. (av. mean 4.17)	 PD 26. (av. mean 3.57)
2.	 PD 26. (av. mean 4.15)	 PD 13. (av. mean 3.53)
3.	 PD 17. (av. mean 3.95)	 PD 14. (av. mean 3.35)
4.	 PD 16. (av. mean 3.85)	 PD 19. (av. mean 3.33)
5.	 PD 20. (av. mean 3.82)	 PD 20. (av. mean 3.33)

Figure 5.37 ESQ-2 top 5 PDs in constructs ALL and II.

Observational similarities within the ALL and II construct PDs (Figure 5.37):

ALL: (PD 16 and 17) – same PD but different framing variation.

ALL and II: (PD 13 and 26) – similar PD outcome; curve-line vs straight-line respectively.

PD 13 and 26 in both constructs were consecutive in ranking placement where PD 13 ranked 1st and PD 26 2nd in construct ALL, while in construct II PD 26 was 1st in ranking order followed by PD 13. In comparing the ALL and II PDs of the ESQ-2 to ESQ-1, observational similarities reveal:

ALL: PD 13, 17, 16 and 20 (differences: PD 26 in ESQ-2, PD 21 in ESQ-1).

II: PD 26, 13 and 20 (differences: PD 14 and 19 in ESQ-2, PD 25 and 21 in ESQ-1).

Four out of five of the top PDs within construct ALL, and three out of five within construct II, were identical between the ESQ-2 outcomes to those of the MSQ. Highlighting the top 5 PDs resulting within each of the individual IKEA, IG and LIKE constructs, combined II and ALL constructs, in addition to the composite PDs of the ESQ-2, Table 5.23 lists the outcomes.

ESQ-2 top PDs	Construct/s
PD 11	IKEA
PD 12	IKEA
PD 13	IG, LIKE, ALL, II
PD 14	II
PD 16	IG, LIKE, ALL
PD 17	IG, LIKE, ALL
PD 19	IKEA, II
PD 20	IG, ALL, II
PD 24	IKEA
PD 25	IKEA, LIKE
PD 26	IG, LIKE, ALL, II

Composite PDs
PD 13 – IG, LIKE, ALL, II
PD 14 – II
PD 16 – IG, LIKE, ALL
PD 17 – IG, LIKE, ALL
PD 19 – IKEA, II
PD 20 – IG, ALL, II
PD 25 – IKEA, LIKE
PD 26 – IG, LIKE, ALL, II

Table 5.23 ESQ-2 top PD outcomes.

The top PDs of the ESQ-2 from constructs IG, LIKE, ALL and II are all Composite PDs. Two of the 5 top IKEA construct PDs were also Composite PDs (PD 19 and PD 25), where in ESQ-1 only PD 25 was a Composite PD from the IKEA construct. Also, all Composite PDs of the ESQ-2 were the same as the ESQ-1 except for PD 14 and 19 being an outcome only in the ESQ-2, while PD 21 was of the ESQ-1 outcome. PD 14 was also in the Composite PDs of the MSQ as well as PD 21. PD 14 is unique because it is a top PD only in the combined construct II, yet not in any by itself. Also, PD 16 and PD 25 were in both ESQs Composite PDs but not in the MSQ.

Among the top PDs were similar outcomes where a PD would be of the same design yet of a different framing variation (50% shift):

(PD 11 and PD 12), (PD 24 and PD 25) – in top IKEA; PD 25 also in LIKE.

(PD 16 and PD 17) – both in top IG, LIKE and ALL.

Same as in the ESQ-1, even though PD 24 and 25 were of the same design outcome yet framed differently, only PD 25 was a Composite PD (also in construct LIKE). Also, although PD 19 and 25 were the two PDs of the IKEA construct that are also Composite PDs (also in constructs LIKE and II respectively), none resulted within all three of the constructs of this study. Since the majority of the IG top PDs were also in construct LIKE (opposed to construct IKEA PDs also resulting in construct LIKE), it can be concluded that IG was more preferred by the ESQ-2 participants than IKEA was even though the majority of the participants were not of the IG cultural art nor familiar to the IG style as are the participants of the ESQ-1.

5.7.5 MSQ, ESQ-KWT and ESQ-UK Top IKEA-IG PDs

Comparing all three of the studies, the MSQ and the two ESQs, the following tables were created to present the top 5 PDs of each of the constructs and their combinations, as well as the Composite PDs amongst each of the studies. The IKEA construct top PDs are presented in Table 5.24, IG in Table 5.25, LIKE in Table 5.26, All in 5.27, II in 5.28, and the Composite PDs in Table 5.29. Each of the tables is followed by comparison observations of the results.

MSQ:	**ESQ-1:**	**ESQ-2:**
PD 19	PD 19	PD 19
PD 11	PD 25	PD 11
PD 24	PD 24	PD 24
PD 12	PD 11	PD 25
PD 25	PD 12	PD 12

Table 5.24 IKEA Construct top PDs in all studies.

- PDs are the same in all studies for construct IKEA; PD 19 is top in all three studies.

MSQ:	**ESQ-1:**	**ESQ-2:**
PD 20	PD 21	PD 13
PD 21	PD 13	PD 26
PD 17	PD 20	PD 17
PD 16	PD 16	PD 20
PD 26	PD 17	PD 16

Table 5.25 IG Construct top PDs in all studies.

- PD 20, PD 17 and PD 16 in all three studies.
- PD 21 only in MSQ and ESQ-1; PD 26 only in MSQ and ESQ-2.
- PD 13 only in ESQ-1 and ESQ-2.

MSQ:	**ESQ-1:**	**ESQ-2:**
PD 13	PD 13	PD 26
PD 20	PD 20	PD 13
PD 17	PD 21	PD 17
PD 21	PD 26	PD 16
PD 26	PD 17	PD 25

Table 5.26 LIKE Construct top PDs in all studies.

- PD 13, PD 17 and PD 26 in all three studies.
- PD 20 and PD 21 only in MSQ and ESQ-1.
- PD 16 and PD 25 only in ESQ-2.

MSQ:	ESQ-1:	ESQ-2:
PD 20	PD 13	PD 13
PD 21	PD 21	PD 26
PD 13	PD 20	PD 17
PD 26	PD 17	PD 16
PD 17	PD 16	PD 20

Table 5.27 ALL Construct top PDs in all studies.

- PD 20, PD 13 and PD 17 in all three studies.
- PD 21 only in MSQ and ESQ-1; PD 26 only in MSQ and ESQ-2.
- PD 16 only in ESQ-1 and ESQ-2.

MSQ:	ESQ-1:	ESQ-2:
PD 20	PD 13	PD 26
PD 21	PD 25	PD 13
PD 26	PD 20	PD 14
PD 13	PD 21	PD 19
PD 14	PD 26	PD 20

Table 5.28 II Construct top PDs in all studies.

- PD 20, PD 26 and PD 13 in all three studies.
- PD 21 only in MSQ and ESQ-1; PD 14 only in MSQ and ESQ-2.
- PD 25 only in ESQ-1; PD 19 only in ESQ-2.

MSQ:	ESQ-1:	ESQ-2:
PD 13	PD 13	PD 13
PD 14	~~none~~	PD 14
~~none~~	PD 16	PD 16
PD 17	PD 17	PD 17
~~none~~	~~none~~	PD 19
PD 20	PD 20	PD 20
PD 21	PD 21	~~none~~
~~none~~	PD 25	PD 25
PD 26	PD 26	PD 26

Table 5.29 Composite PDs in all studies.

- PD 13, PD 17, PD 20 and PD 26 in all studies.
- PD 21 only in MSQ and ESQ-1; PD 14 only in MSQ and ESQ-2.
- PD 16 and PD 25 only in ESQ-1 and ESQ-2; PD 19 only in ESQ-2.

The only top PDs of IKEA construct from all three of the questionnaires that are also Composite PDs were PD 19 (only in ESQ-2) and PD 25 (in both ESQ-1 and ESQ-2). Since there was more resulting in the ESQ-2, this indicates that the UK participants like and recognize the PDs as IKEA style more than the Kuwait participants (MSQ and ESQ-1).

The following (Figure 5.38) illustrates the Composite PDs highlighting those in all three studies:

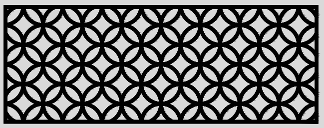
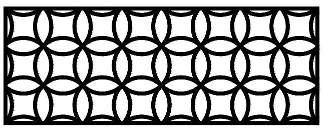
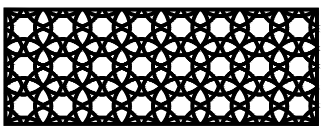
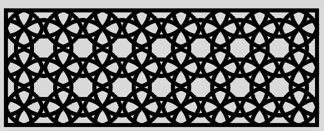
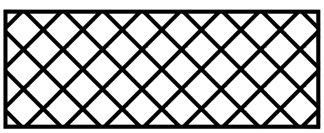
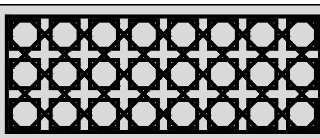
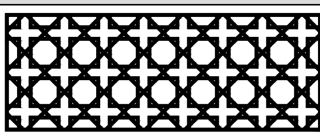
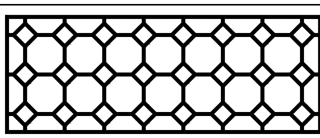
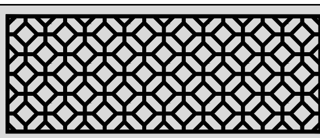
Composite PDs		**MSQ:**	**ESQ-1:**	**ESQ-2:**
PD 13.		✓	✓	✓
PD 14.		✓	✗	✓
PD 16.		✗	✓	✓
PD 17.		✓	✓	✓
PD 19.		✗	✗	✓
PD 20.		✓	✓	✓
PD 21.		✓	✓	✗
PD 25.		✗	✓	✓
PD 26.		✓	✓	✓

Figure 5.38 Composite PDs from all three studies.

Among the Composite PDs of the three studies, some resulting PDs were of the same design yet of a different framing variation (50% shift): PD 16 and PD 17, as well as PD 20 and PD 21. However, of all the Composite PDs resulting from each of the study questionnaires, only four resulted in all three of the studies; PD 13, PD 17, PD 20 and PD 26.

The following section analyses the grammars of each of the top Composite PDs that define the *ideal* IKEA-IG PDs and Shape Grammars of the integrated style.

5.7.6 Shape Grammar Analysis of the Ideal IKEA-IG PDs

Composite PDs resulting in all three of the questionnaire studies (MSQ, ESQ-1 and ESQ-2), also called ‘Top Composite PDs’, are the *ideal* IKEA-IG PDs of the cultural-contemporary style integration. Figure 5.39 demonstrates the Top Composite PDs along with their shape grammars (IS, SR and SRA) that define the design language and DNA of the *ideal* IKEA-IG style:

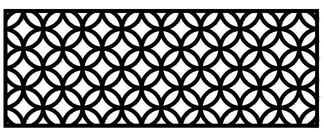
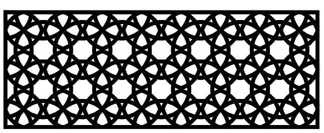
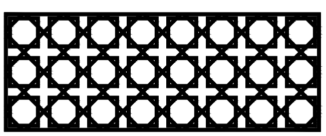
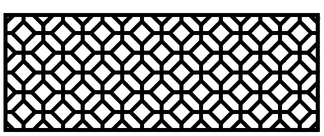
Top Composite PDs		Shape Grammars
PD 13.		IS: Circle and Arched-Diamond. SR: set #3 (Gh/Mh, Gv, GdO.50). SRA: 18 SRAs create the same PD outcome. Framing style: 3A and 3B (identical outcome).
PD 17.		IS: Arched-Square. SR: set #2 (RO.45, Gh/Mh, Gv). SRA: 5 SRAs create the same PD outcome. Framing style: 2B.
PD 20.		IS: Diamond. SR: set #2 (RO.45, Gh/Mh, Gv). SRA: 5 SRAs create the same PD outcome. Framing style: 2A.
PD 26.		IS: Octagon. SR: set #3 (Gh/Mh, Gv, GdO.50). SRA: 18 SRAs create the same PD outcome. Framing style: 3A and 3B (identical outcome).

Figure 5.39 Top Composite PDs and Shape Grammars.

- PD 13 and PD 17 are of curved lines, while PD 20 and 26 are of straight lines.
- PD 13 and PD 26 are similar pattern outcomes, yet PD 13 was constructed using IS ‘circle’, while PD 26 was constructed using IS ‘octagon’.
- All four of the PD structural grammars held SR overlap which led the PD outcomes to reflect a more intricate nature of pattern; in line with both the IG and IKEA style.

Even though PD 13, 17, 20 and 26 may not be of the IKEA construct top PDs, yet they are the balanced synthesized integration of both the IKEA and IG design styles, and are the most ‘liked’ PDs amongst the constructs in all three studies; hence the *ideal* IKEA-IG PDs. Each of the PDs carry a code of initial shape (IS), shape-rules (SR) and their applications (SRA), and, in their investigation lies the *ideal* IKEA-IG shape grammar. These *ideal* IKEA-IG PDs are also further documented as physical prototype artifacts in Appendix EE, p.496, and in Appendix FF, p.498.

In order to compile the shape grammar DNA coding of the IKEA-IG style design language, several investigative design research processes were implemented. The DNA coding of shape rules (the tools) and their sequential applications (the formula) were categorized into three sets of configurations as presented in Table 5.4 (section 5.3.3). Illustrative examples of the PD formations following shape grammar processes of IS, SR and SRAs (the structured formula) were depicted in Figure 5.20 (section 5.3.3). The framing of the PDs (Figure 5.21, also of section 5.3.3) presented two framing variations for each of the IS PD outcomes under the three sets of SRs and their applications. As an example, PD 26 would be coded as Octagon 3A/B; Octagon representing the IS, 3 is the SR set number, and A/B refers to the framing style which in this case both A and B apply as they construct identical PD framing outcomes (Figure 5.21). Additionally, the SRAs for SR set #3 were a total of 18 formation processes all resulting with the identical PD outcome (Table 5.4; see Appendix P, p.388 - Figure P1). Also, in Figure 5.20(a) as an example, was the SRA of SR set #1 to IS Octagon. This demonstrated that by applying a different set of SRs to IS results in a different PD outcome. Moreover, framing variations (Figure 5.21) also result in different outcomes of the same PD.

From the Sequential Rule DNA Coding (Table 5.4), PD 13 and PD 26 are of the same SR set #3, while PD 17 and PD 20 are of SR set #2. As for framing the PD variations (Figure 5.21), PD 13 and PD 26 are of both framing styles A and B resulting in identical outcome, while PD 17 is of framing style B, and PD 20 is of A. It was also found that of the four top Composite PDs in all three studies, only PD 13 can result in identical outcomes from two IS (Circle and Arched-Diamond). Furthermore, from the shape-rule matrix (Figure 3.12), PD 13 and PD 26 fall under Level 3 rule application category, while PD 17 and PD 20 fall under Level 4 rule application category. Furthermore, from the factor analysis grouping of components (Table 5.14), the categorization of PD 13 and PD 17 fall under family ‘Group B’ while PD 20 and PD 26 fall under ‘Group C’.

5.7.7 Demographics and the IKEA-IG PDs

This section investigates demographics data in relation to the *ideal* IKEA-IG PDs. The top PDs of all constructs, from all three studies, were further analysed for demographics associated with the resulting top PDs. Demographic data was investigated in connection to each of PD 13, 17, 20 and 26. The full investigative analysis from the MSQ and ESQs is presented in Appendix Z, p.444. Overall analysis of top PDs in relation to demographics from the MSQ revealed that the majority of participants that preferred and identified the PDs as of IKEA and IG styles were female (except for PD 20), of age group 50 +, from Ahmadi province, are non-Arabian and non-Muslim. Demographics also read education level for PD 13 and 17 as diploma, PD 20 as high-school, and PD 26 as higher-education; for demographic occupation, PD13 shows 'retired', PD 17 and 26 'other', and PD 20 'student'; and for demographic organization, PD 13, 17 and 26 'other', while PD 20 was 'non-applicable'.

As for the ESQs, when comparing the population groups (Kuwait vs UK) towards each of the top IKEA-IG PDs of all constructs, it was found that for all four PDs (PD 13, 17, 20 and 26) more of the Kuwait group participants preferred and identified the PDs as IKEA and IG styles than the UK group. Kuwait group (ESQ-1) demographics revealed that almost half of the participants were of age group 30 to 39, the majority were Arabian, Muslim, holding a bachelor's degree, and employed in a private sector. Whereas the UK group (ESQ-2) demographics revealed that the majority of the participants were females, also of age group 30 to 39, non-Arabian, non-Muslim, and employed in a private sector.

5.8 Summary

Following the philosophy and methodologies of this design research investigation and analysis, study results and outcomes provide a contribution to new knowledge. In examining that the study questionnaire was reliable and valid through a PSQ, conducting a MSQ along with two investigative ESQs to certify the resulting outcomes, as well as compare results of different cultural backgrounds, revealed a more thorough outcome for this study investigation.

The investigative process included data analysis, refinements to study questionnaire and layout, in addition to design adjustments. Although some of the PSQ PDs were illustrated differently than those of the MSQ by some having filled-in shading or colour instead of pure line drawings, the resulting outcomes were not affected. Both pilot and main study outcomes were of the same top

PDs. Similarly, although the ESQs measured physical depictions (with line-weight adjustments) of the PD illustrations tested in the MSQ, yet that still did not affect the resulting outcomes of the top IKEA-IG PDs. Adjustments to PD illustration, refinements to scale and framing measurements also did not affect the resulting top PD outcomes. Moreover, when comparing results of participants from two different geographical locations and backgrounds, results also have proven that the top PD outcomes were still the same between the two group participants in identifying style and style preference.

The IKEA-IG PDs were evaluated within each of the IKEA, IG and LIKE constructs for style identification, preference, and inclusion to the IKEA furniture line in order to assess the cultural-contemporary style's integration and acceptance within contemporary design. The results identified then compared the top PDs of all three studies within the constructs; results revealed coinciding outcomes from all three studies. The top PDs were also further examined to determine the 'golden formula' of the found IKEA-IG style. Composed of shapes, shape-rules and shape-rule applications, shape grammar interpretations were addressed in defining the *ideal* IKEA-IG design language and style.

Further analysis and investigations also revealed demographic data in relation to the top PD outcomes where the majority of participants that led to the top PD outcomes were female and of the age of 50 and over. Interestingly, although they also are mainly non-Arabian, the resulting outcome when comparing the Kuwait group to that of the UK group reveal that most top PD outcomes were selected by the Kuwait group. This could be because although the majority were non-Arabian, yet they live in the Middle East and are therefore more familiar to both the cultural art of IG and the contemporary style of IKEA and would like to see more of this integrated cultural-contemporary style. As non-Arabians that are living or visiting the Middle East, not experiencing the cultural arts of the region would be an incentive for them wanting to see more of the cultural art style to experience a greater sense of place and time having cultural identity realized; therefore, the IKEA-IG inclusion. In this case, the non-Arabian participants living in Kuwait can be viewed as the middle ground of the Kuwait and UK group participants; hence are the '*ideal*' combination of cultural and non-cultural perspective to a style that holds both cultural and contemporary identities (in terms of geographical location). The following chapter will draw more on the conclusions and provide recommendations for further research.

Chapter 6: Conclusions and Recommendations for Further Research

6.1 Introduction

This study is an effort to revive the cultural arts of IG within contemporary style, and therefore the revival of a cultural art identity. Both the cultural art of IG and the contemporary style of IKEA were investigated, and the essence of their language of design realized. The two design styles were analysed using a semiotic design research methodology in order to develop a shape grammar that encompasses both the contemporary design style of IKEA as well as the cultural and traditional art of the IG. The style synthesis was then measured for style identification, preference to integration, and acceptance within current design in order to achieve the main purpose of this design investigation and research study – the revival of the cultural arts of the IG.

Having presented literature on the IKEA and IG style, cultural identity, design semiotics and shape grammars amongst other relevant topics towards this research (Ch. 2), a semiotic design methodology took place identifying and defining style, shape grammar, and style integration processes; for an integrated design language to arise (Ch. 3). The semiotic design methodology used shape grammar applications as a design tool for incorporating the cultural arts of IG in the contemporary design style of IKEA. A shape grammar of both styles was derived and analysed (deconstruction – semiotic analysis). As the design framework identified key elements in the design language of the styles, shape grammar was also then used to reconstruct the derived core elements of both styles (reconstruction – semiotic synthesis) to formulate a method for 'contemporary-cultural' pattern designs (PDs) that align with the IKEA and IG design language (IKEA-IG style).

Using mixed research methodologies (Ch.4), the established design correlation of the synthesized and identified IG and IKEA aesthetic DNA was tested and investigated. The style was measured for its identity, that of visual recognition to the IKEA and IG style within the integrated IKEA-IG design language; and, for IKEA-IG style preference. An initial PSQ was conducted in the Middle East where participants are native to the cultural art of IG and familiar to the design style of IKEA. The questionnaire was found reliable and valid as it also provided identifying necessary adjustments to the questionnaire's layout in addition to assessments to the integrated form of the IKEA-IG style. From there, a MSQ took place where the results were analysed using correlation, descriptive statistics, stratified sampling and design investigations with shape grammars for further refinements to identifying the *ideal* IKEA-IG style grammar. The MSQ was followed with two evaluative studies (ESQ), one took place in the Middle East (ESQ-1) and one in the UK (ESQ-2). Not only were the two final questionnaires conducted to affirm the main study results, but also to investigate whether different cultural background populations of different global locations (Kuwait compared to UK participants) had dissimilar resulting study outcomes.

Study results and analysis (Ch. 5) provided the top PD outcomes from each of the questionnaires revealing the *ideal, real* and *reflective* IKEA-IG style. As the integration of the IKEA and the IG styles was investigated and top PD outcomes holding both design languages defined, their shape grammars were identified capturing the core elements of the combined style synthesis from which both style DNAs maintain their style identity. Acceptability of incorporating the cultural-contemporary style within contemporary design was also attained, and whether differences in cultural background has an effect towards style preference and acceptability was realized. Demographic data was also investigated in relation to the top IKEA-IG PD findings to evaluate if a certain demographic was instrumental to the determinant results and outcomes.

Following the research methodology and data analysis, results were compared, and findings evaluated to derive investigative outcomes from which the research conclusions were drawn.

6.2 Design and Research Methodologies

The main purpose of the research is to revive the identity of the Middle Eastern art culture back into the fabric of its evolving society. As cultural arts are essential in a culture's identity, this study aims to revive cultural arts within contemporary interior design. Kuwait's identity has transformed from a cultural to a global identity as current design in this region has become westernized due to design preference or trend, and the market. To revive its cultural identity, the cultural art must be evolved and introduced into contemporary design in order for both styles to integrate and co-exist.

In efforts to integrate and evolve the styles, a semiotic design methodology was used to identify core elements of style, with shape grammar as a design tool to develop their integration. The PD outcomes of the style synthesis were then measured using a mixed methods research approach to investigate if the integrated IKEA-IG PDs maintained their core identity of both the cultural art of the IG and the contemporary style of IKEA, as well as preference towards the developed style.

6.2.1 Semiotic Analysis

For both cultural and contemporary styles to synthesize, both design styles are investigated. This study approaches design language as a construct around elemental similarities and oppositions which must be identified in order to extract and define an integrated style identity. This is because identity is embedded inside a system of distinct features within its design language. When identified, the elemental features - or style DNA - of each of the two design languages are analysed and criticized in all its manifestations, showing the way these logical and axiological oppositions are at work in all discourse for it to be able to produce meaning and values (semiotics). Being that semiotics is the main part of this study, all other aspects of this research, whether peripheral or circumstantial (though relevant) are drawn into a semiotic golden thread. Therefore, the revival of an art or design identity, are imported styles – which could be applied to any style, such as Cubism and Mercedes; yet, in this research, the aim of cultural art revival is specific to the IG.

Working across boundaries of cultural and contemporary art identity, this research facilitated collaborations and modifications of two different design styles and backgrounds in response to the fast-moving changes in the global market. The synthesis of the two different languages of style delivered a visual identity that reflects its unique nature and aesthetic. The found integrated style was also translated from illustrations to artifact prototype offering the new collaborative identity of contemporary-cultural design, a practical (and powerful) method of measuring the style and assessment. While the design methodology of this research focused on finding the semiotic meaning, the research philosophy focused on finding the *Significance* and shape grammar. The grammar provides the method of construction and holds the geometric data (parametrics) of detailed algorithmic coding of the IKEA-IG PDs.

6.2.2 Shape Grammar Analysis

Shape grammar (SG) provided the data in the construction that cannot be seen, to understand the construction of what can be seen. Semiotics in design uses SG as a practical method to categorise and formulate the shape styles. SGs (with respect to their application) are very important because they are the descriptive way in which the PDs are created; they hold the unseen geometric data, the detailing of its DNA (Figure 6.1).

The parametrics involved (after semiotic deconstruction) in both the IKEA and IG SGs reveal that there are geometric shapes and rules of geometry coded within each design style. SGs semiotically categorized and formulated the evolved style. The established set of IKEA-IG SGs are the synthesized set of grammars from the IKEA and IG semiotic deconstruction of styles.

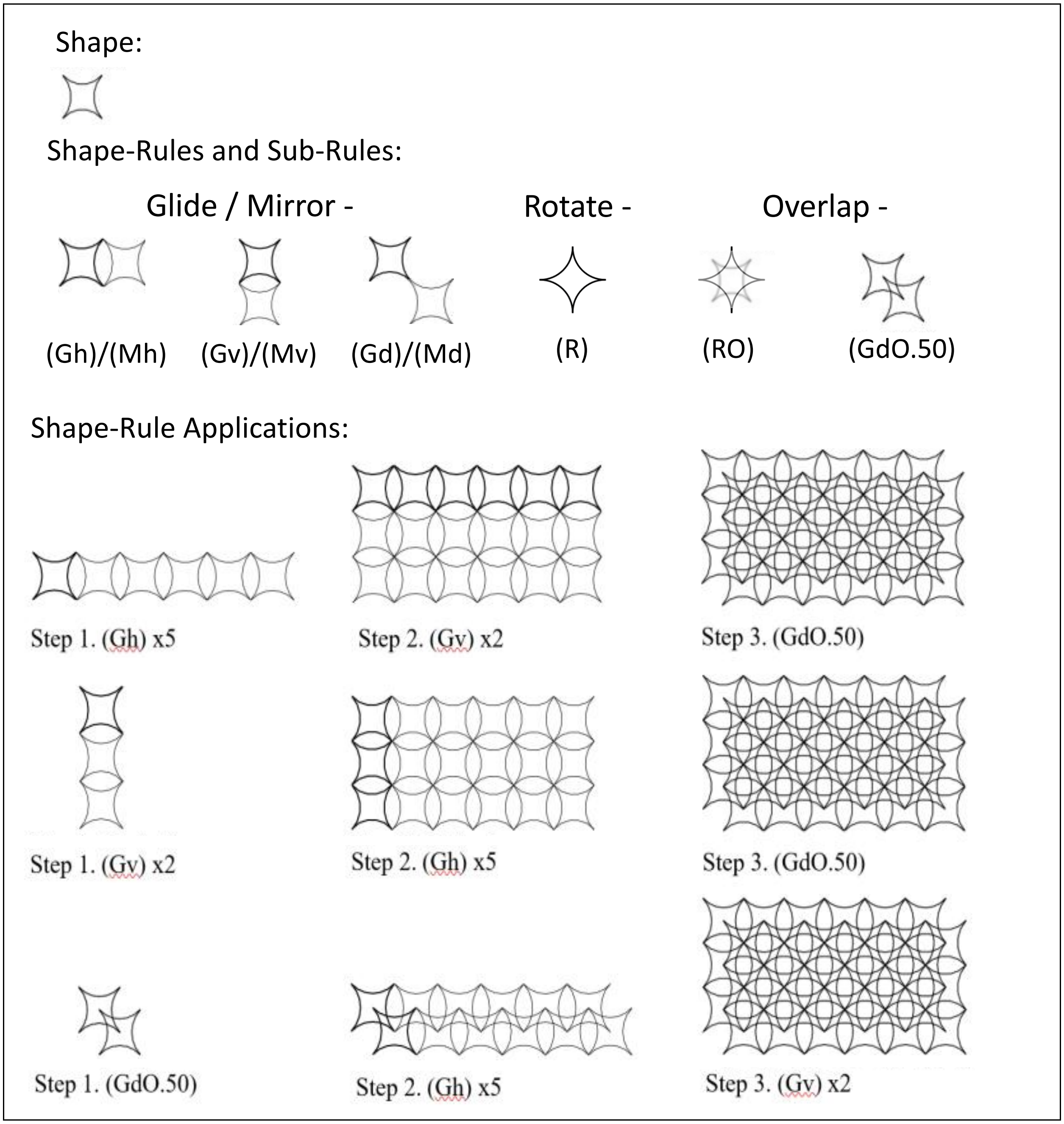


Figure 6.1 Shape Grammar Calculated Transformations.

In addition to the SRAs involved in the generation of PDs as illustrated in Figure 6.1, the design investigation also covered framing the PD as well as scale specifications. It was found from the study results that there was a total of three sets of shape rule combinations from which an organized sequence of applications drove the pattern design reconstruction and creation process. Based on the shape grammars and the understanding of its synthesis, the number of generative PD outcome was justifiably vast and complex yet organized. Using the Auto-CAD program, the IKEA-IG shape grammar combination sets were generated to ensure practical methods of design illustration and production, and to ensure precision of the geometries that build its structures. The findings identified and defined the DNA coding of the IKEA-IG PDs – that which is specific to the IKEA LACK table – as presented in Table 5.4; the IKEA-IG shape grammar PD formation as he demonstrated in Figure 5.20; and the framed IKEA-IG PD outcomes in Figure 5.21 (section 5.3.3).

Identifying and synthesizing the IKEA and IG style DNA produced a range of concepts for testing; and with translating the IKEA-IG illustrations into artifact prototype (Figure 6.2), under IKEA's production processes, a functional integration is provided to the practical outcome (Figure 6.3, also see Appendix FF, p.498). The integration was adapted prior to field testing with participants in order to resolve, refine and subsequently reduce the PD possibilities investigated; in order to reach the aim of this research study in satisfying the objectives. Collected and derived data along with statistical analysis (Ch. 4 and Ch. 5) and further probing, set the basis for the intellectual content to further this study. The parametric analysis of these shape grammars (shapes, rules and special relations) against the participants' responses holds the key to the evolved integrated style.

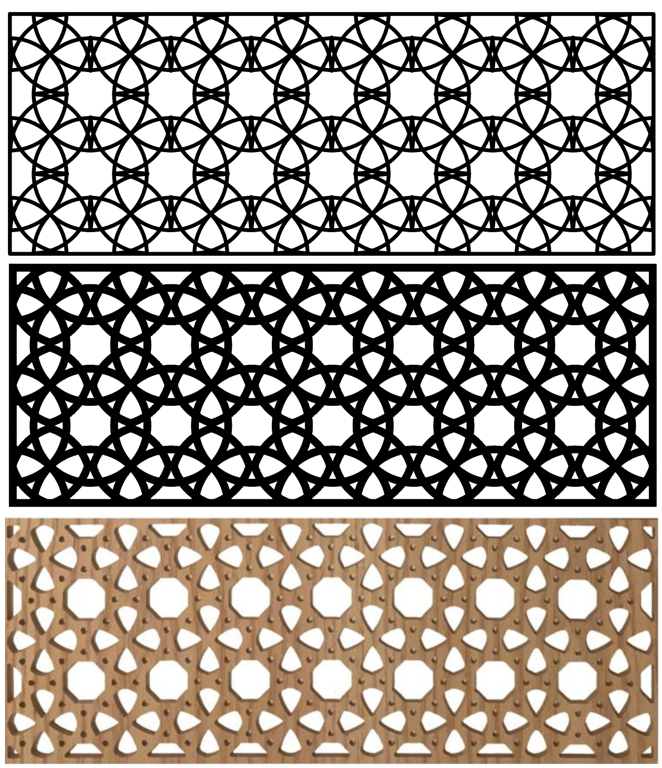


Figure 6.2 Translating the IKEA-IG Illustrations into Prototypes.

Figure 6.3 Installed IKEA-IG prototype attachement.

6.2.3 Research Methodology

This research used positivism and interpretivism philosophies for its methodology. Within these philosophies, the researcher used mixed methods to address the research questions. Being that semiotics is a qualitative subject matter, and that the data collection and analysis for this study carried-out a quantitative investigation meant that this study involved a mixed research methodology. The synthesized, evolved, and integrated IKEA-IG style was tested for style recognition, identification, and preference (three constructs). The cultural-contemporary style was further investigated within the participant demographic data using stratified sampling, as well as cultural comparison investigations between two study groups. The questionnaires also investigated whether the IKEA-IG style is preferred as an addition to be included as part of the IKEA design line. This in efforts to test the research study hypothesis and contribute to knowledge.

An initial pilot study, followed by a MSQ, took place in Kuwait where both styles – that of cultural and contemporary – are familiar to the region's population and therefore a relative setting for investigating the styles. Two ESQs were also conducted following the main study where one also took place in Kuwait, and the other in the UK – as the control group – to investigate if different regional backgrounds of population tested resulted in different outcomes. For the design methodology, maintaining the core aesthetic identity of both the IKEA and the IG styles in the evolving design language synthesis is key; whereas for the research methodology, investigating the degree to which style identity was recognized and preferred is key.

6.3 Research Findings

Prior to the main sample test, the researcher conducted a pilot study to ensure the reliability and validity of the measuring instrument and data. The pilot test data analysis proved to be reliable and valid; hence the researcher was ready for the main sample size. Two ESQs were also conducted after the MSQ to reassure the main study results as well as to investigate if different demographics led to different result outcomes. The following sections highlight all the questionnaire study results and analysis. The findings also compare results and draw conclusive analysis from data findings.

6.3.1 Pilot Study Findings

With reliability and validity confirmed, the findings also indicated that the participants were neutral about whether the IKEA-IG PDs were of the IG style and not very agreeable that the presented PDs were of IKEA's style. The findings also indicated that participants were neutral towards their preference of the PDs; yet, indecisive when asked whether they would like the presented PDs incorporated into the IKEA design line in order to revive and maintain the IG cultural art identity within contemporary context.

Drawing upon the pilot test analysis of style evaluation in recognition and preference, necessary adjustments to the IKEA-IG design language were applied to establish the operative shape grammar and PDs to be tested in the main study of this research. Adjustments to the questionnaire layout also took place for optimum investigation in aims of testing the study hypothesis.

6.3.2 Main Study Findings

The main study questionnaire results reveal the top PDs within the three IKEA, IG and LIKE constructs individually and as a group. In the IKEA construct, top resulting PDs are of simple geometries in line with IKEA's style; in the IG construct, top PDs are of intricate geometries in line with the IG style; and in the LIKE construct, the majority are of intricate geometries. Also, none of the top PDs of all three constructs (PD 20, 21, 26, 17, and 13) were of the top resulting

IKEA construct; this in addition to the top PDs of LIKE construct indicate that the participants prefer the IG style more than the simple geometries of IKEA probably because they are of that cultural art and identity. Also, in the investigation of demographics in relation to the top PD outcomes, a significant relation was found in demographic ‘Province’ within the top 5 PDs in the IKEA construct; as well as ‘Gender’ and ‘Province’ within the top 5 in the IG construct.

As the results identified the top PDs from the constructs, 12 PDs were found and implemented into prototype artifact productions for a more *real* and *reflective* representation means of measuring the style in an evaluative study questionnaire. Further testing was conducted to evaluate and validate the MSQ findings of identifying the *ideal* IKEA-IG style.

6.3.3 Evaluative Study Findings

With the top IKEA-IG style PDs of the MSQ implemented into furniture item prototype, the cultural-contemporary table-panels were evaluated for style identity and preference within current design. Two ESQs were conducted, one in the Middle East, Kuwait (ESQ-1) and one in the UK (ESQ-2). Top resulting PDs of both ESQs from all three combined constructs revealed identical outcomes (PD 13, 16, 17 and 20) with the exception of PD 21 also resulting top in the ESQ-1, and PD 26 top in the ESQ-2. The results also indicated that both groups prefer IKEA style furniture almost equally; and that the KWT group (ESQ-1) prefers to see more of the IKEA-IG style compared to the UK group (ESQ-2). Moreover, although both groups like the IKEA-IG style table-panels almost equally, the UK group prefers no additional design to the original IKEA LACK table compared to the KWT group.

Furthermore, it was also found that in both ESQs the independent variables ‘Religion’ has a significant effect on preference to see more of the IKEA-IG style, whereas ‘Group’ has a significant effect on preference of having no additional design to the original IKEA LACK table. The results reveal that the Islamic participants prefer to see more of the IKEA-IG style, while the UK group prefers to have no additional design to the IKEA LACK table.

6.3.4 Research Study Conclusions

Drawing upon conclusions from each of the studies (MSQ, ESQ-1 and ESQ-2), the research hypothesis was tested and accepted. The questionnaire results found that the PDs were of the cultural art of IG, the contemporary design style of IKEA, and liked. Although amongst the questionnaires the ESQ-2 participants did not prefer to have the IKEA-IG designs as an addition to IKEA, the results of the MSQ and ESQ-1 participants did prefer to the inclusion of the IKEA-IG style. This concludes that although the integrated cultural-contemporary style of IKEA-IG was liked by all participants (Kuwait and UK), the style was more preferred as an inclusion within its own cultural background; this is due to cultural relativity of style effecting or creating its acceptance as results have shown that both group participants were familiar to the IG style.

Arguably, by comparing the ESQ results of the IG construct, outcomes revealed that both groups identified the same top PDs as being of the IG style with very slight variations in ranking order. Being that the feedback responses of both groups recognizing the same PD outcomes as that of the IG style implies that they were both familiar to the style, or at the least recognize it as such; further confirming the UK group participants familiarity to IG style results. Due to the significant similarity in results comparing the two group ratings of identifying the PDs as of the IG style, the outcomes suggest that both group participants were familiar with the style being measured.

Nonetheless, despite the level of cultural familiarity to style, this comparison still serves the purpose of this study because the UK group acts as a control group sample providing comparative insight towards this study's culturally integrated styles. Analysing the results led to finding that it was not the level of familiarity (or recognition) towards style that showed significance in the cultural comparison outcome of this study, rather it was cultural relativity to style. The degree of connectivity, understanding and identifying to and with the style being measured had proven to influence acceptance and desirability of the participants and their experience or engagement to style. Being of the same cultural background and identity, the KWT group participants had an innate cultural relativity to the style compared to the UK participants creating a more relatable experience towards the style. As cultural arts are part of a cultures' identity, a semiotic connection of an intrinsic nature is conveyed through the arts communicating meaning (that is of the observer's interpretation) that directly is connected to cultural identity – semiotic relativity.

6.4 Limitations of Study

The research limitations of this study fall under three general categories: research methodology, data collection, and design methodology. These limitations are addressed in the following sections.

6.4.1 Research Methodology Limitations

For the research methodology limitation, although this research study carried a mixed method, yet the data collection did not involve an interview technique (which is mainly used in qualitative methodology) to provide further in-depth investigations and analysis from the participant responses towards the integrated IKEA-IG style. In the ESQ, some participants approached the researcher and shared their views on the designs expressing how the style culturally relates to them, some asked where they can find this item product (thinking it is an existing IKEA product) which shows that they like the item, as well as the item being viewed as part of the IKEA design language (meaning that the style integration was successful). Therefore, also as a recommendation, this study can potentially move into a more qualitative research focus base to obtain a more thorough understanding of what participants see, think or experience through their response provided open ended questions towards the subject matter of the study as a suggestion; or can expand upon the mixed methods presented.

6.4.2 Data Collection Limitations

For the data collection limitation, consideration towards 'global' participant demographic arises. Although it is the participants of surveys conducted in the Middle East that highly want the inclusion of the cultural-contemporary style into the fabric of contemporary society, yet it has been noted that a higher percentage of participants that did want the cultural-contemporary style inclusion were of non-Arabian heritage yet living in the Middle East. The Arabian participants do want the inclusion, yet, more specifically, the non-Arabian participants living in Kuwait were the most that want the IKEA-IG style as part of the IKEA furniture line; therefore, wanting to see more of the cultural arts within its context and origin of source. Hence, the preservation of cultural arts is an important factor of a culture's identity to other cultural backgrounds as well as to its own.

Since more non-Arabians living in the Middle East want to see cultural arts within its country or region of origin than the natives, it can be concluded that to non-natives living or visiting abroad, experiencing the artistic heritage of the culture they reside in provides more connectivity to place, creating a deeper level of experiencing and understanding its cultural identity. Locals on the other hand are of the culture and its identity.

Along this path of interpretive analysis, it would also be a different level outcome towards measuring the preference of natives to the arts that live abroad towards the cultural integration with and within contemporary design compared to the natives that live local to the cultural art style. Having that 30% of the participants of this study's MSQ, and 9% of the ESQ-1 (Kuwait), were non-Arabian, there was 0% of the participants of the ESQ-2 (UK) that were of an Arabian ethnicity. This created a limitation to a justifiable relation for the comparison. A person abroad would have a different intake towards their cultural arts being experienced outside of the region from which it was established. The sense of connectivity and relativity to identity would not equate to one who is local to their native origin.

Also, when it comes to limitations to global expansions of cultural design, having that today's society is a multi-cultural society where people of different backgrounds and cultures reside in different parts of the world, cultural sensitivity and inclusivity is of high relevance and importance towards ethnic identity. This is why IKEA's search is for cultural integration as its customers are global citizens. Providing them with cultural identity through the arts delivers cultural relativity and a powerful sense of connection, affinity and belonging to home away from home.

6.4.3 Design Methodology Limitations

The design methodology limitations include the extent to which this design study investigation met the IG style, IKEA style, and their morphed integration based on semiotics and shape grammar procedures. This design research study focused on style in terms of geometry, shape, design language, shape grammar, pattern, pattern formation, style integration and the evolving style. Other aspects of design style identity and brand DNA could be explored and investigated as well – such as colour, texture and material – which can also be considered as a recommendation for further study progression.

Limitations are also found within the design study under shape grammar, generative design processes, pattern scale, as well as framing and production limitations. Shape grammar was the tool used for style investigation, extraction, and integration into an evolved cultural-contemporary language of design. Shape-rules were based on rules of symmetry and symmetrical proportions as symmetry was found in both the design language of IG and IKEA; and was embedded throughout the integrated IKEA-IG design language. As the researcher attempted to explore the styles using shape grammar, the process looked at initial shape, symmetry within the initial shape, shape-rules, and how shape-rules can be applied to initial shape for the development of pattern formations. This investigative process incorporated using AutoCAD as the generative design mechanism for accurate precision of shape grammar procedures and outcome. Under this computer-aided design (CAD) software, it was found that some initial shapes had to be eliminated (such as initial shape 'triangle' and 'arched-triangle') due to a non-symmetrical square-grid unit divisibility.

In the process of table-panel artifact prototype creation, limitations were also set to table-panel size, pattern scale, detailing and proportional divisibility within framing dimensional constraints. The prototype creation was based on IKEA's productions processes, standards, and design principles (affordable, lightweight, flat-packed, stackable, mass-produced, recyclable material, and designed to be self-installed by the customer); while framing the prototype was based on the IG principles and rules of symmetry (not bound within the frame, yet centered within it). Another limitation within the prototype design creation was pattern scale. Dimensional limitations apply to IKEA-IG pattern scale governed within symmetrical proportions and divisibility fitting for the table-panel frame size determined by the IKEA LACK table dimensions. The PD scale is limited by the table-panel frame size, and the table-panel frame size is limited to fit the IKEA LACK table, and the number of possible table-panel instillations is also limited to fit the LACK table dimensions (up to two instillations per table side).

In maintaining style, brand identity, or production specification, limitations can be useful. For instance, in shape-grammar, shape-rule applications can create an infinite repetitive PD formation, therefore a limitation is necessary to be applied such as in the number of applications set in the creation of the IKEA-IG table-panel prototypes. Considerations to production limitations were concerned with design detail and intensity, practicality, as well as feasibility of implementation and production. Pattern scale and framing limitations were also addressed under the prototype design development production processes and procedures. Pattern scale specification must be determined for physical implementation and production feasibility (using a laser-cutter tool following IKEA's mass-production processes), without losing its pattern form. Therefore, in order to take the IKEA-IG illustration under prototype production processes, limitations to shape-rule parametrics such as pattern-scale, line-weight and PD detail were addressed.

Another vital determinant of PD limitation was its relevance to both the IKEA and IG design language and style. A framed PD must be centred, maintaining complete unit repetition and symmetrical divisibility - for it to be in-line with the Islamic geometries, while also maintaining the production processes of IKEA. The IKEA-IG PDs lend their meditative quality of infinite geometries to the cultural art of the IG, while carry a minimalist design criterion following IKEA's design language. To expand on this design study, limitations of other aspects of design can also be explored, such as limitation to a certain colour scheme or use of materiality. Depending how a design limitation arises, it can be a form of defining a style's structure. Limitations can be considered as providing a directional lead to expand on and contribute to knowledge.

6.5 Research Contributions

With the rise of modernization and current globalization, technological advancements and developments play a major role in the diminishing cultural identity within the arts. The evolution caused rapid transformations in Kuwait during the second half of the 20th century, which resulted in a loss to its cultural identity. The tension between globalization and localization processes, and the dichotomy between cultural identity dynamisms shaping current environment, was more evident and magnified in the Middle East than in other parts of the World. The coexistence of the globalization and localization processes are inseparable and are in a continuous state of change and interaction. Therefore, this research is essential as it satisfies the need for this region's cultural art revival in the understanding of globalization (IKEA) and localization (IG) with respect to the diversity of the two styles and their interactions (IKEA-IG) in order to evolve with and within the built environment.

As IKEA grew and expanded into the global market, it recognized the necessity of cultural identity considerations that imply other art style recognitions. In addition to its many attributes that lead to its worldwide expansion and success, such as affordable and flat-pack self-assembled furniture to name a few, its sensitivity towards other cultural integrations also aids in the expansion and success of its industry. Collaborations with other cultural arts, as attempted in this research, create grounds that benefit both IKEA's need for cultural integration as well as the revival and maintaining of cultural identity through the arts.

This research is a contribution to knowledge and is in efforts to revive and maintain cultural identity in the design field, therefore influencing the market and society. Incorporating cultural arts within contemporary design was also reinforced by IKEA's search for cultural integration (Mia Shanley, 2014). Therefore, cultural integration of the IG art and IKEA's style serves beneficial to both design investigations of this study's cultural and contemporary styles, as well as a contribution to knowledge. Providing the possibility of the two styles' integration, the findings of this thesis led to the identification of the *ideal* integration of the cultural arts of IG within the contemporary style of IKEA. A semiotic investigation of styles enabled their synthesis by identifying the common geometries and rules of symmetry that define and integrate both styles in synchrony. Using shape grammar applications offers designers a tool to explore and identify a language of design while semiotics provides a method for their engagement.

In an attempt to identify the *ideal* IKEA-IG style integration, this study developed *real* and *reflective* measures by implementing its design language into physical application processes. Although the IKEA-IG style is of both cultural and contemporary design, production measures and procedures follow contemporary grounds of design applications to enable its evolution and revival within the contemporary design world. The IKEA-IG table-panel prototype was designed to complement IKEA's furniture; therefore, based on IKEA's production processes and product design constraints. IKEA's LACK table was used as a case study in order to introduce the cultural-contemporary style artifact into IKEA's design language and contemporary style. The proposed table-panel prototype does not modify IKEA's existing furniture or style but is intended to add cultural print and significance in an attachment style artifact.

This integration contributes to knowledge as it demonstrates how a cultural art can be revived within contemporary design, as well as providing the developed design formula of the integrated cultural-contemporary design style of IKEA-IG. This also contributes to practice as the developed design language can be applied towards practical creations in the field of design as it provides designers countless opportunities of engaging the style, as well as to uncover fundamental mechanisms in design of exploring other cultural arts, or brands, and the collaboration of cultural art identities. The impact of the contribution could lead designers to revive and restore other cultural arts using practical and philosophical methodologies to implement style integration; and contributes to society by ultimately being able to obtain cultural identity within present day design.

The main objective of this study is not in creating a prototype artifact, but in finding the *ideal* IKEA-IG style integration in efforts to revive the cultural arts of IG into contemporary design, and therefore, into contemporary society. Figure 6.4 demonstrates an example of the developed culturally integrated style's influence and evolution into an interior design setting.

Figure 6.4 IKEA-IG style in a home interior setting.

Adopting the design language of the IG into IKEA's style supports the main purpose and drive of this research; reviving cultural arts identity in contemporary design while contributing to knowledge, creative design methods and practice; the design industry and society, by providing innovative design possibility to revive, maintain and evolve cultural art identity within contemporary interior design.

6.6 Recommendations

Reviving cultural arts enables the preservation of cultural identity within society. This research provides practical and philosophical methodologies in design for designers to explore other cultural art integrations within contemporary style. Its research findings can also be transferrable between other design disciplines such as industrial and product design, branding, and graphic design. As this research defines the IKEA-IG design language integration and demonstrates its style in a physical form as a table-panel prototype artifact, other interior design applications of the culturally infused contemporary style can be also explored, such as fabrics and textiles, as well as interior fixtures common to the culture such as room dividers and chest-boxes (traditionally used as closets). This unique integrated cultural-contemporary style, and its diversity within the IKEA-IG family range, can be an addition to IKEA product line. Obtaining cultural diversity serves IKEA's want for cultural integration; and reviving the cultural arts of IG within contemporary design serves the purpose of this thesis. Being that IKEA is a worldwide industry, the inclusion of other cultural arts not only serves as a vessel to revive and preserve cultural identity within contemporary design, but also serves as a vehicle to evolve and expand other cultural arts globally.

Identifying geometries and rules of symmetry were key to investigating the IKEA and IG style. Exploring commonalities and differences among the two styles enabled their synthesis. Determining geometric shapes and symmetry rules to generate and define the integrated style using shape grammar was a core aspect of establishing the IKEA-IG style and its identity, yet there are other elements that distinguish its style as well. Further investigation within each of the styles is also important to further identify more of the design elements they hold such as colour, texture, material, composition and pattern formation. As this research covered the shape grammar for the purpose of this study, further research can explore other elements within the IKEA and IG styles to identify other design aspects of the two styles engagement.

This study can be used towards other cultural art explorations to be embraced within contemporary design. More cultural art forms and identities should be considered by designers and practitioners for investigations and integrations where not only other cultural arts can be explored, but to also take form in different applications. For instance, the IKEA-IG style table-panels were designed as a prototype for this study, yet different types of applications of the style can be developed to further the artistic influence within interior design. Because IKEA-IG is a design language, its form can take onto other IKEA home-furniture product lines in general, such as shelving units, frames and partitions. Also, in having several PDs within the IKEA-IG style enables the development of a family group – similarly to IKEA's product lines – while having the flexibility to select different designs from within the style. The importance of such approach towards art revival or preservation is vital to cultural arts, and therefore, cultural identity.

From a global perspective, this process of translating traditional arts into contemporary context can also be adopted using this study's philosophy, design and research methodologies to revive other cultural styles into contemporary style interiors. IKEA's global success in furniture design includes commercial and scientific research to achieve the IG cultural art revival within today's market, and hence, our home interiors. This also allows for cultural integration that IKEA seeks, and for natives of a particular style its cultural revival or reservation; and for IKEA's world-wide customer's, cultural globalization of furniture products and artifacts to revive a rich traditional design language and cultural art identity. Thus, integrating cultural arts within contemporary style not only preserves the art, but it is also an integral part of maintaining and evolving its identity.

6.7 Summary and Concluding Remarks

In the Middle East, the shift towards modernization and technological advancements and developments created tensions between globalization and localization that led to a diminished cultural identity within the arts. Local traditional and cultural artwork had been overtaken by mass-produced and imported styles. Understanding the role in which cultural arts has in maintaining cultural identity within the fabric of society was the drive behind this research study. Cultural arts manifest a unique language of design that reflects an aesthetic cultural identity. In efforts to revive and a cultural art identity back into the evolving fabric of society, the cultural style must evolve within contemporary design while maintaining its core identity.

With IG as the cultural art style of this study, and IKEA as the contemporary vessel for style integration and revival, this research carried design and research methodologies to investigate and establish a balanced synthesis between the cultural and contemporary styles. IKEA was selected because not only is it a world-wide industry recognized as an iconic representation of contemporary interior design and style, but also because IKEA recognizes a gap in cultural diversity within its product designs; therefore, was used as a case study for the revival of the cultural art of IG. As IKEA expanded into the global market, its customers have become global citizens; hence, IKEA is now seeking to embrace globalization in design to incorporate cultural sensibility and diversity into its design language.

A semiotic 'Golden Thread' runs through this PhD providing the framework to direct design innovation and implementation. Methods of developing a cultural-contemporary style integration whilst maintaining both core identities was developed through semiotic deconstruction and reconstruction of style. Creating a design language sensitive to cultural diversity within the built environment entailed using shape grammar applications to identify, synthesize, and develop the cultural-contemporary style integration. The key to developing an archetype of an IKEA-IG style integration was firstly to measure both the IKEA and IG design languages by identifying each of the style's DNA and establishing common style features. Elements that capture the essence of both styles composed of specific geometric shapes and symmetry rules were identified and established to form the basis for the IKEA and IG synthesis. Using shape grammar explorations of extracting and synthesizing commonalities within the styles, identified a set of shapes, shape-rules, sub-rules, and shape-rule applications indicative of the styles' integration. Having created a link to a cultural-contemporary language of design, the established elements from the shape grammar investigations revealed consistent pattern design creations obtaining core features of both styles and their shape grammar framework. In order not to lose the cultural nor the contemporary style identities in their amalgamation, maintaining the artistic fundamentals and symmetrical principles of the IG, and IKEA's design philosophy and vision, was key.

The resulting synthesis of the established IKEA and IG style design languages generated an array of pattern design (PD) illustrations of their shape grammar integration. Holding a unique shape grammar of IKEA, IG, and their integration, the developed IKEA-IG style PDs were then measured using mixed methods survey questionnaires from which data was analysed, compared, evaluated and further investigated to refine and define the *ideal* IKEA-IG style integration. This ultimately is in effort to enable the revival of the cultural art of IG allowing it to evolve within the contemporary design realm. The surveys measured for style recognition to certify that the integrated style maintained the key elements that signify the origin or identity of the styles being integrated. The degree to which style was identified, liked, and accepted provided vital data for the progress of this study in achieving the research goal. Three study questionnaires were conducted (MSQ and two ESQs) following a pilot study to check the surveys' reliability and validity, from which the IKEA-IG style was measured. Starting with a MSQ, the PD illustrations were ranked within each of this study's constructs to identify each of the IG and IKEA style core elements that possess the most dominant and prominent grammars of their design language. The survey also measured the preference and acceptability towards the IKEA-IG style. Two ESQs were conducted following the MSQ, one in the Middle East and one in the UK, adding a layer of cultural comparison to this study's investigation.

In the ESQs, the IKEA-IG PDs were measured as product prototypes instead of illustrations for a more real and reflective study outcome to the style integration with and within current design. The

ESQs were also carried inside IKEA stores for a more practical investigative outcome at both geographical locations (Kuwait and UK) where the IKEA-IG style prototypes were displayed. The IKEA-IG style prototype took on a table-panel artifact form (under the IKEA production processes) and was presented using the IKEA LACK table as a case study for its installation. In order for the cultural-contemporary style to evolve (not impose) within contemporary design, the product prototype table-panel artifact is not to change the existing IKEA product, but instead was designed to complement the existing product; a table-panel attachment adding cultural identity to its already existing product line. The IKEA-IG table-panels were presented to IKEA's customers from which more data collection and analysis took place. Preference of the integrated style was measured to evaluate the cultural-contemporary design language likability as a style, while preference of the style integration within contemporary design was measured to assess its acceptability within the design market; this in efforts to evaluate the integrated IKEA-IG style workability in reviving and evolving the IG cultural art identity into contemporary design.

All three study results were analysed and compared, revealing the *Ideal, Real,* and *Reflective* IKEA-IG style PDs from which their shape grammar structures were re-investigate to attain the styles' core DNA elements that brand its identity. The resulting outcomes were applied to the developed IKEA-IG grammars refining the IKEA and IG style synthesis, therefore integration. The result outcomes established the IKEA-IG design language holding the cultural-contemporary style identity. The found IKEA-IG outcomes of style identification and preference revealed the styles' shape grammar; one that holds both style DNAs, their synthesis, and range of concepts.

The data collection was an integral part of this research study as it provided very thorough investigative material for analysing the integrated style to support the aim and main purpose of this study. This research proved successful in integrating the cultural art within contemporary design while maintaining its core identity as it evolves with current design. Because the IKEA-IG PDs were presented inside IKEA, to IKEA customers, in the ESQs for style evaluation and feedback, a valuable marketing insight was provided from both the customers and IKEA. This investigative technique carried a co-design approach where the customers' affinity and desire to engage with brand was channelled. The well-established approach is a constrictive avenue to creative practice that was developed in the 1970 in Scandinavia. "A key tenet of co-design is that users, as 'experts' of their own experience, become central to the design process" (Design Council, 2016). The acquired brand and marketing value captured a very strong aspect of this whole study even though it came about indirectly; being that this research study involved the global interior design industry, IKEA, commercializes this research – giving it a commercial aspect – and a powerful one at that. This finding proves vital for commercialization and supporting IKEA's search for cultural integration, as well as providing a practical way of incorporating the integrated cultural-contemporary design style into society, via the design market.

IKEA's involvement in this research study exceeded their provision and support for conducting the study questionnaire inside of their stores and the involvement of their customers, but also extend their interest towards study results and a follow-up with research outcomes. IKEA Kuwait conveyed adopting the integrated style locally and eventually expanding within the Middle Eastern region and beyond, delivering this rich cultural art globally. The researcher aims to share and propose the design study results, outcomes and conclusions to the IKEA stores, particularly Kuwait as it is key to the IG art revival within its cultural origin. IKEA's engagement serves both the intended purpose of this study's take on cultural revival and IKEA's search for cultural integration.

As a global interior design marketing empire, IKEA is the ideal vessel to carry-out this design study into actual workable commercialized strategies that ultimately supports the revival of the cultural art of IG (Figure 6.5). Provided a design marketing collaboration, this design study research investigation can satisfy both, cultural preservation (or revival) and cultural integration for IKEA's global customers. Having achieved integrating a cultural art into the contemporary language of design, the key to successfully deliver the findings into practical application methods for reviving and evolving the cultural art, is the commercial aspect – commercialization.

This design research study provided a contemporary form to a cultural art, and a cultural form to a contemporary style; reviving the IG into contemporary style of IKEA in an integrated cultural-contemporary art identity. This was in effort to revive a cultural art form for it not to be lost; therefore, reviving an essential aspect of cultural identity. It is also in effort to bring the attention of design and designers to other cultural arts in need of preservation within current design to maintain cultural identity in the built environment. Adopting the appropriate methodologies to discover and develop alternative design paradigms and practices for innovative design solutions provides the formula for cultural arts, or brand, to integrate and evolve.

Provided that this study carried a semiotic design methodology using shape grammar applications to enable integrating the cultural arts (IG) within contemporary design (IKEA) is a contribution to design and design practice by proposing the possibility of other cultural art integrations. As this investigation delivered ground-breaking ideas of commercial viability, this study also contributed to the design industry. The revival of cultural arts within present day design ultimately contributes to society as it manifests an artistic visual form of its cultural identity. This contribution to knowledge highlighted philosophies and methodologies of design and research that can be applied to other cultural arts and context for a novel contribution of new knowledge to design research.

Figure 6.5 Evolving the Style in and within Contemporary Design Market.

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Appendix A: Islamic Furniture Design

Traditional Islamic furniture is hand-made, natural wood material, embellished with Islamic geometric designs. Furniture ranges from Qur'anic stands, tables, chairs, window screens, screen doors (or partitions) and more; some of which are presented:

<u>Qur'anic stand:</u>



https://antiquefurnituredirect.co.uk/antique-furniture/antique-anglo-indian-magazine-stand-quran-stand/

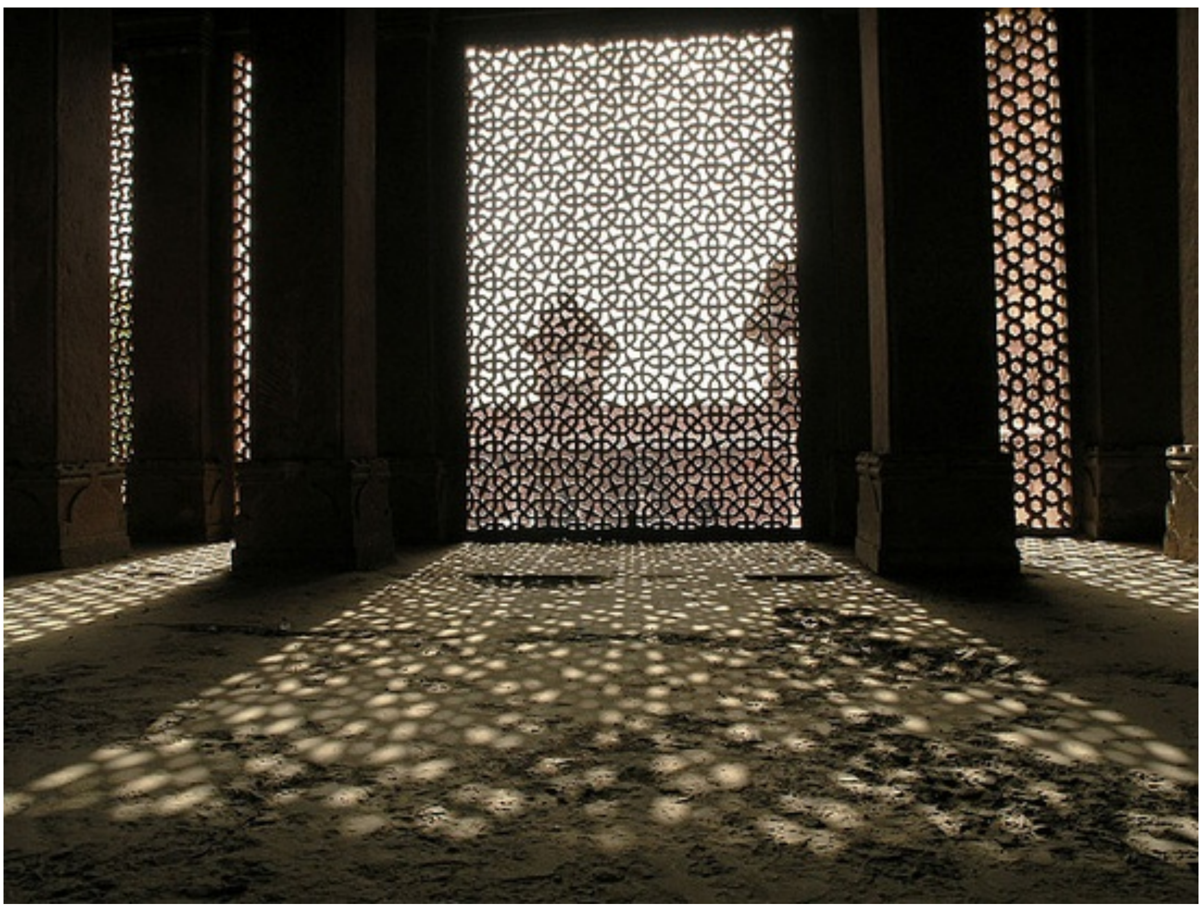
<u>Islamic Table:</u>



https://www.onekingslane.com/p/4817408-moorish-star-octagonal-bone-inlay-table.do

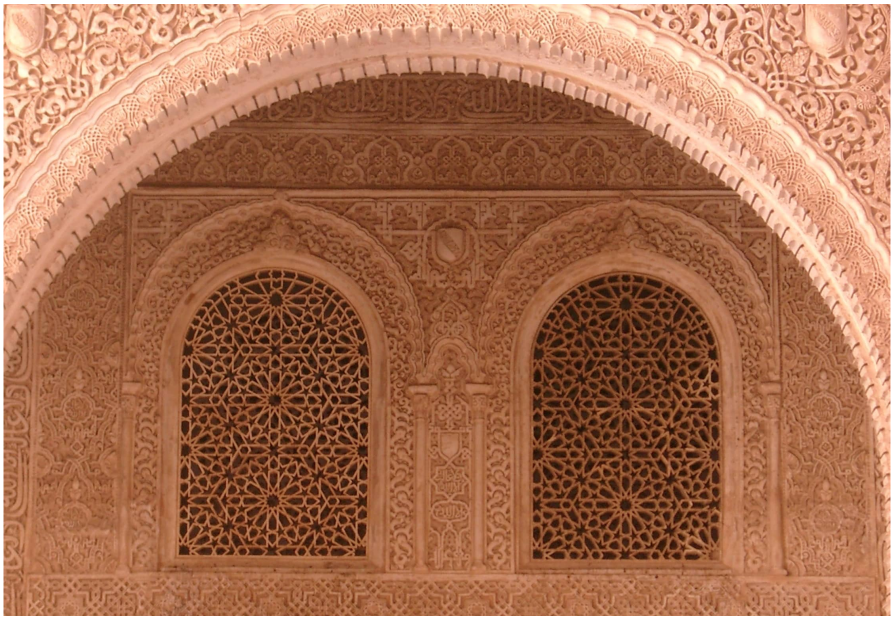
 

https://mamluky.com/product/engraved-wooden-octagonal-middle-table-islamic-pattern-made-of-high-quality-finnish-plywood-glued-with-a-turkish-walnut-veneer/



https://homesynchronize.com/islamic-style-window-screens/

Alhambra Palace detail in Granada, Spain:



https://renovatio.zaytuna.edu/assets/images/architecture-palace-wall-arch-brick-symmetry-572100-pxhere.com-1.jpg

Interior model example:

https://img.freepik.com/free-photo/islamic-style-living-room-interior-design-with-arch-arabic-pattern_258219-204.jpg

Appendix B: IKEA Furniture Design

IKEA Furniture is mass-produced, machine-cut, of smooth finishes and surfaces, stackable, mix and match simple geometry furniture. The following are IKEA product examples:

https://www.ikea.com/gb/en/cat/products-index-index/

IKEA LACK Series examples:

http://www.ikea.com/gb/en/collections/lack/


https://homemydesign.com/2014/25-stylish-ikea-tv-and-media-furniture/

Appendix C: IKEA Timeline and Global Expansion of Company

IKEA's growth and world-wide expansion:

1943 - IKEA is founded by Ingvar Kamprad.

1945 - The first IKEA advertisements appear.

1948 - Furniture is introduced into the IKEA range.

1951 - The first IKEA catalogue is published.

1953 - The first furniture showroom opens in Älmhult, Sweden.

1958 - The first IKEA store opens in Sweden.

1963 - IKEA arrives in Norway.

1965 - Largest IKEA store opens in Stockholm, Sweden.

1969 - IKEA arrives in Copenhagen, Denmark.

1973 - IKEA arrives in Switzerland

1974 - IKEA arrives in Germany.

1975 - IKEA arrives in Sydney, Australia.

1976 - IKEA arrives in Canada

1977 - IKEA arrives in Austria

1979 - IKEA arrives in the Netherlands

1982 - IKEA Group is formed

1984 - IKEA arrives in Belgium; IKEA catalogue numbers increase.

1985 - IKEA arrives in the USA

1987 - IKEA arrives in Manchester, UK.

1989 - IKEA arrives in Milan, Italy.

1990 - IKEA arrives in Hungary

1991 - IKEA arrives in the Czech Republic and Poland

1996 - IKEA arrives in Madrid, Spain.

1997 - IKEA on the web.

1998 - IKEA arrives in Shanghai, China.

2000 - IKEA arrives in Russia; IKEA customers can shop online.

2004 - IKEA arrives in Portugal; The 200th IKEA store opens (IKEA New Haven), US.

2006 - IKEA arrives in Japan;

2008 - Web meetings; Express check-outs.

Appendix D: IKEA Timeline of Product Expansion and Evolution

IKEA's products, product line growth, production developments:

1948 - Furniture is introduced into the IKEA range.

1956 - Designing furniture for flat packs and self-assembly.

1958 - Gillis Lundgren designs the TORE drawer unit.

1961 - ÖGLA chair.

- Product testing begins.

1962 - Marian Grabinski designs the MTP bookcase. The MTP bookcase is a contemporary classic and will see numerous imitations over the years.

1968 - Particleboard makes its mark.

1969 - PRIVAT sofa designed by architect Åke Fribryter.

1973 - Denim used for furniture.

- TAJT, a multifunctional seat and recliner.

1974 - SKOPA chair.

1976 - POEM is launched (later known as POÄNG). Another IKEA classic is born, the comfortable armchair POEM made of laminated wood; later evolves into POÄNG.

- 'The Testament of a Furniture Dealer' documents IKEA's vision and business idea and has a strong influence on the development and vitality of IKEA's culture.

1979 - BILLY bookcase is born. An IKEA classic.

- KLIPPAN sofa; another IKEA classic.

1980 - LACK table arrives.

1982 - LACK range is extended. To compliment the LACK table, LACK shelves are designed.

1984 -STOCKHOLM range of furnishings appears.

1985 - MOMENT sofa is designed by Niels Gammelgaard

1990 - The first environmental policy at IKEA.

1994 - MAMMUT series.

1995 - The first IKEA PS collection is launched. PS stands for 'Post Scriptum', or the latest additions to the world of IKEA design. The IKEA PS collection is one way of sharing its design values – form and function at a low price.

1996 - DAGIS kids chair by Richard Clack is born.

1997 - Children's IKEA is launched.

1999 - IKEA wins international award for VÄRDE kitchen.

2001 - Another innovative product. The print-on-board technique.

2003 - The fourth IKEA PS collection is launched.

2005 - Everything for the bedroom under one roof.

- The fifth IKEA PS collection is launched. a range is developed in which innovation is the key word for materials, design, function and techniques.

2006 - IKEA Stockholm collection is launched. The third generation of the IKEA Stockholm collection.

- BESTÅ storage system is launched.

2009 - 6th IKEA PS collection is launched. With a theme of 'Never-ending design story', it combines passion for good design and outstanding low prices. The economical use of resources and responsibility for people and the environment.

- BILLY bookcase. The world's most versatile bookcase.

2010 - KLIPPAN sofa. KLIPPAN, celebrates 30 years in the IKEA product range.

2013 - IKEA relaunches first flat-pack table. IKEA, is re-launching the original piece of furniture that kick-started the 'flat pack revolution' (LÖVET, 1956); the LÖVBACKEN side table.

- LÖVBACKEN is true to the original design right down to its measurements; one tweak to the design is tabletop replaced with a stained poplar veneer on MDF for the LÖVBACKEN.

- August 2013; the new IKEA catalogue sent to 13,157,000 households in the UK.

- IKEA range numbers 9,500 different products – and of which there are 90 occasional (or side tables) tables. (Dezeen, 2013).

LÖVBACKEN side table – (Dezeen, 2013).

Appendix E: Participant Information Sheet and Consent Form

Background and aim of research were provided to willing participants. A brief guideline for answering the survey questionnaire was also presented:

Participant Information Sheet

Researcher: Maryam Alainati
PhD Student – Bournemouth University
malainati@bournemouth.ac.uk
Supervised by Prof. Siamak Noroozi
snoroozi@bournemouth.ac.uk

Reviving the Cultural Arts of the Islamic Geometries into Contemporary Interior Design.

You are being invited to take part in a research project. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. Ask us if there is anything that is not clear or if you would like more information.

It is completely voluntary, and participants have the right to not answer any question if they choose not to. You also can choose to withdraw at any time. The information collected about participants will be kept strictly confidential. All the data will be used solely for the purpose of this research and future publication.

The aim of this research is to revive cultural art identity within contemporary design. From the cultural arts of this Middle Eastern region, this study focuses on the art of Islamic Geometries (IG); and, from the contemporary design world, on IKEA for its international success in today's home design industry. The balance between preserving the artistic soul of the IG and IKEA's vision is key.

This survey is to investigate the outcome of the two styles' engagement as well as to identify and analyse factors affecting individuals' preference. Distributed among fifty participants, the study is to take place in Kuwait in order to gather data relevant to the region. The questionnaire is designed in three parts, each of which having a brief description of the task and are to be answered by marking inside the tick-box for your selection.

Part 1. Involves a set of given images. You are to answer three main questions on each given image reflecting to whether you think the pattern design style is IKEA or IG, and if you like the pattern or not. The questions are rated on a scale (from strongly agree to strongly disagree) to rate your preference.
Part 2. Presents questions about your preference to IKEA's furniture.
Part 3. Is about your demographic data.

The findings of this thesis will contribute to knowledge through providing the possibility of integrating the cultural arts of IG within the contemporary design of IKEA; to the practice of interior design by leading the possibility to explore other cultural art preservations; and, to society by ultimately being able to obtain cultural identity within present day.

All the information collected during the course of the research will be kept in accordance with the Data Protection Act 1998. You will not be able to be identified in any reports or publications. All data relating to this study will be kept for 5 years on a BU password protected secure network. If you have any concerns regarding this study, please contact Professor Siamak Noroozi by email snoroozi@bournemouth.ac.uk.

Thank you in advance for your time.

Sincerely yours,

Maryam Alainati
PhD Student
Bournemouth University
malainati@bournemouth.ac.uk

By completing the questionnaire, you are consenting to take part in this research study.

Appendix F: Pilot Study Survey Questionnaire

Pilot study was conducted on the 23rd of December 2016:

Survey Questionnaire

This questionnaire is designed in three parts. Kindly, read the quick description of each part and answer the questions that follow by marking inside the tick-box for your answer.

Part 1:

The first part presents images of different pattern designs. For each pattern design, please answer questions that follow by selecting one answer for each of the images:

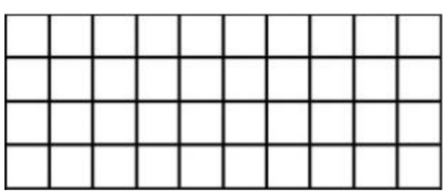
Part 2:

The second part presents questions about your preference to IKEA's furniture, and your preference to the inclusion of the IKEA-IG style into IKEA's line of furniture. Please select your answer from the selection:

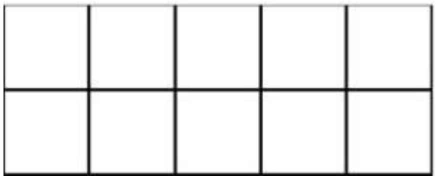
Part 3:

The third part is the demographic data. Please choose one answer from the selection:

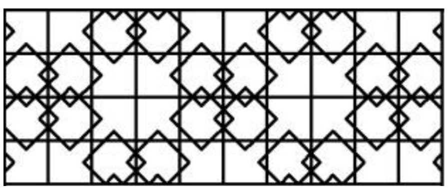
Part 1:



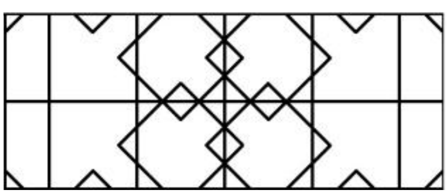
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1 – This is an IKEA style.					
2 – This is an IG style.					
3 – I like this design.					



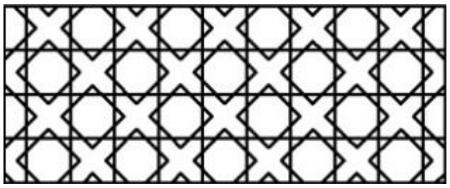
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4 – This is an IKEA style.					
5 – This is an IG style.					
6 – I like this design.					



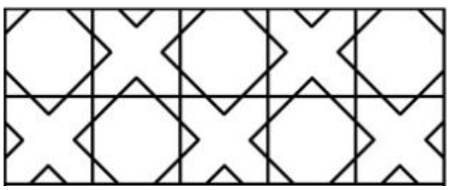
7 – This is an IKEA style.					
8 – This is an IG style.					
9 – I like this design.					



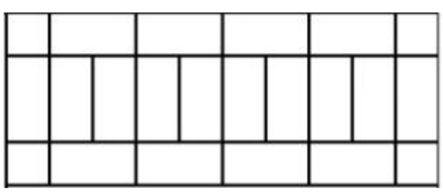
10 – This is an IKEA style.					
11 – This is an IG style.					
12 – I like this design.					



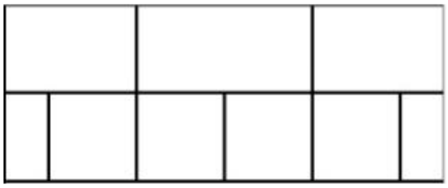
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
13 – This is an IKEA style.					
14 – This is an IG style.					
15 – I like this design.					



16 – This is an IKEA style.					
17 – This is an IG style.					
18 – I like this design.					



19 – This is an IKEA style.					
20 – This is an IG style.					
21 – I like this design.					

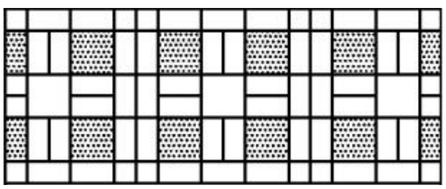


Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree

22 – This is an IKEA style.

23 – This is an IG style.

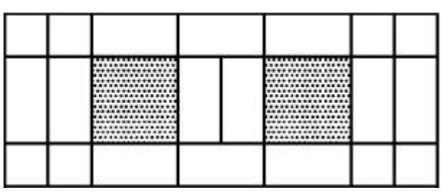
24 – I like this design.



25 – This is an IKEA style.

26 – This is an IG style.

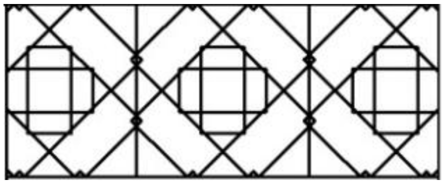
27 – I like this design.



28 – This is an IKEA style.

29 – This is an IG style.

30 – I like this design.

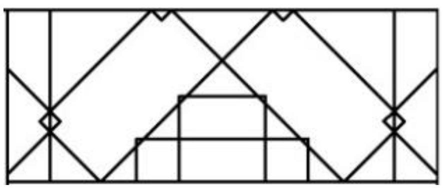


Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree

31 – This is an IKEA style.

32 – This is an IG style.

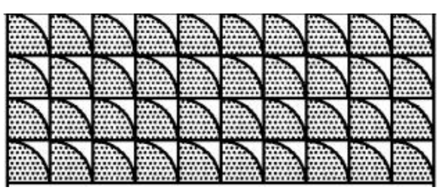
33 – I like this design.



34 – This is an IKEA style.

35 – This is an IG style.

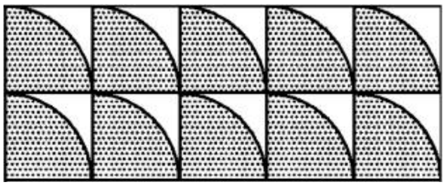
36 – I like this design.



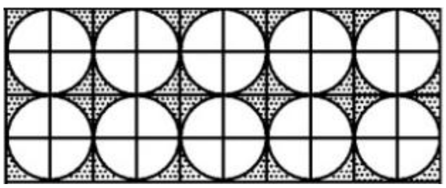
37 – This is an IKEA style.

38 – This is an IG style.

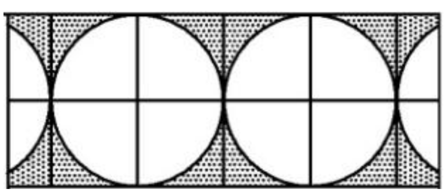
39 – I like this design.



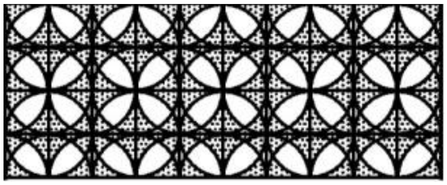
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
40 – This is an IKEA style.					
41 – This is an IG style.					
42 – I like this design.					



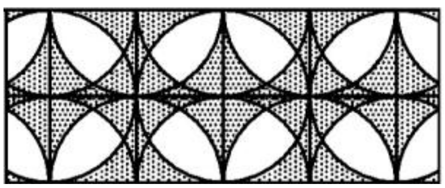
43 – This is an IKEA style.					
44 – This is an IG style.					
45 – I like this design.					



46 – This is an IKEA style.					
47 – This is an IG style.					
48 – I like this design.					



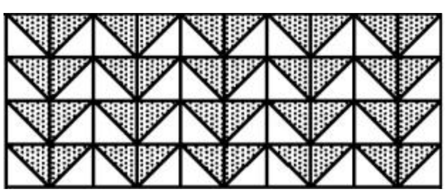
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
49 – This is an IKEA style.					
50 – This is an IG style.					
51 – I like this design.					



52 – This is an IKEA style.

53 – This is an IG style.

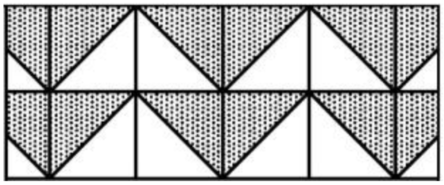
54 – I like this design.



55 – This is an IKEA style.

56 – This is an IG style.

57 – I like this design.

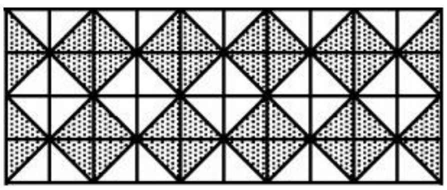


Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree

58 – This is an IKEA style.

59 – This is an IG style.

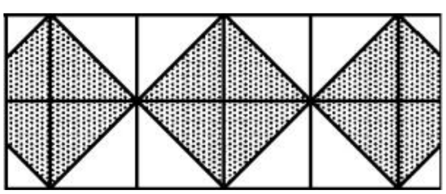
60 – I like this design.



61 – This is an IKEA style.

62 – This is an IG style.

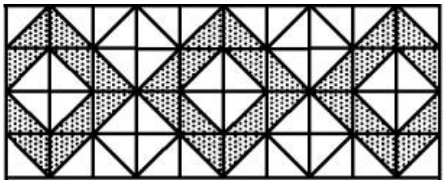
63 – I like this design.



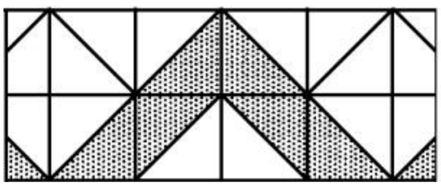
64 – This is an IKEA style.

65 – This is an IG style.

66 – I like this design.



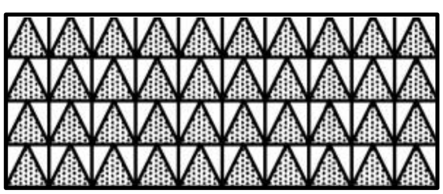
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
67 – This is an IKEA style.					
68 – This is an IG style.					
69 – I like this design.					



70 – This is an IKEA style.

71 – This is an IG style.

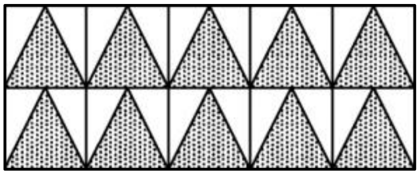
72 – I like this design.



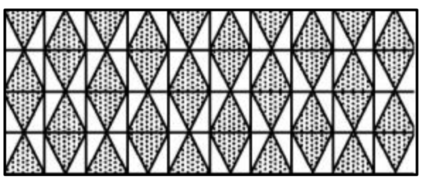
73 – This is an IKEA style.

74 – This is an IG style.

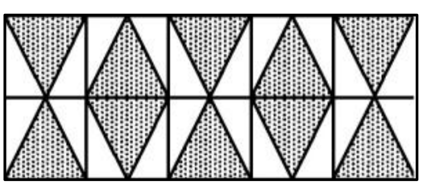
75 – I like this design.



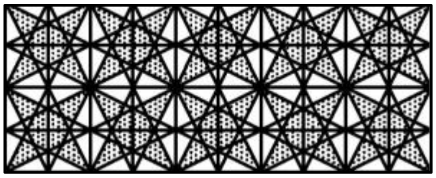
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
76 – This is an IKEA style.					
77 – This is an IG style.					
78 – I like this design.					



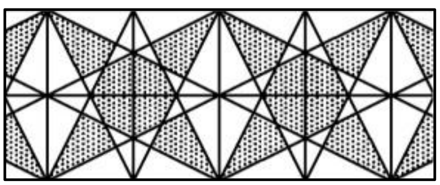
79 – This is an IKEA style.					
80 – This is an IG style.					
81 – I like this design.					



82 – This is an IKEA style.					
83 – This is an IG style.					
84 – I like this design.					



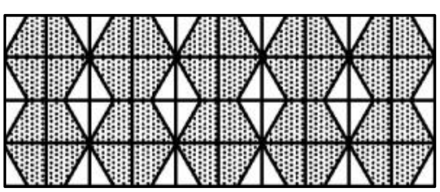
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
85 – This is an IKEA style.					
86 – This is an IG style.					
87 – I like this design.					



88 – This is an IKEA style.

89 – This is an IG style.

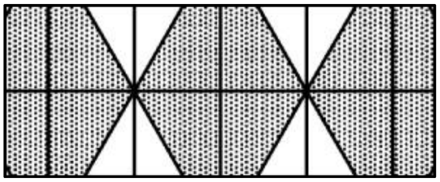
90 – I like this design.



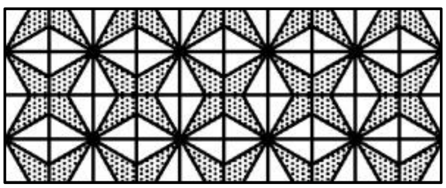
91 – This is an IKEA style.

92 – This is an IG style.

93 – I like this design.



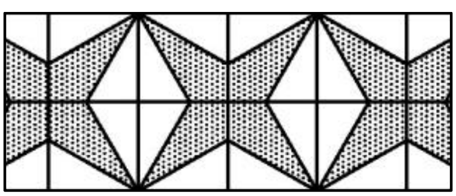
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
94 – This is an IKEA style.					
95 – This is an IG style.					
96 – I like this design.					



97 – This is an IKEA style.

98 – This is an IG style.

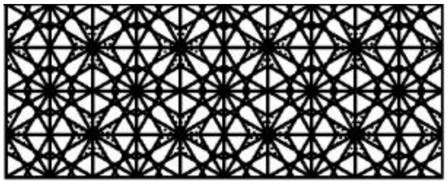
99 – I like this design.



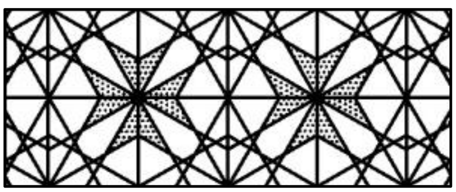
100 – This is an IKEA style.

101 – This is an IG style.

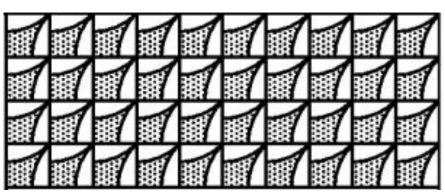
102 – I like this design.



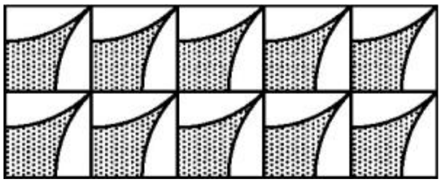
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
103 – This is an IKEA style.					
104 – This is an IG style.					
105 – I like this design.					



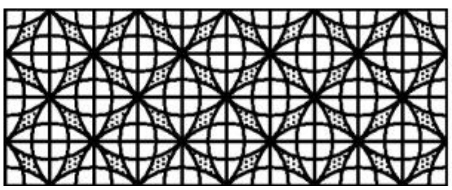
106 – This is an IKEA style.					
107 – This is an IG style.					
108 – I like this design.					



109 – This is an IKEA style.					
110 – This is an IG style.					
111 – I like this design.					



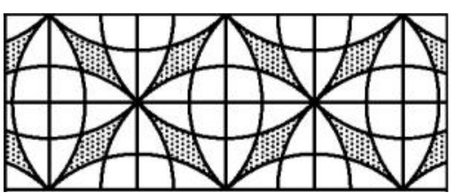
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
112 – This is an IKEA style.					
113 – This is an IG style.					
114 – I like this design.					



115 – This is an IKEA style.

116 – This is an IG style.

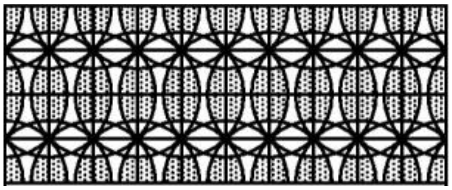
117 – I like this design.



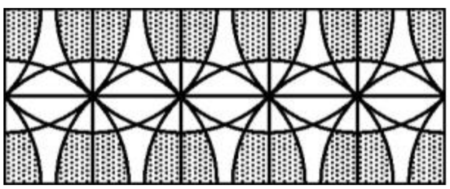
118 – This is an IKEA style.

119 – This is an IG style.

120 – I like this design.



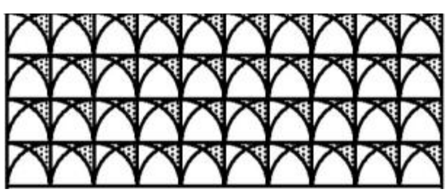
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
121 – This is an IKEA style.					
122 – This is an IG style.					
123 – I like this design.					



124 – This is an IKEA style.

125 – This is an IG style.

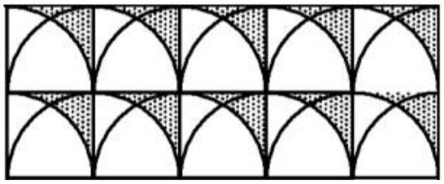
126 – I like this design.



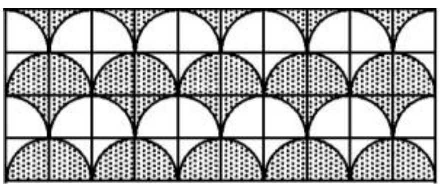
127 – This is an IKEA style.

128 – This is an IG style.

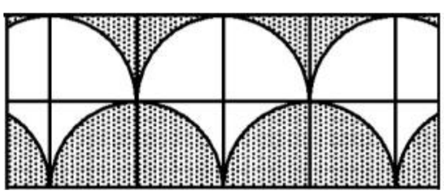
129 – I like this design.



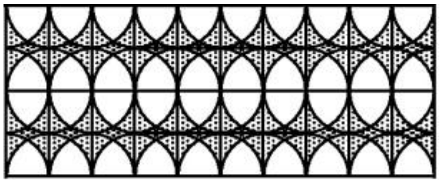
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
130 – This is an IKEA style.					
131 – This is an IG style.					
132 – I like this design.					



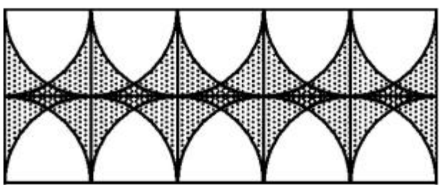
133 – This is an IKEA style.					
134 – This is an IG style.					
135 – I like this design.					



136 – This is an IKEA style.					
137 – This is an IG style.					
138 – I like this design.					



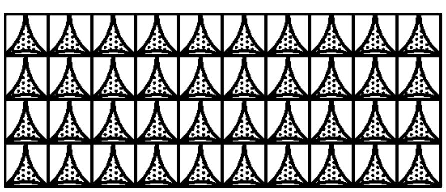
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
139 – This is an IKEA style.					
140 – This is an IG style.					
141 – I like this design.					



142 – This is an IKEA style.

143 – This is an IG style.

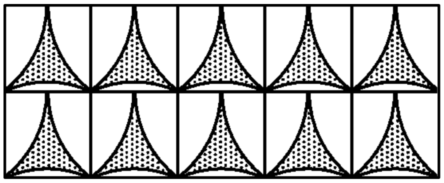
144 – I like this design.



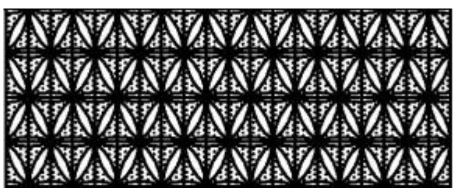
145 – This is an IKEA style.

146 – This is an IG style.

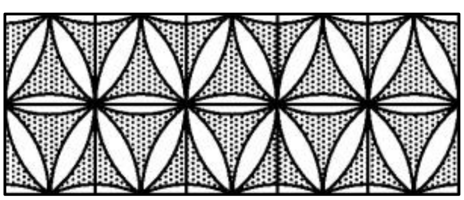
147 – I like this design.



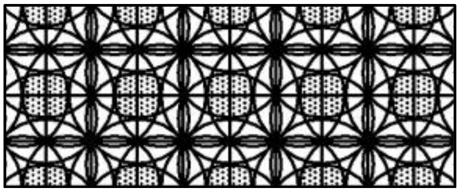
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
148 – This is an IKEA style.					
149 – This is an IG style.					
150 – I like this design.					



151 – This is an IKEA style.					
152 – This is an IG style.					
153 – I like this design.					



154 – This is an IKEA style.					
155 – This is an IG style.					
156 – I like this design.					

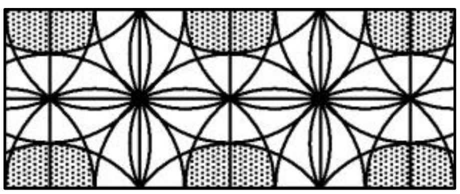


Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree

157 – This is an IKEA style.

158 – This is an IG style.

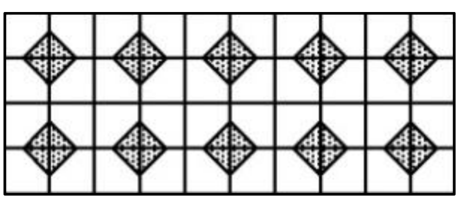
159 – I like this design.



160 – This is an IKEA style.

161 – This is an IG style.

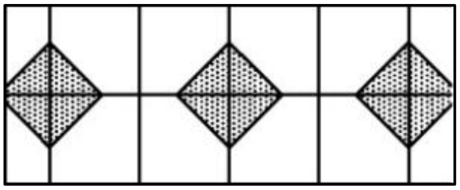
162 – I like this design.



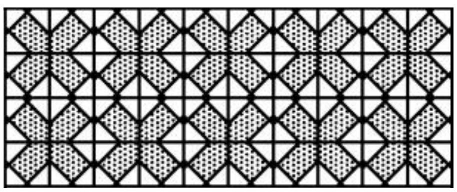
163 – This is an IKEA style.

164 – This is an IG style.

165 – I like this design.



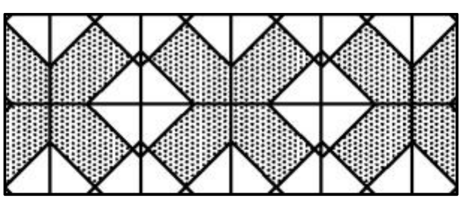
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
166 – This is an IKEA style.					
167 – This is an IG style.					
168 – I like this design.					



169 – This is an IKEA style.

170 – This is an IG style.

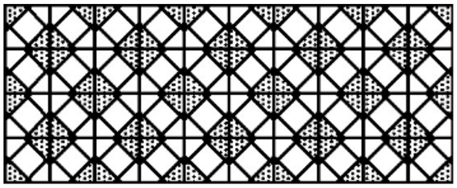
171 – I like this design.



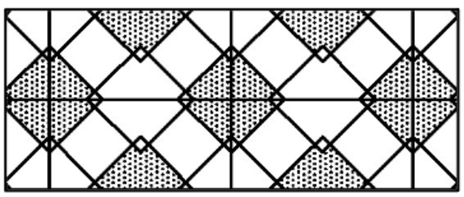
172 – This is an IKEA style.

173 – This is an IG style.

174 – I like this design.



	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
175 – This is an IKEA style.					
176 – This is an IG style.					
177 – I like this design.					



178 – This is an IKEA style.					
179 – This is an IG style.					
180 – I like this design.					

Part 2:

181 – I like IKEA’s furniture.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

182 – I would like IKEA-IG in IKEA’s furniture.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Part 3:

Demographic Data								
183	Gender	Male	Female					
184	Age	18 ≥	19 - 29	30 - 39	40 - 49	≥ 50		
185	Ethnicity	GCC Countries	Other Arabian	Non-Arabian				
186	Religion	Muslim	Other					
187	Education	Below High School	High School	Diploma (2 years)	Bachelor (4 years)	Master	PhD	
188	Province	Capital	Hawalli	Farwaniya	Mubarak Alkabeer	Ahmadi	Jahra	Not Sure

The end, thank you.

Appendix G: Pilot Study Results Data

Pilot study results from Part 1 and 2 of the survey questionnaire. Part 1 reveals test results from constructs IKEA, IG and LIKE; Part 2 is of the fourth construct:

Part 1:

First construct if item was deleted (IKEA):

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
SS_1_IKEA	116.78	1016.006	.378	.	.967
SL_4_IKEA	116.47	1025.971	.288	.	.967
SS_7_IKEA	117.72	1029.692	.319	.	.967
SL_10_IKEA	117.56	1037.511	.131	.	.967
SS_13_IKEA	117.61	1016.530	.491	.	.966
SL_16_IKEA	117.33	1016.457	.461	.	.966
SS_19_IKEA	116.39	1034.473	.178	.	.967
SL_22_IKEA	116.50	1024.657	.349	.	.967
SS_25_IKEA	117.31	1027.647	.315	.	.967
SL_28_IKEA	116.92	1010.993	.541	.	.966
SS_31_IKEA	117.58	1008.593	.658	.	.966
SL_34_IKEA	117.50	1019.686	.461	.	.966
CS_37_IKEA	117.53	1018.713	.525	.	.966
CL_40_IKEA	117.19	1012.218	.536	.	.966
CS_43_IKEA	116.89	1005.130	.574	.	.966
CL_46_IKEA	117.00	1009.943	.495	.	.966
CS_49_IKEA	117.75	1007.736	.728	.	.965
CL_52_IKEA	117.72	997.349	.744	.	.965
SS_55_IKEA	117.36	994.294	.735	.	.965
SL_58_IKEA	117.36	990.866	.734	.	.965
SS_61_IKEA	116.94	994.340	.721	.	.965
SL_64_IKEA	116.72	987.521	.747	.	.965
SS_67_IKEA	117.14	1002.009	.680	.	.965
SL_70_IKEA	117.06	983.997	.821	.	.965
SS_73_IKEA	117.37	998.649	.725	.	.967

SL_76_IKEA	117.53	992.521	.714	.	.967
SS_79_IKEA	116.83	1001.021	.693	.	.966
SL_82_IKEA	116.74	997.640	.717	.	.966
SS_85_IKEA	117.33	996.229	.758	.	.965
SL_88_IKEA	117.46	1000.104	.735	.	.965
SS_91_IKEA	117.73	1003.414	.706	.	.965
SL_94_IKEA	117.69	999.894	.729	.	.965
SS_97_IKEA	117.47	989.569	.697	.	.966
SL_100_IKEA	117.58	1001.031	.708	.	.966
SS_103_IKEA	117.44	1000.287	.719	.	.966
SL_106_IKEA	117.52	1006.463	.741	.	.966
CS_109_IKEA	117.50	1000.714	.721	.	.965
CL_112_IKEA	117.67	1010.343	.636	.	.966
CS_115_IKEA	117.39	999.044	.705	.	.965
CL_118_IKEA	117.33	994.229	.751	.	.965
CS_121_IKEA	117.42	1000.136	.642	.	.966
CL_124_IKEA	117.50	999.514	.681	.	.965
CS_127_IKEA	117.50	1003.514	.676	.	.965
CL_130_IKEA	117.33	994.914	.760	.	.965
CS_133_IKEA	117.19	1000.275	.688	.	.965
CL_136_IKEA	117.17	996.943	.720	.	.965
CS_139_IKEA	117.53	1009.399	.587	.	.966
CL_142_IKEA	117.44	1008.140	.628	.	.966
CS_145_IKEA	116.88	995.789	.672	.	.965
CL_148_IKEA	116.91	997.834	.681	.	.965
CS_151_IKEA	117.10	1004.964	.714	.	.966
CL_154_IKEA	117.29	1006.227	.698	.	.966
CS_157_IKEA	117.62	1007.001	.706	.	.965
CL_160_IKEA	117.29	1002.520	.673	.	.965
SS_163_IKEA	116.92	996.021	.670	.	.965
SL_166_IKEA	116.97	987.913	.744	.	.965
SS_169_IKEA	117.53	1007.399	.620	.	.966
SL_172_IKEA	117.53	996.542	.773	.	.965
SS_175_IKEA	117.58	1003.336	.702	.	.965
SL_178_IKEA	117.25	998.250	.669	.	.965

Second construct if item was deleted (IG):

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
SS_2_IG	149.69	982.047	.422	.	.964
SL_5_ IG	149.97	996.142	.305	.	.965
SS_8_ IG	148.03	994.885	.393	.	.964
SL_11_ IG	148.58	993.050	.307	.	.965
SS_14_ IG	148.33	989.543	.387	.	.964
SL_17_ IG	148.61	985.616	.414	.	.964
SS_20_ IG	150.14	992.237	.401	.	.964
SL_23_ IG	150.14	999.209	.263	.	.965
SS_26_ IG	148.97	974.085	.626	.	.964
SL_29_ IG	149.56	982.140	.501	.	.964
SS_32_ IG	148.69	980.961	.473	.	.964
SL_35_ IG	149.58	961.279	.692	.	.963
CS_38_ IG	149.78	966.635	.740	.	.963
CL_41_ IG	149.83	968.829	.670	.	.963
CS_44_ IG	149.31	963.475	.731	.	.963
CL_47_ IG	149.50	958.543	.790	.	.963
CS_50_ IG	148.86	963.380	.585	.	.964
CL_53_ IG	149.14	956.523	.699	.	.963
SS_56_ IG	149.81	967.875	.682	.	.963
SL_59_ IG	149.72	975.521	.558	.	.964
SS_62_ IG	148.69	978.847	.536	.	.964
SL_65_ IG	149.36	964.123	.793	.	.963
SS_68_ IG	148.78	976.063	.537	.	.964
SL_71_ IG	149.47	975.228	.556	.	.964
SS_74_ IG	149.45	968.787	.640	.	.963
SL_77_ IG	149.43	967.601	.711	.	.963
SS_80_ IG	148.84	963.342	.569	.	.964
SL_83_ IG	149.10	956.561	.643	.	.963
SS_86_ IG	148.69	977.874	.561	.	.964
SL_89_ IG	149.07	975.204	.559	.	.964
SS_92_ IG	148.74	976.149	.540	.	.964
SL_95_ IG	148.55	981.447	.492	.	.964
SS_98_ IG	148.78	978.287	.568	.	.964
SL_101_ IG	149.11	956.033	.683	.	.963

SS_104_ IG	148.61	967.554	.647	.	.963
SL_107_ IG	148.66	968.623	.594	.	.963
CS_110_ IG	149.89	981.130	.497	.	.964
CL_113_ IG	150.00	977.657	.636	.	.964
CS_116_ IG	148.81	964.733	.662	.	.963
CL_119_ IG	149.39	966.302	.689	.	.963
CS_122_ IG	149.11	957.359	.683	.	.963
CL_125_ IG	149.17	961.629	.651	.	.963
CS_128_ IG	149.22	956.349	.660	.	.963
CL_131_ IG	149.39	968.359	.625	.	.963
CS_134_ IG	149.17	955.914	.728	.	.963
CL_137_ IG	149.25	963.507	.661	.	.963
CS_140_ IG	148.53	964.485	.637	.	.963
CL_143_ IG	148.81	969.818	.603	.	.964
CS_146_ IG	148.65	959.684	.650	.	.963
CL_149_ IG	148.74	965.338	.677	.	.963
CS_152_ IG	148.39	971.539	.600	.	.963
CL_155_ IG	148.42	967.865	.598	.	.963
CS_158_ IG	148.38	970.994	.575	.	.964
CL_161_ IG	148.46	974.091	.582	.	.964
SS_164_ IG	148.58	981.450	.495	.	.964
SL_167_ IG	148.78	978.178	.567	.	.964
SS_170_ IG	148.22	979.378	.536	.	.964
SL_173_ IG	148.64	977.609	.556	.	.964
SS_176_ IG	148.26	973.048	.598	.	.964
SL_179_ IG	148.55	982.429	.483	.	.964

Third construct if item was deleted (LIKE):

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
SS_3_LIKE	151.92	990.936	.484	.	.958
SL_6_LIKE	151.94	1020.740	.061	.	.960
SS_9_LIKE	150.89	996.444	.454	.	.958
SL_12_LIKE	151.31	1004.333	.281	.	.959
SS_15_LIKE	150.64	994.637	.496	.	.958
SL_18_LIKE	150.86	1019.152	.097	.	.960
SS_21_LIKE	152.19	996.675	.506	.	.958
SL_24_LIKE	152.25	1000.364	.445	.	.959
SS_27_LIKE	151.28	981.235	.643	.	.958
SL_30_LIKE	151.75	1002.479	.323	.	.959
SS_33_LIKE	151.39	982.759	.620	.	.958
SL_36_LIKE	152.14	993.266	.408	.	.959
CS_39_LIKE	152.00	975.371	.739	.	.957
CL_42_LIKE	152.06	988.397	.571	.	.958
CS_45_LIKE	151.92	976.193	.667	.	.958
CL_48_LIKE	152.03	971.742	.707	.	.957
CS_51_LIKE	151.42	970.936	.641	.	.958
CL_54_LIKE	151.50	962.886	.783	.	.957
SS_57_LIKE	152.14	978.237	.677	.	.958
SL_60_LIKE	152.25	985.907	.619	.	.958
SS_63_LIKE	151.08	992.936	.515	.	.958
SL_66_LIKE	151.44	988.425	.545	.	.958
SS_69_LIKE	151.25	994.021	.440	.	.959
SL_72_LIKE	151.67	991.600	.470	.	.958
SS_75_LIKE	152.09	989.646	.574	.	.958
SL_78_LIKE	152.32	991.822	.599	.	.958
SS_81_LIKE	152.20	979.915	.702	.	.957
SL_84_LIKE	152.34	978.573	.693	.	.957
SS_87_LIKE	151.65	992.853	.482	.	.958
SL_90_LIKE	151.81	989.005	.598	.	.958
SS_93_LIKE	151.38	972.747	.690	.	.957
SL_96_LIKE	151.55	974.431	.615	.	.958
SS_99_LIKE	151.18	977.837	.627	.	.958
SL_102_LIKE	151.15	983.199	.685	.	.957

SS_105_LIKE	151.47	983.407	.608	.	.958
SL_108_LIKE	151.20	974.884	.630	.	.958
CS_111_LIKE	152.08	980.650	.657	.	.958
CL_114_LIKE	152.11	983.187	.673	.	.958
CS_117_LIKE	151.06	977.825	.683	.	.958
CL_120_LIKE	151.33	972.743	.695	.	.957
CS_123_LIKE	151.50	974.429	.610	.	.958
CL_126_LIKE	151.64	975.552	.623	.	.958
CS_129_LIKE	151.53	970.999	.725	.	.957
CL_132_LIKE	151.56	973.168	.702	.	.957
CS_135_LIKE	151.33	983.200	.591	.	.958
CL_138_LIKE	151.64	993.494	.448	.	.959
CS_141_LIKE	151.03	972.371	.671	.	.958
CL_144_LIKE	151.22	977.206	.665	.	.958
CS_147_LIKE	151.41	978.876	.612	.	.958
CL_150_LIKE	151.39	974.948	.629	.	.958
CS_153_LIKE	151.21	980.187	.643	.	.958
CL_156_LIKE	151.13	982.949	.679	.	.957
CS_159_LIKE	151.38	991.953	.585	.	.958
CL_162_LIKE	151.46	989.395	.567	.	.958
SS_165_LIKE	151.19	983.361	.674	.	.958
SL_168_LIKE	151.33	999.543	.454	.	.958
SS_171_LIKE	150.89	981.987	.616	.	.958
SL_174_LIKE	151.28	993.806	.482	.	.958
SS_177_LIKE	150.83	995.114	.431	.	.959
SL_180_LIKE	151.17	992.943	.462	.	.958

<u>Part 2:</u>

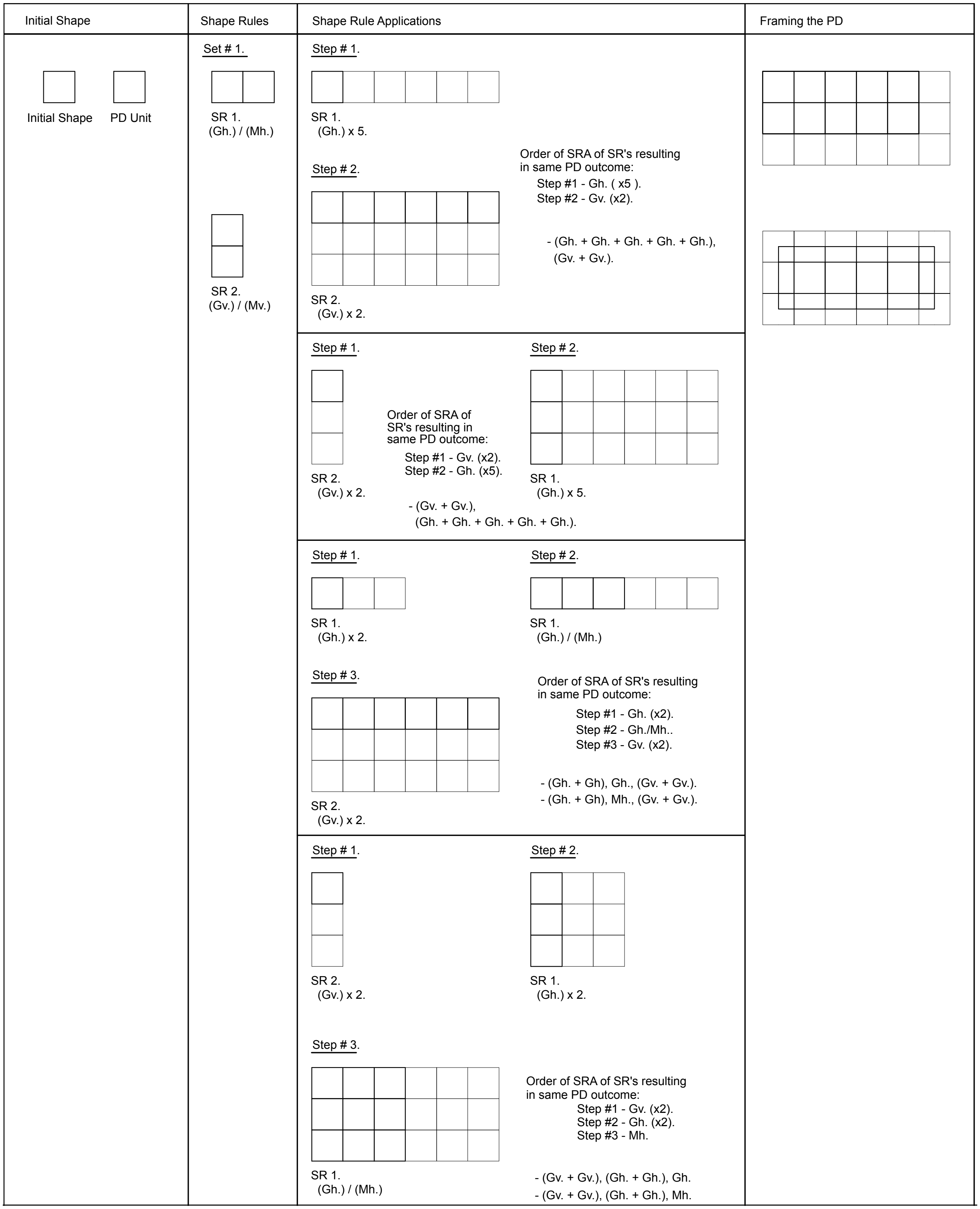
Fourth construct if item was deleted:

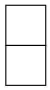
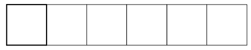
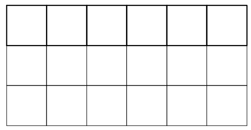
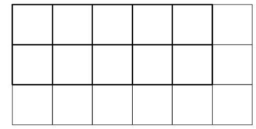
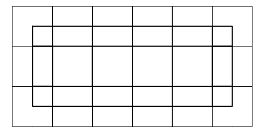
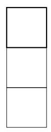
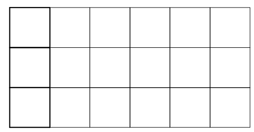
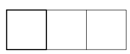
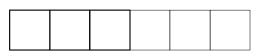
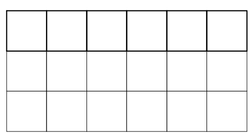
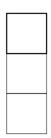
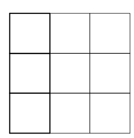
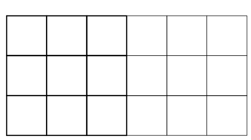
Item-Total Statistics

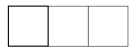
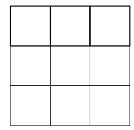
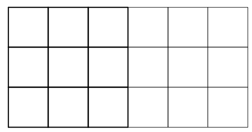
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Like_IKEA_Furniture_181	19.42	10.593	.612	.462	.691
Like_IKEA-IG_in_IKEA_182	19.81	11.361	.069	.145	.825

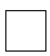
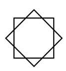
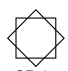
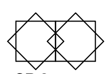
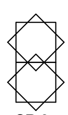
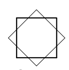
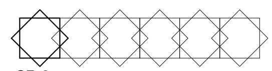
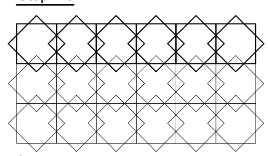
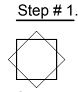
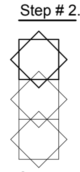
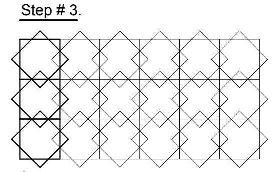
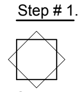
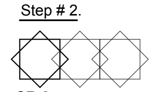
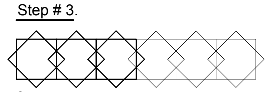
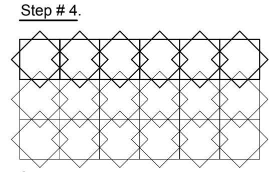
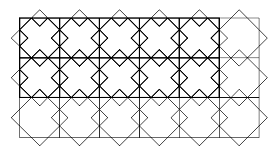
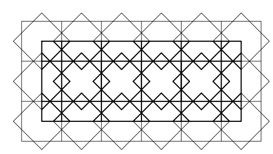
Appendix H: IKEA-IG Shape Grammar PD Formations

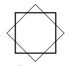
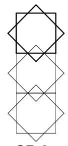
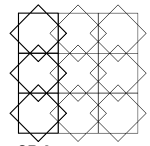
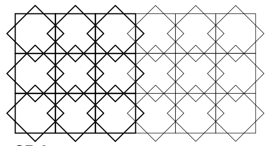
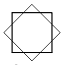
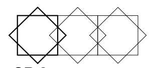
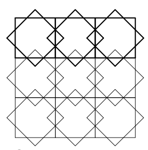
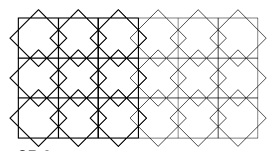
Shape grammar of the IKEA-IG pattern design illustrations; composed of initial shape, shape rule, shape-rule application, and framing:

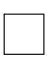
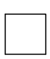
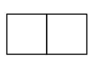
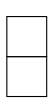
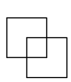
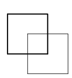
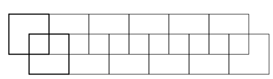
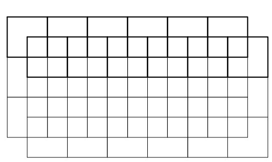
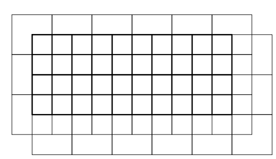
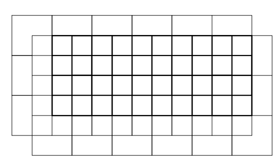


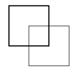
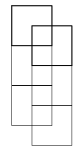
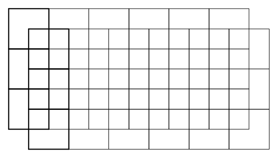
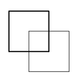
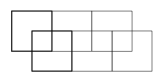
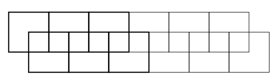
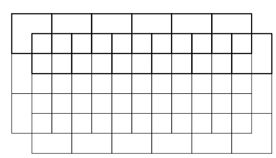
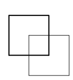
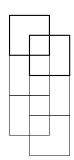
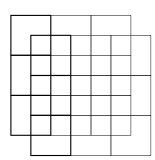
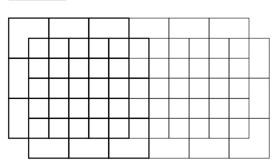
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
 Initial Shape PD Unit	Set # 1.  SR 1. (Gh.) / (Mh.)  SR 2. (Gv.) / (Mv.)	Step # 1.  SR 1. (Gh.) x 5. Step # 2.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x5). Step #2 - Gv. (x2). - (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.).	 
		Step # 1.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x5). - (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.). Step # 2.  SR 1. (Gh.) x 5.	
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 1. (Gh.) / (Mh.) Step # 3.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gh./Mh.. Step #3 - Gv. (x2). - (Gh. + Gh), Gh., (Gv. + Gv.). - (Gh. + Gh), Mh., (Gv. + Gv.).	
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 1. (Gh.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - Mh. - (Gv. + Gv.), (Gh. + Gh.), Gh. - (Gv. + Gv.), (Gh. + Gh.), Mh.	

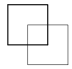
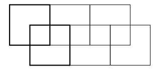
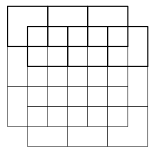
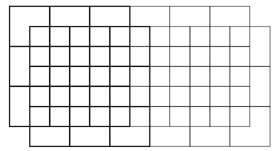
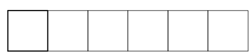
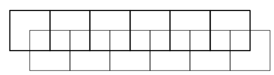
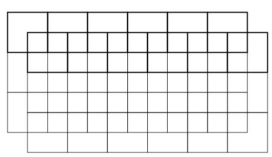
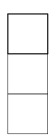
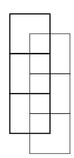
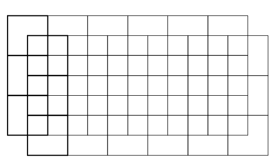
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - Gh./Mh. - (Gh. + Gh.), (Gv. + Gv.), Gh. - (Gh. + Gh.), (Gv. + Gv.), Mh.	

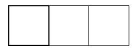
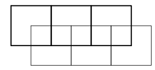
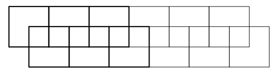
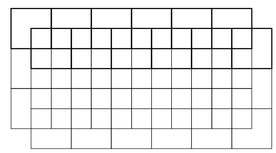
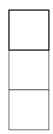
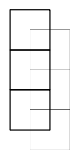
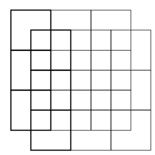
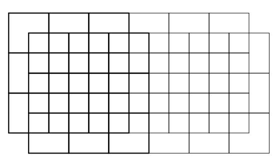
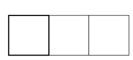
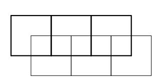
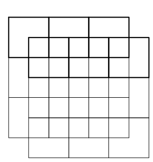
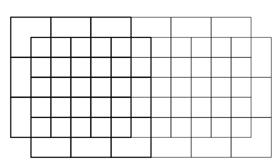
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
 Initial Shape  PD Unit	Set # 2.  SR 1. (RO. 45)  SR 2. (Gh.) / (Mh.)  SR 3. (Gv.) / (Mv.)	Step # 1.  SR 1. (RO. 45) Step # 2.  SR 2. (Gh.) x 5. Step # 3.  SR 3. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gh. (x5). Step #3 - Gv. (x2). - RO 45., (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.). Step # 1.  SR 1. (RO. 45) Step # 2.  SR 3. (Gv.) x 2. Step # 3.  SR 2. (Gh.) x 5. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gv. (x2). Step #3 - Gh. (x5). - RO 45., (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.). Step # 1.  SR 1. (RO. 45) Step # 2.  SR 2. (Gh.) x 2. Step # 3.  SR 2. (Gh.) / (Mh.) Step # 4.  SR 3. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gh. (x2). Step #3 - Gh./Mh. Step #4 - Gv. (x2). - RO 45., (Gh. + Gh), Gh., (Gv. + Gv.). - RO 45., (Gh. + Gh), Mh., (Gv. + Gv.).	 

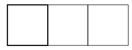
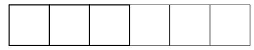
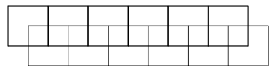
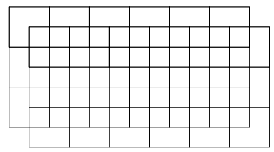
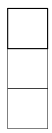
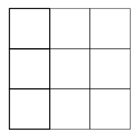
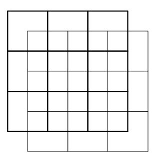
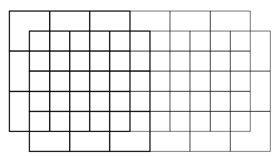
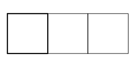
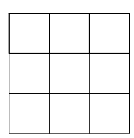
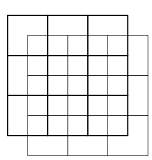
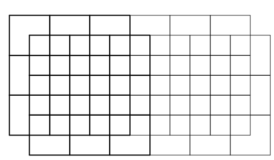
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (RO. 45) Step # 2.  SR 3. (Gv.) x 2. Step # 3.  SR 2. (Gh.) x 2. Step # 4.  SR 2. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gv. (x2). Step #3 - Gh. (x2). Step #4 - Gh./Mh. - RO 45., (Gv. + Gv.), (Gh. + Gh.), Gh. - RO 45., (Gv. + Gv.), (Gh. + Gh.), Mh.	
		Step # 1.  SR 1. (RO. 45) Step # 2.  SR 2. (Gh.) x 2. Step # 3.  SR 3. (Gv.) x 2. Step # 4.  SR 2. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gh. (x2). Step #3 - Gv. (x2). Step #4 - Gh./Mh. - RO 45., (Gh. + Gh.), (Gv. + Gv.), Gh. - RO 45., (Gh. + Gh.), (Gv. + Gv.), Mh.	

Initial Shape	Shape Rules	Shape Rule Applications - (SR 'GdO.50' used in Step #1.)	Framing the PD
 Initial Shape  PD Unit	Set # 3.  SR 1. (Gh.) / (Mh.)  SR 2. (Gv.) / (Mv.)  SR 3. (GdO. 50)	Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 1. (Gh.) x 5 Step # 3.  SR 2. (Gv.) x 2 Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO. 50. Step #2 - Gh. (x5). Step #3 - Gv. (x2). - GdO. 50., (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.).	 

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO. 50. Step #2 - Gv. (x2). Step #3 - Gh. (x5). Step # 3.  SR 1. (Gh.) x 5. - GdO. 50., (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.).	
		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 1. (Gh.) x 2 Step # 3.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO.50. Step #2 - Gh. (x2).. Step #3 - Gh. Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - GdO.50, (Gh. + Gh), Gh., (Gv. + Gv.).	- ** Mirror rule can not apply.
		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) x 2. Step # 4.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO.50. Step #2 - Gv. (x2).. Step #3 - Gh. (x2) Step #4 - Gh. - GdO.50, (Gv. + Gv), (Gh. + Gh.), Gh.	- ** Mirror rule can not apply.

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 1. (Gh.) x 2 Step # 3.  SR 2. (Gv.) x 2. Step # 4.  SR 2. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO.50. Step #2 - Gh. (x2). Step #3 - Gv. (x2). Step #4 - Gh. - GdO.50, (Gh. + Gh), (Gv. + Gv.), Gh.	- ** Mirror rule can not apply.
		Shape Rule Applications - (SR 'GdO.50' used in Step #2.)	
		Step # 1.  SR 1. (Gh.) x 5. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 2. (Gv.) x 2 Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x5). Step #2 - GdO. 50. Step #3 - Gv. (x2). - (Gh. + Gh. + Gh. + Gh. + Gh.), GdO. 50., (Gv. + Gv.).	
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 1. (Gh.) x 5. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - GdO. 50. Step #3 - Gh. (x5). - (Gv. + Gv.), GdO. 50, (Gh. + Gh. + Gh. + Gh. + Gh.),	

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - GdO.50. Step #3 - Gh. Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - (Gh. + Gh.), GdO.50, Gh., (Gv. + Gv.).	- ** Mirror rule can not apply.
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 1. (Gh.) x 2. Step # 4.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - GdO.50. Step #3 - Gh. (x2). Step #4 - Gh. - (Gv. + Gv), GdO.50, (Gh. + Gh.), Gh.	- ** Mirror rule can not apply.
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 2. (Gv.) x 2. Step # 4.  SR 2. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - GdO.50. Step #3 - Gv. (x2). Step #4 - Gh. - (Gh. + Gh), GdO.50, (Gv. + Gv.), Gh.	- ** Mirror rule can not apply.

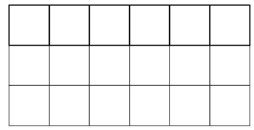
Initial Shape	Shape Rules	Shape Rule Applications - (SR 'GdO.50' used in Step #3.)	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 1. (Gh.) / (Mh.) Step # 3.  SR 3. (GdO. 50) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gh./Mh. Step #3 - GdO.50. Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - (Gh. + Gh.), Gh.,GdO.50, (Gv. + Gv.). - (Gh. + Gh.), Mh.,GdO.50, (Gv. + Gv.).	
		Step # 1.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - GdO.50. Step #4 - Gh. Step # 2.  SR 1. (Gh.) x 2. Step # 3.  SR 3. (GdO. 50) Step # 4.  SR 1. (Gh.) - (Gv. + Gv.), (Gh. + Gh.), (GdO.50), Gh.	- ** Mirror rule can not apply.
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - GdO.50. Step #4 - Gh. Step # 3.  SR 3. (GdO.50) Step # 4.  SR 2. (Gh.) - (Gh. + Gh.), (Gv. + Gv.), (GdO.50), Gh.	- ** Mirror rule can not apply.

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued			

Step # 1.

SR 1.
(Gh.) x 5.

Step # 2.

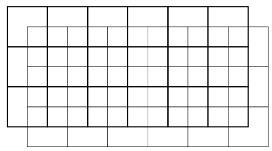


SR 2.
(Gv.) x 2.

Order of SRA of SR's resulting in same PD outcome:

Step #1 - Gh. (x5).
Step #2 - Gv. (x2).
Step #3 - GdO.50.

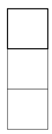
Step # 3.



SR 3.
(GdO.50)

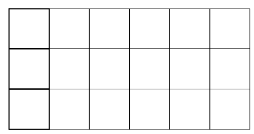
- (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.), (GdO.50).

Step # 1.



SR 2.
(Gv.) x 2.

Step # 2.

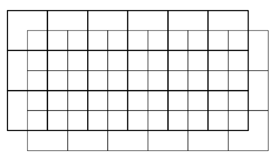


SR 1.
(Gh.) x 5.

Order of SRA of SR's resulting in same PD outcome:

Step #1 - Gv. (x2).
Step #2 - Gh. (x5).
Step #3 - GdO.50.

Step # 3.

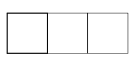


SR 3.
(GdO.50)

- (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.). (GdO.50).

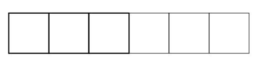
Shape Rule Applications - (SR 'GdO.50' used in Step #4.)

Step # 1.



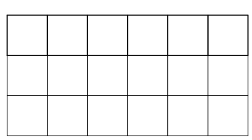
SR 1.
(Gh.) x 2.

Step # 2.



SR 1.
(Gh.) / (Mh.)

Step # 3.

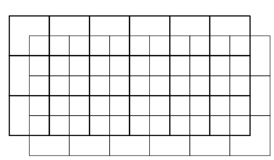


SR 2.
(Gv.) x 2.

Order of SRA of SR's resulting in same PD outcome:

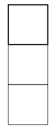
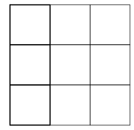
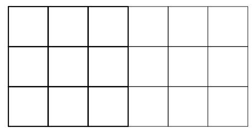
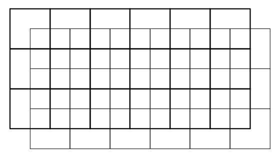
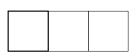
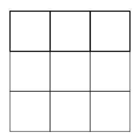
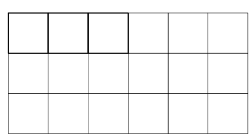
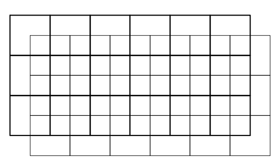
Step #1 - Gh. (x2).
Step #2 - Gh./Mh..
Step #3 - Gv. (x2).
Step #4 - GdO.50.

Step # 4.

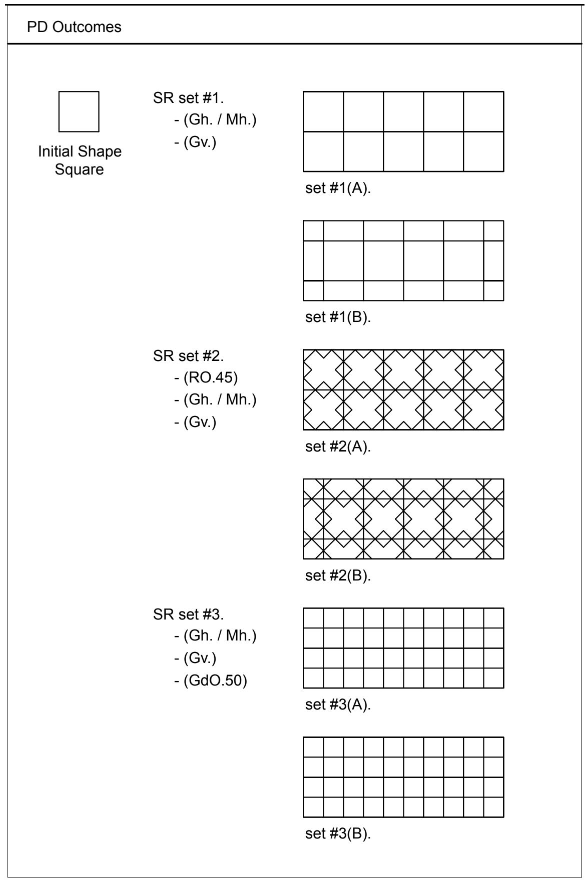


SR 3.
(GdO.50)

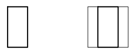
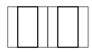
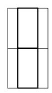
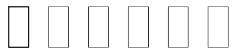
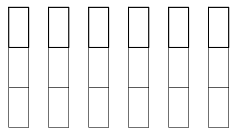
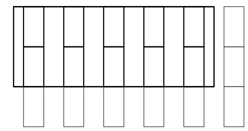
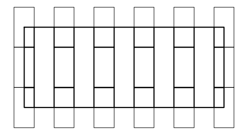
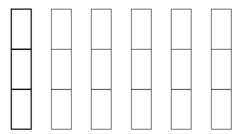
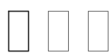
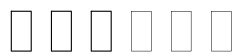
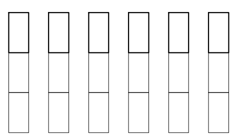
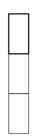
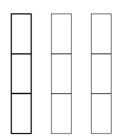
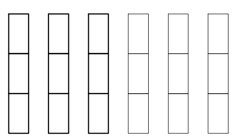
- (Gh. + Gh), Gh., (Gv. + Gv.), (GdO.50).
- (Gh. + Gh), Mh., (Gv. + Gv.), (GdO.50).

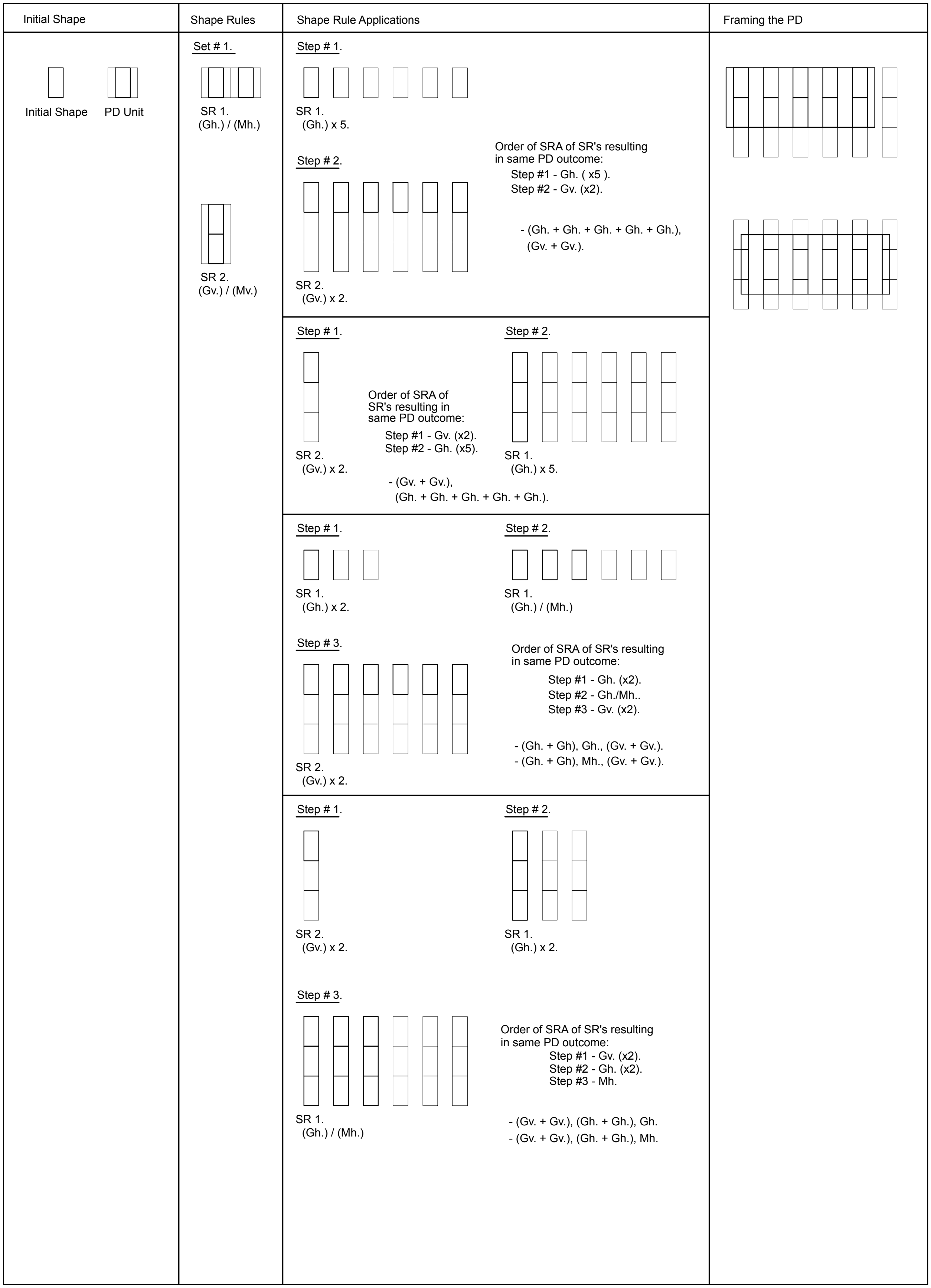
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 1. (Gh.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - Gh./Mh. Step #4 - GdO.50. Step # 4.  SR 3. (GdO.50) - (Gv. + Gv.), (Gh. + Gh.), Gh., (GdO.50). - (Gv. + Gv.), (Gh. + Gh.), Mh., (GdO.50).	
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - Gh./Mh. Step #4 - GdO.50. Step # 4.  SR 3. (GdO.50) - (Gh. + Gh.), (Gv. + Gv.), Gh., (GdO.50). - (Gh. + Gh.), (Gv. + Gv.), Mh., (GdO.50).	

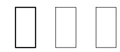
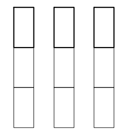
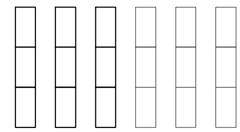
PD Formation: Initial Shape Square.

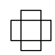
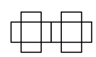
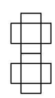
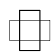
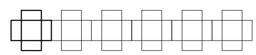
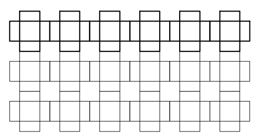
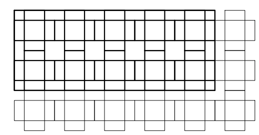
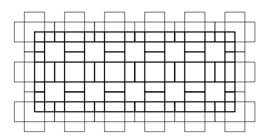
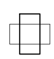
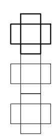
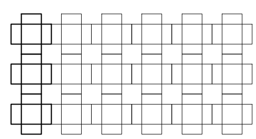
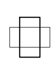
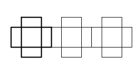
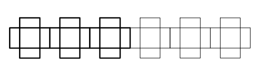
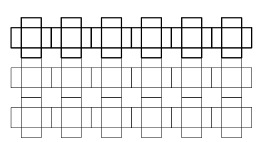


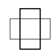
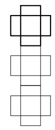
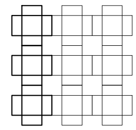
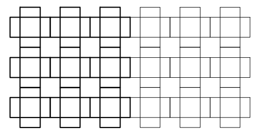
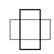
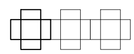
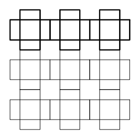
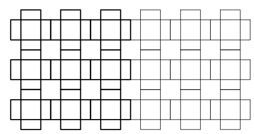
PD Framed Outcomes: Initial Shape Square.

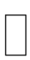
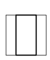
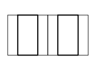
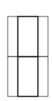
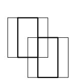
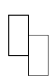
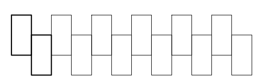
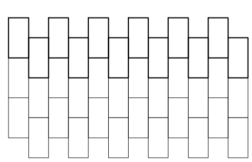
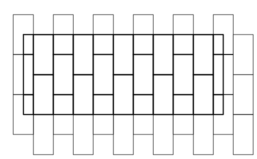
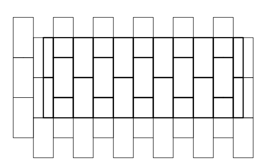
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
 Initial Shape PD Unit	Set # 1.  SR 1. (Gh.) / (Mh.)  SR 2. (Gv.) / (Mv.)	Step # 1.  SR 1. (Gh.) x 5. Step # 2.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x5). Step #2 - Gv. (x2). - (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.).	 
		Step # 1.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x5). - (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.). Step # 2.  SR 1. (Gh.) x 5.	
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 1. (Gh.) / (Mh.) Step # 3.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gh./Mh.. Step #3 - Gv. (x2). - (Gh. + Gh), Gh., (Gv. + Gv.). - (Gh. + Gh), Mh., (Gv. + Gv.).	
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 1. (Gh.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - Mh. - (Gv. + Gv.), (Gh. + Gh.), Gh. - (Gv. + Gv.), (Gh. + Gh.), Mh.	

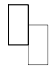
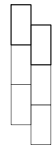
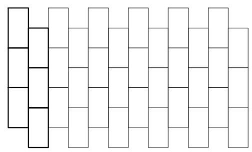
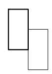
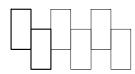
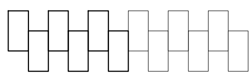
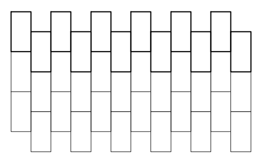
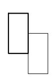
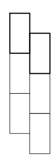
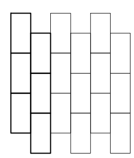
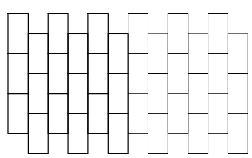

Initial Shape
Shape Rules
Shape Rule Applications
Framing the PD
Initial Shape
PD Unit
Set # 1.
SR 1.
(Gh.) / (Mh.)
SR 2.
(Gv.) / (Mv.)
Step # 1.
SR 1.
(Gh.) x 5.
Step # 2.
SR 2.
(Gv.) x 2.
Order of SRA of SR's resulting
in same PD outcome:
Step #1 - Gh. (x5).
Step #2 - Gv. (x2).
- (Gh. + Gh. + Gh. + Gh. + Gh.),
(Gv. + Gv.).
Step # 1.
SR 2.
(Gv.) x 2.
Order of SRA of
SR's resulting in
same PD outcome:
Step #1 - Gv. (x2).
Step #2 - Gh. (x5).
- (Gv. + Gv.),
(Gh. + Gh. + Gh. + Gh. + Gh.).
Step # 2.
SR 1.
(Gh.) x 5.
Step # 1.
SR 1.
(Gh.) x 2.
Step # 2.
SR 1.
(Gh.) / (Mh.)
Step # 3.
SR 2.
(Gv.) x 2.
Order of SRA of SR's resulting
in same PD outcome:
Step #1 - Gh. (x2).
Step #2 - Gh./Mh..
Step #3 - Gv. (x2).
- (Gh. + Gh), Gh., (Gv. + Gv.).
- (Gh. + Gh), Mh., (Gv. + Gv.).
Step # 1.
SR 2.
(Gv.) x 2.
Step # 2.
SR 1.
(Gh.) x 2.
Step # 3.
SR 1.
(Gh.) / (Mh.)
Order of SRA of SR's resulting
in same PD outcome:
Step #1 - Gv. (x2).
Step #2 - Gh. (x2).
Step #3 - Mh.
- (Gv. + Gv.), (Gh. + Gh.), Gh.
- (Gv. + Gv.), (Gh. + Gh.), Mh.

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - Gh./Mh. - (Gh. + Gh.), (Gv. + Gv.), Gh. - (Gh. + Gh.), (Gv. + Gv.), Mh.	

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
 Initial Shape PD Unit	Set # 2.  SR 1. (RO. 90)  SR 2. (Gh.) / (Mh.)  SR 3. (Gv.) / (Mv.)	Step # 1.  SR 1. (RO. 90) Step # 2.  SR 2. (Gh.) x 5. Step # 3.  SR 3. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 90. Step #2 - Gh. (x5). Step #3 - Gv. (x2). - RO 90., (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.).	 
		Step # 1.  SR 1. (RO. 90) Step # 2.  SR 3. (Gv.) x 2. Step # 3.  SR 2. (Gh.) x 5. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 90. Step #2 - Gv. (x2). Step #3 - Gh. (x5). - RO 90., (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.).	
		Step # 1.  SR 1. (RO. 90) Step # 2.  SR 2. (Gh.) x 2. Step # 3.  SR 2. (Gh.) / (Mh.) Step # 4.  SR 3. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 90. Step #2 - Gh. (x2). Step #3 - Gh./Mh. Step #4 - Gv. (x2). - RO 90., (Gh. + Gh), Gh., (Gv. + Gv.). - RO 90., (Gh. + Gh), Mh., (Gv. + Gv.).	

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (RO. 90) Step # 2.  SR 3. (Gv.) x 2. Step # 3.  SR 2. (Gh.) x 2. Step # 4.  SR 2. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 90. Step #2 - Gv. (x2). Step #3 - Gh. (x2). Step #4 - Gh./Mh. - RO 90., (Gv. + Gv.), (Gh. + Gh.), Gh. - RO 90., (Gv. + Gv.), (Gh. + Gh.), Mh.	
		Step # 1.  SR 1. (RO. 90) Step # 2.  SR 2. (Gh.) x 2. Step # 3.  SR 3. (Gv.) x 2. Step # 4.  SR 2. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 90. Step #2 - Gh. (x2). Step #3 - Gv. (x2). Step #4 - Gh./Mh. - RO 90., (Gh. + Gh.), (Gv. + Gv.), Gh. - RO 90., (Gh. + Gh.), (Gv. + Gv.), Mh.	

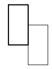
Initial Shape	Shape Rules	Shape Rule Applications - (SR 'GdO.50' used in Step #1.)	Framing the PD
 Initial Shape  PD Unit	Set # 3.  SR 1. (Gh.) / (Mh.)  SR 2. (Gv.) / (Mv.)  SR 3. (GdO. 50)	Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 1. (Gh.) x 5 Step # 3.  SR 2. (Gv.) x 2 Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO. 50. Step #2 - Gh. (x5). Step #3 - Gv. (x2). - GdO. 50., (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.).	 

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO. 50. Step #2 - Gv. (x2). Step #3 - Gh. (x5). Step # 3.  SR 1. (Gh.) x 5. - GdO. 50., (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.).	
		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 1. (Gh.) x 2 Step # 3.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO.50. Step #2 - Gh. (x2).. Step #3 - Gh. Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - GdO.50, (Gh. + Gh), Gh., (Gv. + Gv.).	- ** Mirror rule can not apply.
		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) x 2. Step # 4.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO.50. Step #2 - Gv. (x2).. Step #3 - Gh. (x2) Step #4 - Gh. - GdO.50, (Gv. + Gv), (Gh. + Gh.), Gh.	- ** Mirror rule can not apply.

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		(see below)	- ** Mirror rule can not apply.

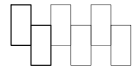
Shape Rule Applications

Step # 1.



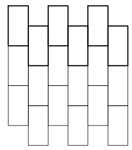
SR 3.
(GdO. 50)

Step # 2.



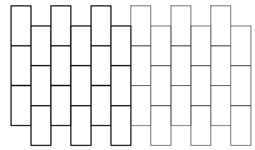
SR 1.
(Gh.) x 2

Step # 3.



SR 2.
(Gv.) x 2.

Step # 4.



SR 2.
(Gh.)

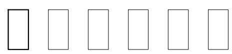
Order of SRA of SR's resulting in same PD outcome:

Step #1 - GdO.50.
Step #2 - Gh. (x2).
Step #3 - Gv. (x2).
Step #4 - Gh.

- GdO.50, (Gh. + Gh),
(Gv. + Gv.), Gh.

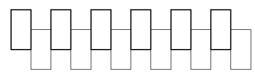
Shape Rule Applications - (SR 'GdO.50' used in Step #2.)

Step # 1.



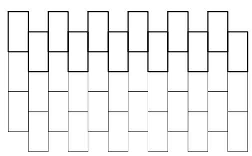
SR 1.
(Gh.) x 5.

Step # 2.



SR 3.
(GdO. 50)

Step # 3.



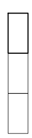
SR 2.
(Gv.) x 2

Order of SRA of SR's resulting in same PD outcome:

Step #1 - Gh. (x5).
Step #2 - GdO. 50.
Step #3 - Gv. (x2).

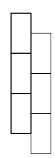
- (Gh. + Gh. + Gh. + Gh. + Gh.),
GdO. 50., (Gv. + Gv.).

Step # 1.



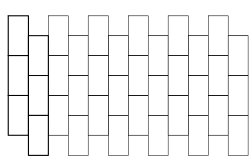
SR 2.
(Gv.) x 2.

Step # 2.



SR 3.
(GdO. 50)

Step # 3.

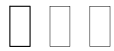
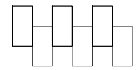
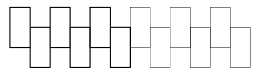
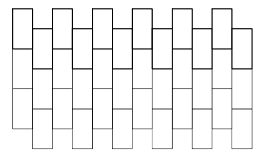
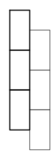
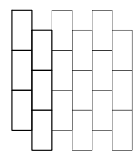
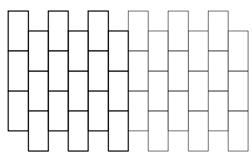
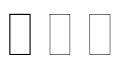
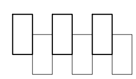
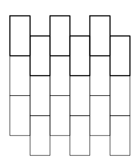
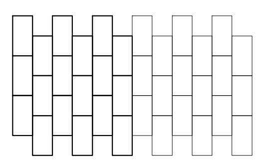


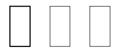
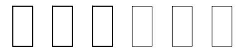
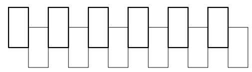
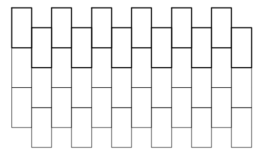
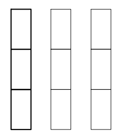
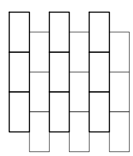
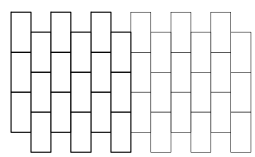
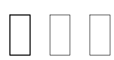
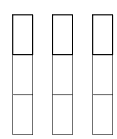
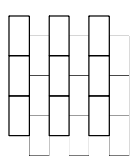
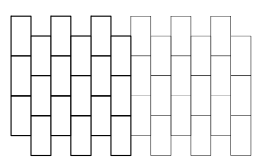
SR 1.
(Gh.) x 5.

Order of SRA of SR's resulting in same PD outcome:

Step #1 - Gv. (x2).
Step #2 - GdO. 50.
Step #3 - Gh. (x5).

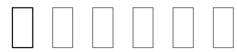
- (Gv. + Gv.), GdO. 50,
(Gh. + Gh. + Gh. + Gh. + Gh.),

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - GdO.50. Step #3 - Gh. Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - (Gh. + Gh.), GdO.50, Gh., (Gv. + Gv.).	- ** Mirror rule can not apply.
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 1. (Gh.) x 2. Step # 4.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - GdO.50. Step #3 - Gh. (x2). Step #4 - Gh. - (Gv. + Gv), GdO.50, (Gh. + Gh.), Gh.	- ** Mirror rule can not apply.
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 2. (Gv.) x 2. Step # 4.  SR 2. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - GdO.50. Step #3 - Gv. (x2). Step #4 - Gh. - (Gh. + Gh), GdO.50, (Gv. + Gv.), Gh.	- ** Mirror rule can not apply.

Initial Shape	Shape Rules	Shape Rule Applications - (SR 'GdO.50' used in Step #3.)	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 1. (Gh.) / (Mh.) Step # 3.  SR 3. (GdO. 50) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gh./Mh. Step #3 - GdO.50. Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - (Gh. + Gh.), Gh.,GdO.50, (Gv. + Gv.). - (Gh. + Gh.), Mh.,GdO.50, (Gv. + Gv.).	
		Step # 1.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - GdO.50. Step #4 - Gh. Step # 2.  SR 1. (Gh.) x 2. Step # 3.  SR 3. (GdO. 50) Step # 4.  SR 1. (Gh.) - (Gv. + Gv.), (Gh. + Gh.), (GdO.50), Gh.	- ** Mirror rule can not apply.
		Step # 1.  SR 1. (Gh.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - GdO.50. Step #4 - Gh. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 3. (GdO.50) Step # 4.  SR 2. (Gh.) - (Gh. + Gh.), (Gv. + Gv.), (GdO.50), Gh.	- ** Mirror rule can not apply.

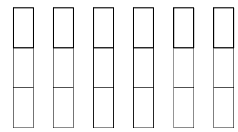
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		(see below)	

Step # 1.



SR 1.
(Gh.) x 5.

Step # 2.

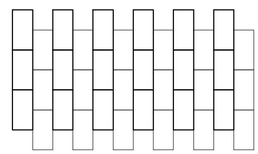


SR 2.
(Gv.) x 2.

Order of SRA of SR's resulting in same PD outcome:

Step #1 - Gh. (x5).
Step #2 - Gv. (x2).
Step #3 - GdO.50.

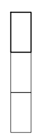
Step # 3.



SR 3.
(GdO.50)

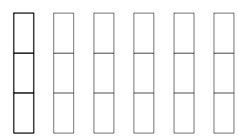
- (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.), (GdO.50).

Step # 1.



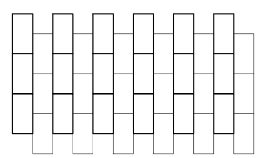
SR 2.
(Gv.) x 2.

Step # 2.



SR 1.
(Gh.) x 5.

Step # 3.



SR 3.
(GdO.50)

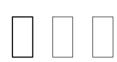
Order of SRA of SR's resulting in same PD outcome:

Step #1 - Gv. (x2).
Step #2 - Gh. (x5).
Step #3 - GdO.50.

- (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.). (GdO.50).

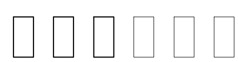
Shape Rule Applications - (SR 'GdO.50' used in Step #4.)

Step # 1.



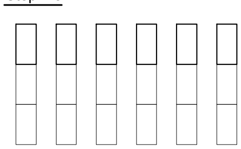
SR 1.
(Gh.) x 2.

Step # 2.



SR 1.
(Gh.) / (Mh.)

Step # 3.

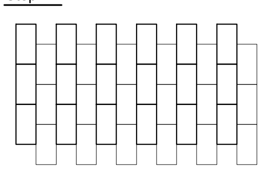


SR 2.
(Gv.) x 2.

Order of SRA of SR's resulting in same PD outcome:

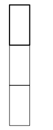
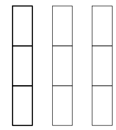
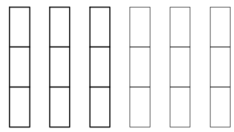
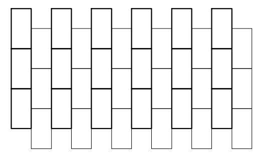
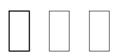
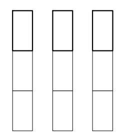
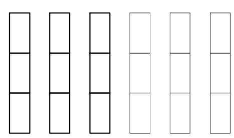
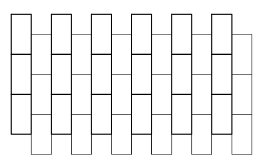
Step #1 - Gh. (x2).
Step #2 - Gh./Mh..
Step #3 - Gv. (x2).
Step #4 - GdO.50.

Step # 4.

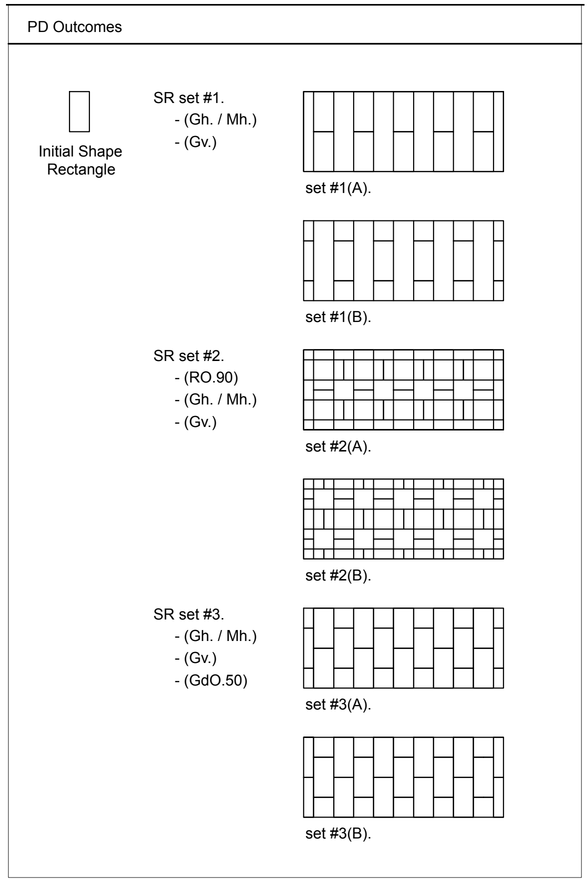


SR 3.
(GdO.50)

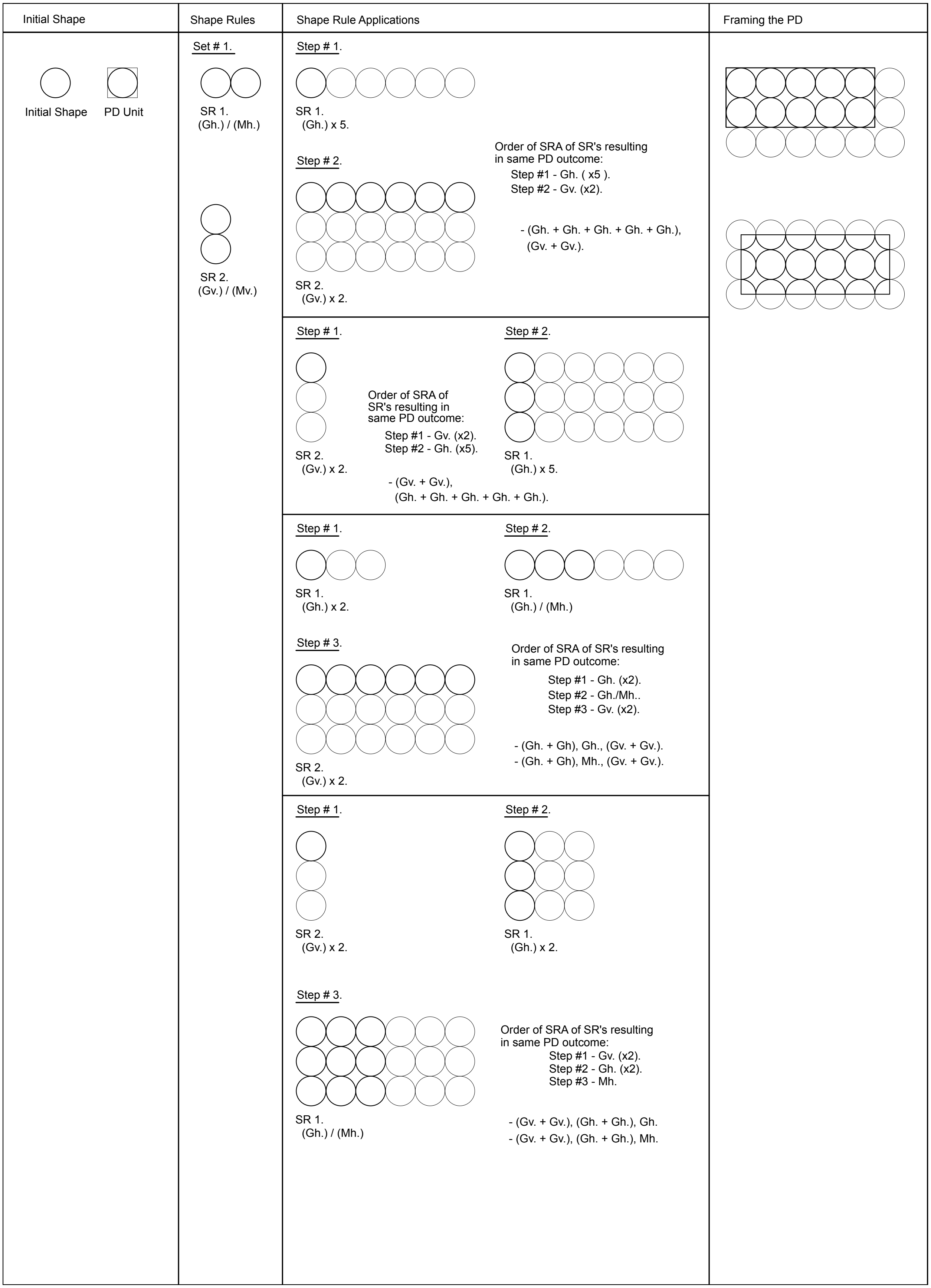
- (Gh. + Gh), Gh., (Gv. + Gv.), (GdO.50).
- (Gh. + Gh), Mh., (Gv. + Gv.), (GdO.50).

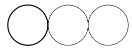
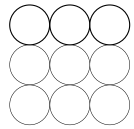
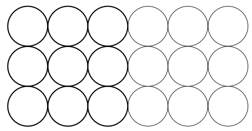
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 1. (Gh.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - Gh./Mh. Step #4 - GdO.50. Step # 4.  SR 3. (GdO.50) - (Gv. + Gv.), (Gh. + Gh.), Gh., (GdO.50). - (Gv. + Gv.), (Gh. + Gh.), Mh., (GdO.50).	
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - Gh./Mh. Step #4 - GdO.50. Step # 4.  SR 3. (GdO.50) - (Gh. + Gh.), (Gv. + Gv.), Gh., (GdO.50). - (Gh. + Gh.), (Gv. + Gv.), Mh., (GdO.50).	

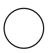
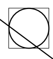
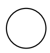
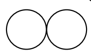
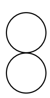
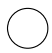
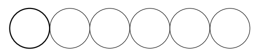
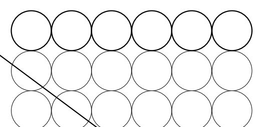
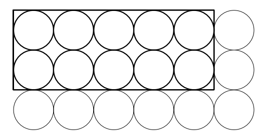
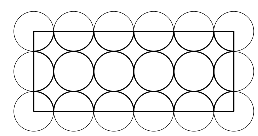
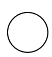
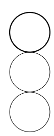
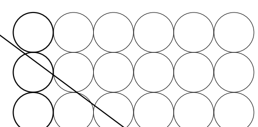
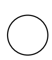
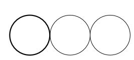
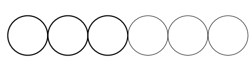
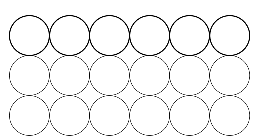
PD Formation: Initial Shape Rectangle.

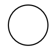
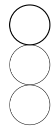
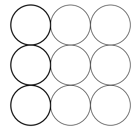
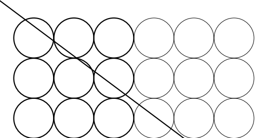
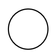
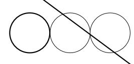
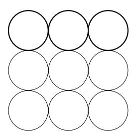
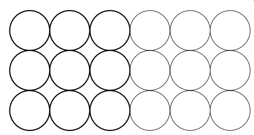


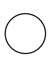
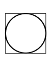
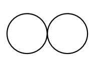
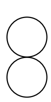
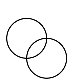
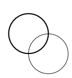
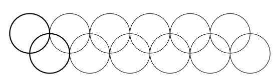
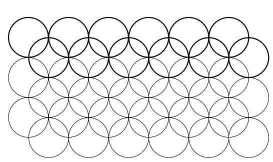
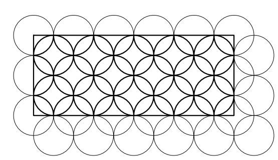
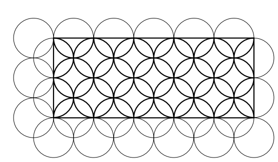
PD Framed Outcomes: Initial Shape Rectangle.

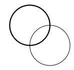
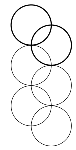
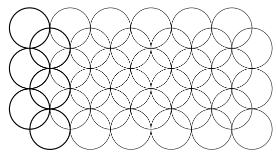
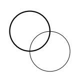
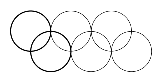
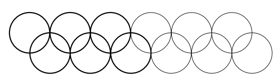
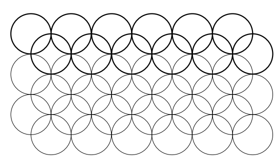
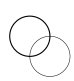
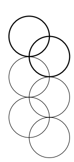
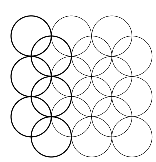
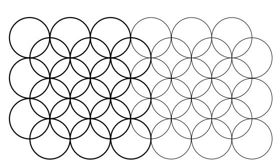

Initial Shape
Shape Rules
Shape Rule Applications
Framing the PD
Initial Shape
PD Unit
Set # 1.
SR 1.
(Gh.) / (Mh.)
SR 2.
(Gv.) / (Mv.)
Step # 1.
SR 1.
(Gh.) x 5.
Step # 2.
SR 2.
(Gv.) x 2.
Order of SRA of SR's resulting in same PD outcome:
Step #1 - Gh. (x5).
Step #2 - Gv. (x2).
- (Gh. + Gh. + Gh. + Gh. + Gh.),
(Gv. + Gv.).
Step # 1.
SR 2.
(Gv.) x 2.
Order of SRA of SR's resulting in same PD outcome:
Step #1 - Gv. (x2).
Step #2 - Gh. (x5).
- (Gv. + Gv.),
(Gh. + Gh. + Gh. + Gh. + Gh.).
Step # 2.
SR 1.
(Gh.) x 5.
Step # 1.
SR 1.
(Gh.) x 2.
Step # 2.
SR 1.
(Gh.) / (Mh.)
Step # 3.
SR 2.
(Gv.) x 2.
Order of SRA of SR's resulting in same PD outcome:
Step #1 - Gh. (x2).
Step #2 - Gh./Mh..
Step #3 - Gv. (x2).
- (Gh. + Gh), Gh., (Gv. + Gv.).
- (Gh. + Gh), Mh., (Gv. + Gv.).
Step # 1.
SR 2.
(Gv.) x 2.
Step # 2.
SR 1.
(Gh.) x 2.
Step # 3.
SR 1.
(Gh.) / (Mh.)
Order of SRA of SR's resulting in same PD outcome:
Step #1 - Gv. (x2).
Step #2 - Gh. (x2).
Step #3 - Mh.
- (Gv. + Gv.), (Gh. + Gh.), Gh.
- (Gv. + Gv.), (Gh. + Gh.), Mh.

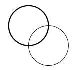
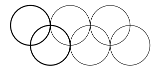
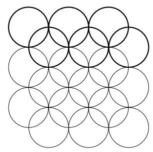
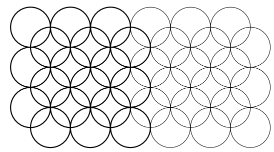
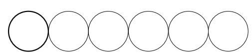
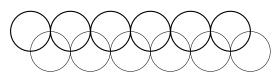
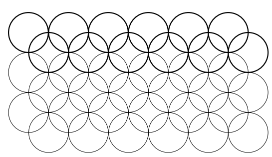
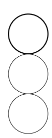
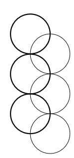
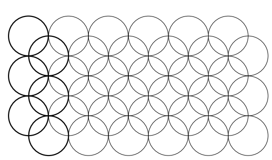
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - Gh./Mh. - (Gh. + Gh.), (Gv. + Gv.), Gh. - (Gh. + Gh.), (Gv. + Gv.), Mh.	

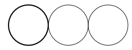
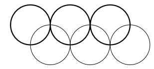
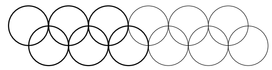
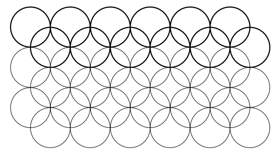
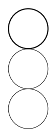
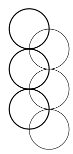
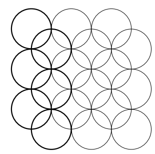
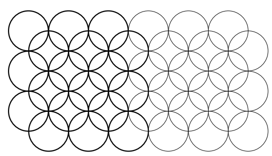
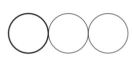
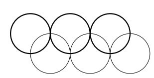
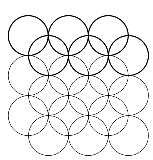
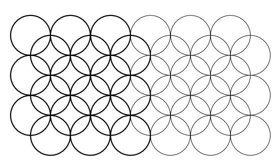
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
  Initial Shape PD Unit - SRA (RO. 'at any degree') results in same IS outcome and SR set#1 PD outcome. Therefore, SRA (RO.) can not be applied to IS Circle.	Set # 2.  SR 1. (RO.)  SR 2. (Gh.) / (Mh.)  SR 3. (Gv.) / (Mv.)	Step # 1.  SR 1. (RO.) Step # 2.  SR 2. (Gh.) x 5. Step # 3.  SR 3. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO. Step #2 - Gh. (x5). Step #3 - Gv. (x2). - RO., (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.).	 
		Step # 1.  SR 1. (RO.) Step # 2.  SR 3. (Gv.) x 2. Step # 3.  SR 2. (Gh.) x 5. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO. Step #2 - Gv. (x2). Step #3 - Gh. (x5). - RO., (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.).	
		Step # 1.  SR 1. (RO.) Step # 2.  SR 2. (Gh.) x 2. Step # 3.  SR 2. (Gh.) / (Mh.) Step # 4.  SR 3. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO. Step #2 - Gh. (x2). Step #3 - Gh./Mh. Step #4 - Gv. (x2). - RO., (Gh. + Gh), Gh., (Gv. + Gv.). - RO., (Gh. + Gh), Mh., (Gv. + Gv.).	

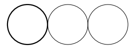
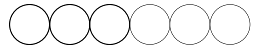
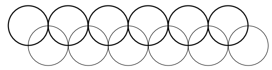
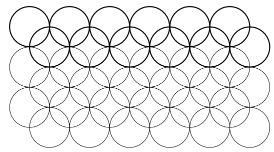
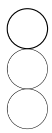
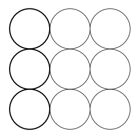
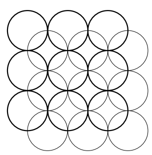
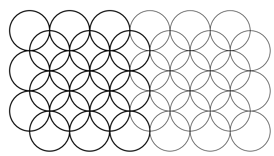
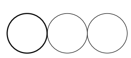
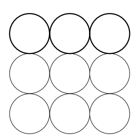
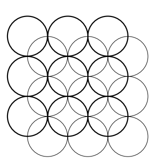
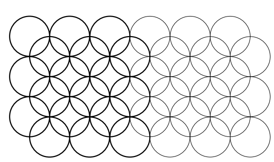
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (RO.) Step # 2.  SR 3. (Gv.) x 2. Step # 3.  SR 2. (Gh.) x 2. Step # 4.  SR 2. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gv. (x2). Step #3 - Gh. (x2). Step #4 - Gh./Mh. - RO., (Gv. + Gv.), (Gh. + Gh.), Gh. - RO., (Gv. + Gv.), (Gh. + Gh.), Mh.	
		Step # 1.  SR 1. (RO.) Step # 2.  SR 2. (Gh.) x 2. Step # 3.  SR 3. (Gv.) x 2. Step # 4.  SR 2. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - RO. Step #2 - Gh. (x2). Step #3 - Gv. (x2). Step #4 - Gh./Mh. - RO., (Gh. + Gh.), (Gv. + Gv.), Gh. - RO., (Gh. + Gh.), (Gv. + Gv.), Mh.	

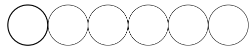
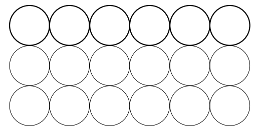
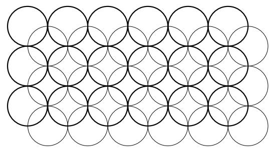
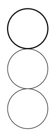
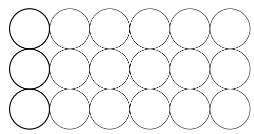
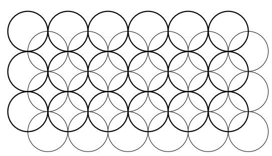
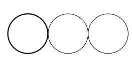
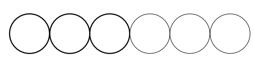
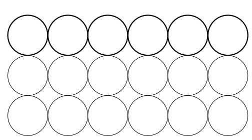
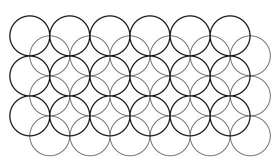
Initial Shape	Shape Rules	Shape Rule Applications - (SR 'GdO.50' used in Step #1.)	Framing the PD
 Initial Shape  PD Unit	Set # 3.  SR 1. (Gh.) / (Mh.)  SR 2. (Gv.) / (Mv.)  SR 3. (GdO. 50)	Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 1. (Gh.) x 5 Step # 3.  SR 2. (Gv.) x 2 Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO. 50. Step #2 - Gh. (x5). Step #3 - Gv. (x2). - GdO. 50., (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.).	 

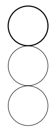
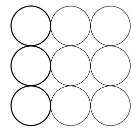
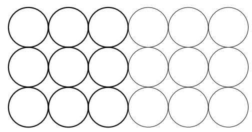
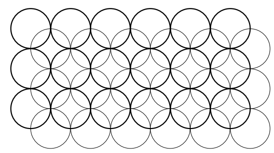
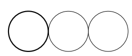
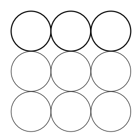
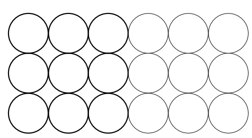
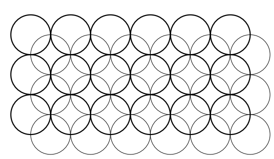
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO. 50. Step #2 - Gv. (x2). Step #3 - Gh. (x5). Step # 3.  SR 1. (Gh.) x 5. - GdO. 50., (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.).	
		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 1. (Gh.) x 2 Step # 3.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO.50. Step #2 - Gh. (x2). Step #3 - Gh. Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - GdO.50, (Gh. + Gh), Gh., (Gv. + Gv.).	- ** Mirror rule can not apply.
		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) x 2. Step # 4.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO.50. Step #2 - Gv. (x2).. Step #3 - Gh. (x2) Step #4 - Gh. - GdO.50, (Gv. + Gv), (Gh. + Gh.), Gh.	- ** Mirror rule can not apply.

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 1. (Gh.) x 2 Step # 3.  SR 2. (Gv.) x 2. Step # 4.  SR 2. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO.50. Step #2 - Gh. (x2). Step #3 - Gv. (x2). Step #4 - Gh. - GdO.50, (Gh. + Gh), (Gv. + Gv.), Gh.	- ** Mirror rule can not apply.
		Shape Rule Applications - (SR 'GdO.50' used in Step #2.)	
		Step # 1.  SR 1. (Gh.) x 5. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 2. (Gv.) x 2 Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x5). Step #2 - GdO. 50. Step #3 - Gv. (x2). - (Gh. + Gh. + Gh. + Gh. + Gh.), GdO. 50., (Gv. + Gv.).	
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 1. (Gh.) x 5. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - GdO. 50. Step #3 - Gh. (x5). - (Gv. + Gv.), GdO. 50, (Gh. + Gh. + Gh. + Gh. + Gh.),	

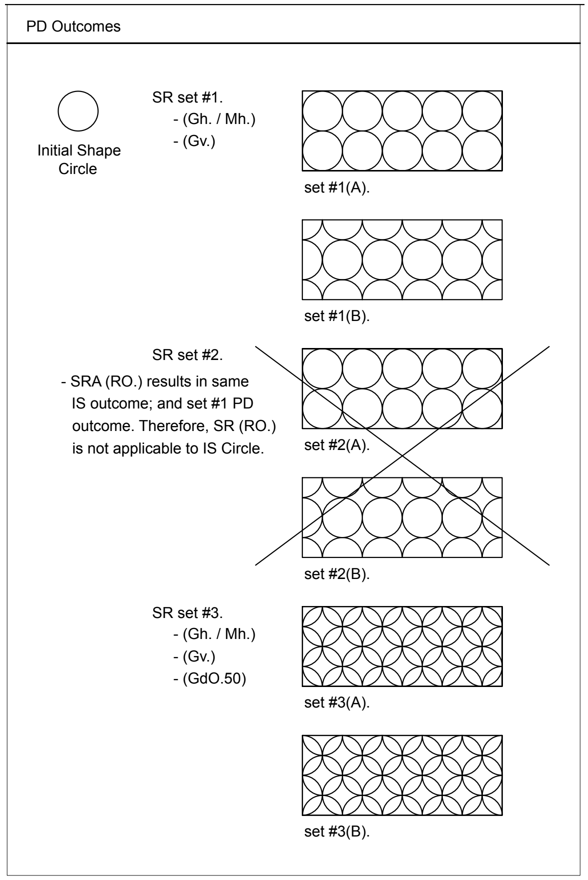
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		<u>Step # 1.</u>  SR 1. (Gh.) x 2. <u>Step # 2.</u>  SR 3. (GdO. 50) <u>Step # 3.</u>  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - GdO.50. Step #3 - Gh. Step #4 - .Gv. (x2). <u>Step # 4.</u>  SR 2. (Gv.) x 2. - (Gh. + Gh.), GdO.50, Gh., (Gv. + Gv.).	- ** Mirror rule can not apply.
		<u>Step # 1.</u>  SR 2. (Gv.) x 2. <u>Step # 2.</u>  SR 3. (GdO. 50) <u>Step # 3.</u>  SR 1. (Gh.) x 2. <u>Step # 4.</u>  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - GdO.50. Step #3 - Gh. (x2). Step #4 - Gh. - (Gv. + Gv), GdO.50, (Gh. + Gh.), Gh.	- ** Mirror rule can not apply.
		<u>Step # 1.</u>  SR 1. (Gh.) x 2. <u>Step # 2.</u>  SR 3. (GdO. 50) <u>Step # 3.</u>  SR 2. (Gv.) x 2. <u>Step # 4.</u>  SR 2. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - GdO.50. Step #3 - Gv. (x2). Step #4 - Gh. - (Gh. + Gh), GdO.50, (Gv. + Gv.), Gh.	- ** Mirror rule can not apply.

Initial Shape	Shape Rules	Shape Rule Applications - (SR 'GdO.50' used in Step #3.)	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 1. (Gh.) / (Mh.) Step # 3.  SR 3. (GdO. 50) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gh./Mh. Step #3 - GdO.50. Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - (Gh. + Gh.), Gh.,GdO.50, (Gv. + Gv.). - (Gh. + Gh.), Mh.,GdO.50, (Gv. + Gv.).	
		Step # 1.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - GdO.50. Step #4 - Gh. Step # 2.  SR 1. (Gh.) x 2. Step # 3.  SR 3. (GdO. 50) Step # 4.  SR 1. (Gh.) - (Gv. + Gv.), (Gh. + Gh.), (GdO.50), Gh.	- ** Mirror rule can not apply.
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - GdO.50. Step #4 - Gh. Step # 3.  SR 3. (GdO.50) Step # 4.  SR 2. (Gh.) - (Gh. + Gh.), (Gv. + Gv.), (GdO.50), Gh.	- ** Mirror rule can not apply.

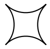
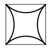
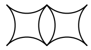
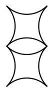
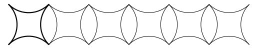
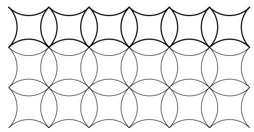
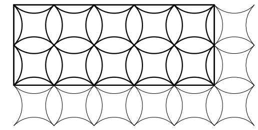
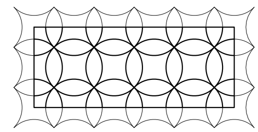
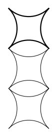
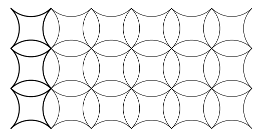
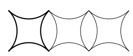
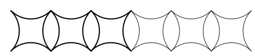
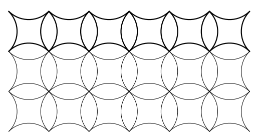
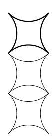
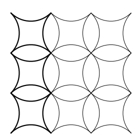
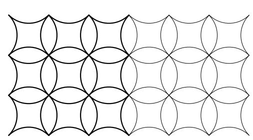
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 5. Step # 2.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x5). Step #2 - Gv. (x2). Step #3 - GdO.50. Step # 3.  SR 3. (GdO.50) - (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.), (GdO.50).	
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 1. (Gh.) x 5. Step # 3.  SR 3. (GdO.50) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x5). Step #3 - GdO.50. - (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.). (GdO.50).	
		Shape Rule Applications - (SR 'GdO.50' used in Step #4.)	
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 1. (Gh.) / (Mh.) Step # 3.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gh./Mh.. Step #3 - Gv. (x2). Step #4 - GdO.50. Step # 4.  SR 3. (GdO.50) - (Gh. + Gh), Gh., (Gv. + Gv.), (GdO.50). - (Gh. + Gh), Mh., (Gv. + Gv.), (GdO.50).	

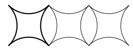
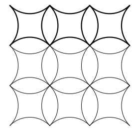
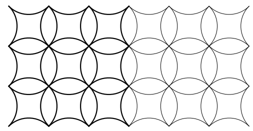
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 1. (Gh.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - Gh./Mh. Step #4 - GdO.50. Step # 4.  SR 3. (GdO.50) - (Gv. + Gv.), (Gh. + Gh.), Gh., (GdO.50). - (Gv. + Gv.), (Gh. + Gh.), Mh., (GdO.50).	
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - Gh./Mh. Step #4 - GdO.50. Step # 4.  SR 3. (GdO.50) - (Gh. + Gh.), (Gv. + Gv.), Gh., (GdO.50). - (Gh. + Gh.), (Gv. + Gv.), Mh., (GdO.50).	

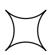
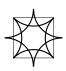
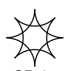
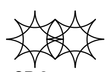
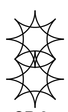
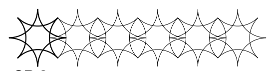
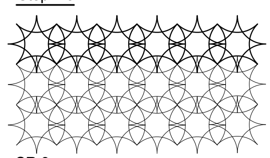
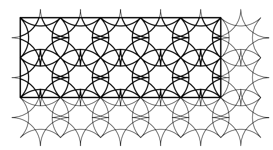
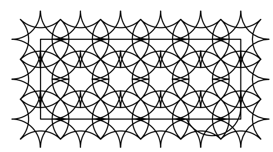
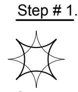
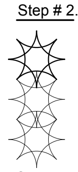
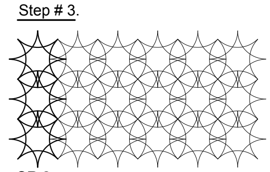
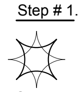
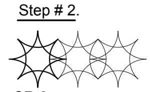
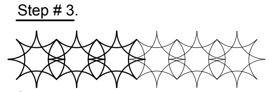
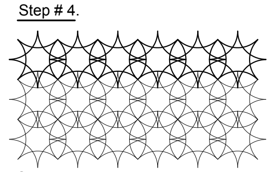
PD Formation: Initial Shape Circle.

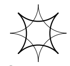
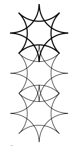
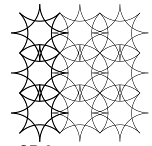
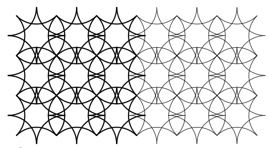
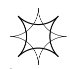
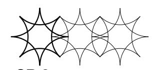
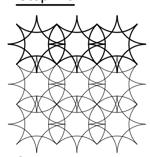
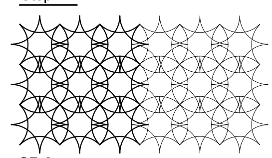


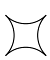
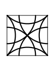
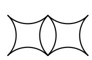
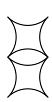
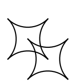
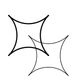
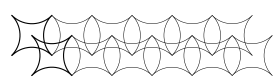
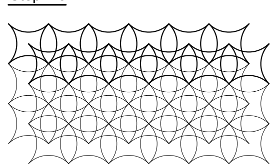
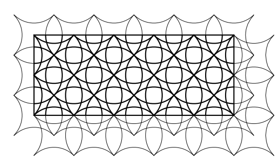
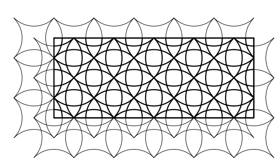
PD Framed Outcomes: Initial Shape Circle.

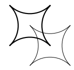
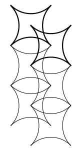
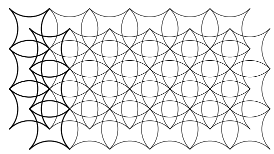
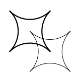
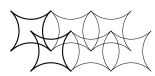
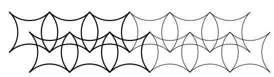
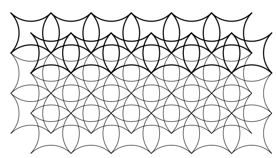
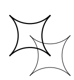
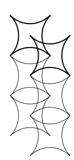
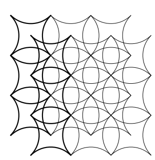
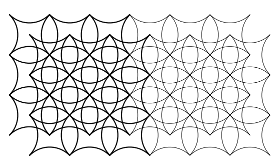
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
 Initial Shape  PD Unit	Set # 1.  SR 1. (Gh.) / (Mh.)  SR 2. (Gv.) / (Mv.)	Step # 1.  SR 1. (Gh.) x 5. Step # 2.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x5). Step #2 - Gv. (x2). - (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.).	 
		Step # 1.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x5). Step # 2.  SR 1. (Gh.) x 5. - (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.).	
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 1. (Gh.) / (Mh.) Step # 3.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gh./Mh.. Step #3 - Gv. (x2). - (Gh. + Gh), Gh., (Gv. + Gv.). - (Gh. + Gh), Mh., (Gv. + Gv.).	
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 1. (Gh.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - Mh. - (Gv. + Gv.), (Gh. + Gh.), Gh. - (Gv. + Gv.), (Gh. + Gh.), Mh.	

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - Gh./Mh. - (Gh. + Gh.), (Gv. + Gv.), Gh. - (Gh. + Gh.), (Gv. + Gv.), Mh.	

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
 Initial Shape  PD Unit	Set # 2.  SR 1. (RO. 45)  SR 2. (Gh.) / (Mh.)  SR 3. (Gv.) / (Mv.)	Step # 1.  SR 1. (RO. 45) Step # 2.  SR 2. (Gh.) x 5. Step # 3.  SR 3. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gh. (x5). Step #3 - Gv. (x2). - RO 45., (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.).	 
		Step # 1.  SR 1. (RO. 45) Step # 2.  SR 3. (Gv.) x 2. Step # 3.  SR 2. (Gh.) x 5. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gv. (x2). Step #3 - Gh. (x5). - RO 45., (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.).	
		Step # 1.  SR 1. (RO. 45) Step # 2.  SR 2. (Gh.) x 2. Step # 3.  SR 2. (Gh.) / (Mh.) Step # 4.  SR 3. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gh. (x2). Step #3 - Gh./Mh. Step #4 - Gv. (x2). - RO 45., (Gh. + Gh), Gh., (Gv. + Gv.). - RO 45., (Gh. + Gh), Mh., (Gv. + Gv.).	

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (RO. 45) Step # 2.  SR 3. (Gv.) x 2. Step # 3.  SR 2. (Gh.) x 2. Step # 4.  SR 2. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gv. (x2). Step #3 - Gh. (x2). Step #4 - Gh./Mh. - RO 45., (Gv. + Gv.), (Gh. + Gh.), Gh. - RO 45., (Gv. + Gv.), (Gh. + Gh.), Mh.	
		Step # 1.  SR 1. (RO. 45) Step # 2.  SR 2. (Gh.) x 2. Step # 3.  SR 3. (Gv.) x 2. Step # 4.  SR 2. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gh. (x2). Step #3 - Gv. (x2). Step #4 - Gh./Mh. - RO 45., (Gh. + Gh.), (Gv. + Gv.), Gh. - RO 45., (Gh. + Gh.), (Gv. + Gv.), Mh.	

Initial Shape	Shape Rules	Shape Rule Applications - (SR 'GdO.50' used in Step #1.)	Framing the PD
 Initial Shape  PD Unit	Set # 3.  SR 1. (Gh.) / (Mh.)  SR 2. (Gv.) / (Mv.)  SR 3. (GdO. 50)	Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 1. (Gh.) x 5 Step # 3.  SR 2. (Gv.) x 2 Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO. 50. Step #2 - Gh. (x5). Step #3 - Gv. (x2). - GdO. 50., (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.).	 

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO. 50. Step #2 - Gv. (x2). Step #3 - Gh. (x5). Step # 3.  SR 1. (Gh.) x 5. - GdO. 50., (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.).	
		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 1. (Gh.) x 2 Step # 3.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO.50. Step #2 - Gh. (x2).. Step #3 - Gh. Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - GdO.50, (Gh. + Gh), Gh., (Gv. + Gv.).	- ** Mirror rule can not apply.
		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO.50. Step #2 - Gv. (x2).. Step #3 - Gh. (x2) Step #4 - Gh. Step # 4.  SR 1. (Gh.) - GdO.50, (Gv. + Gv), (Gh. + Gh.), Gh.	- ** Mirror rule can not apply.

<table>
<tr><th>Initial Shape</th><th>Shape Rules</th><th>Shape Rule Applications</th><th>Framing the PD</th></tr>
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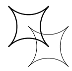
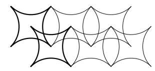
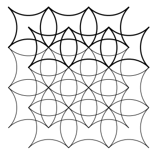
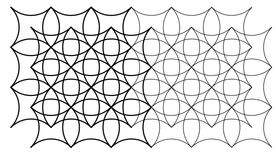
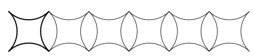

SR 3.
(GdO. 50)

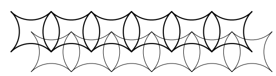
Step # 2.

SR 1.
(Gh.) x 2

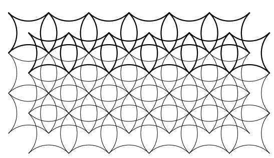
Step # 3.

SR 2.
(Gv.) x 2.

Step # 4.

SR 2.
(Gh.)

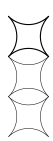
Order of SRA of SR's resulting
in same PD outcome:
Step #1 - GdO.50.
Step #2 - Gh. (x2).
Step #3 - Gv. (x2).
Step #4 - Gh.

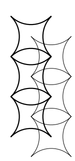
- GdO.50, (Gh. + Gh),
(Gv. + Gv.), Gh.
</td><td>- ** Mirror rule can not apply.</td></tr>
<tr><td></td><td></td><td>Shape Rule Applications - (SR 'GdO.50' used in Step #2.)</td><td></td></tr>
<tr><td></td><td></td><td>
Step # 1.

SR 1.
(Gh.) x 5.

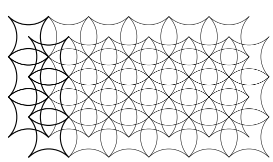
Step # 2.

SR 3.
(GdO. 50)

Step # 3.

SR 2.
(Gv.) x 2

Order of SRA of SR's resulting
in same PD outcome:
Step #1 - Gh. (x5).
Step #2 - GdO. 50.
Step #3 - Gv. (x2).

- (Gh. + Gh. + Gh. + Gh. + Gh.),
GdO. 50., (Gv. + Gv.).
</td><td></td></tr>
<tr><td></td><td></td><td>
Step # 1.

SR 2.
(Gv.) x 2.

Step # 2.

SR 3.
(GdO. 50)

Step # 3.

SR 1.
(Gh.) x 5.

Order of SRA of SR's resulting
in same PD outcome:
Step #1 - Gv. (x2).
Step #2 - GdO. 50.
Step #3 - Gh. (x5).

- (Gv. + Gv.), GdO. 50,
(Gh. + Gh. + Gh. + Gh. + Gh.),
</td><td></td></tr>
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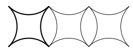
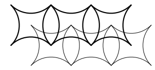
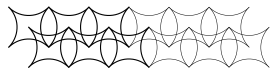
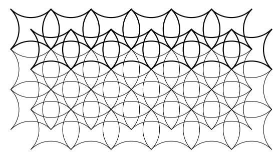
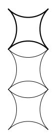
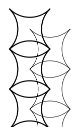
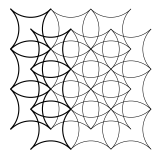
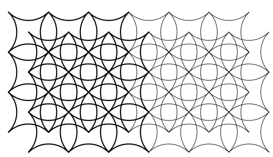
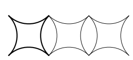
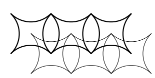
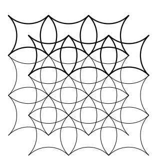
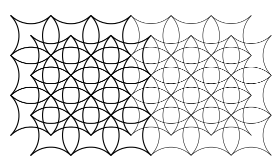
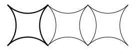
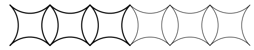
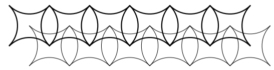
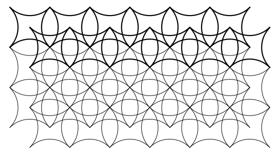
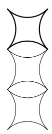
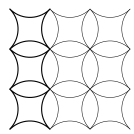
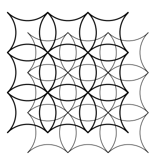
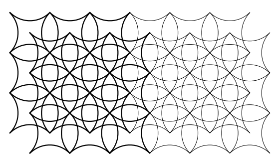
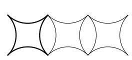
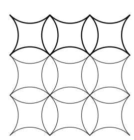
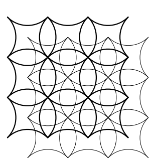
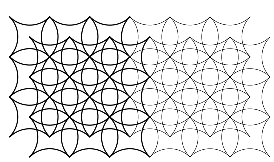
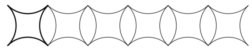
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - GdO.50. Step #3 - Gh./Mh Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - (Gh. + Gh.), GdO.50, Gh., (Gv. + Gv.). - (Gh. + Gh.), GdO.50, Mh., (Gv. + Gv.).	- ** Mirror rule can not apply.
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 1. (Gh.) x 2. Step # 4.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - GdO.50. Step #3 - Gh. (x2). Step #4 - Gh. - (Gv. + Gv), GdO.50, (Gh. + Gh.), Gh.	- ** Mirror rule can not apply.
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 2. (Gv.) x 2. Step # 4.  SR 2. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - GdO.50. Step #3 - Gv. (x2). Step #4 - Gh. - (Gh. + Gh), GdO.50, (Gv. + Gv.), Gh.	- ** Mirror rule can not apply.

Initial Shape	Shape Rules	Shape Rule Applications - (SR 'GdO.50' used in Step #3.)	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 1. (Gh.) / (Mh.) Step # 3.  SR 3. (GdO. 50) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gh./Mh. Step #3 - GdO.50. Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - (Gh. + Gh.), Gh.,GdO.50, (Gv. + Gv.). - (Gh. + Gh.), Mh.,GdO.50, (Gv. + Gv.).	
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 1. (Gh.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - GdO.50. Step #4 - Gh. Step # 3.  SR 3. (GdO. 50) Step # 4.  SR 1. (Gh.) - (Gv. + Gv.), (Gh. + Gh.), (GdO.50), Gh.	- ** Mirror rule can not apply.
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - GdO.50. Step #4 - Gh. Step # 3.  SR 3. (GdO.50) Step # 4.  SR 2. (Gh.) - (Gh. + Gh.), (Gv. + Gv.), (GdO.50), Gh.	- ** Mirror rule can not apply.

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued			

Step # 1.

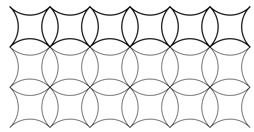


SR 1.
(Gh.) x 5.

Order of SRA of SR's resulting in same PD outcome:

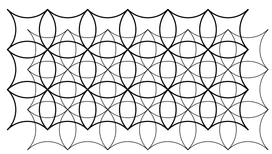
Step #1 - Gh. (x5).
Step #2 - Gv. (x2).
Step #3 - GdO.50.

Step # 2.



SR 2.
(Gv.) x 2.

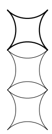
Step # 3.



SR 3.
(GdO.50)

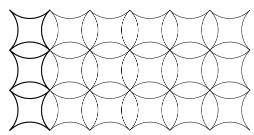
- (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.), (GdO.50).

Step # 1.



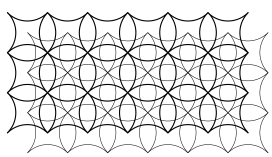
SR 2.
(Gv.) x 2.

Step # 2.



SR 1.
(Gh.) x 5.

Step # 3.



SR 3.
(GdO.50)

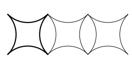
Order of SRA of SR's resulting in same PD outcome:

Step #1 - Gv. (x2).
Step #2 - Gh. (x5).
Step #3 - GdO.50.

- (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.). (GdO.50).

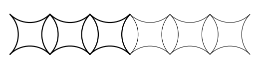
Shape Rule Applications - (SR 'GdO.50' used in Step #4.)

Step # 1.



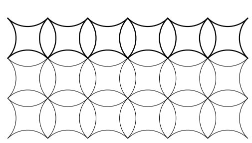
SR 1.
(Gh.) x 2.

Step # 2.



SR 1.
(Gh.) / (Mh.)

Step # 3.

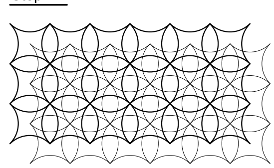


SR 2.
(Gv.) x 2.

Order of SRA of SR's resulting in same PD outcome:

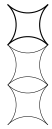
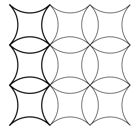
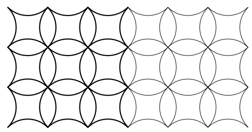
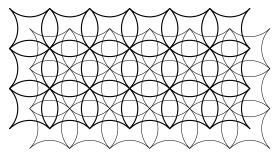
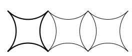
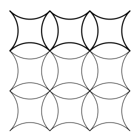
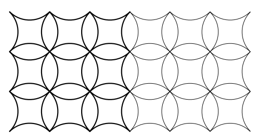
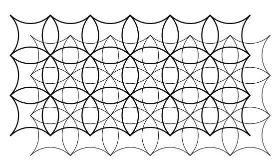
Step #1 - Gh. (x2).
Step #2 - Gh./Mh..
Step #3 - Gv. (x2).
Step #4 - GdO.50.

Step # 4.

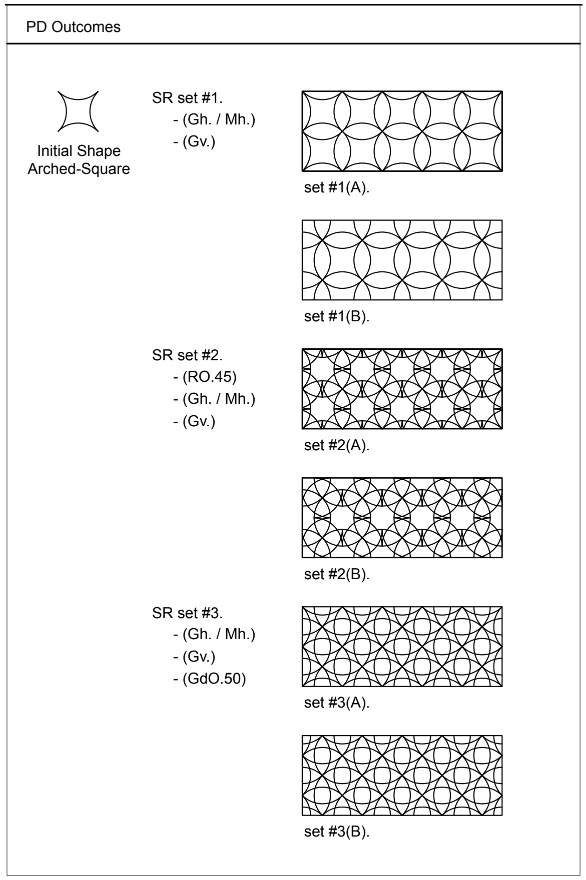


SR 3.
(GdO.50)

- (Gh. + Gh), Gh., (Gv. + Gv.), (GdO.50).
- (Gh. + Gh), Mh., (Gv. + Gv.), (GdO.50).

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 1. (Gh.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - Gh./Mh. Step #4 - GdO.50. - (Gv. + Gv.), (Gh. + Gh.), Gh., (GdO.50). - (Gv. + Gv.), (Gh. + Gh.), Mh., (GdO.50). Step # 4.  SR 3. (GdO.50)	
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - Gh./Mh. Step #4 - GdO.50. - (Gh. + Gh.), (Gv. + Gv.), Gh., (GdO.50). - (Gh. + Gh.), (Gv. + Gv.), Mh., (GdO.50). Step # 4.  SR 3. (GdO.50)	

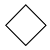
PD Formation: Initial Shape Arched-Square.



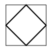
PD Framed Outcomes: Initial Shape Arched-Square.

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD

Initial Shape



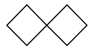
Initial Shape



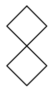
PD Unit

Shape Rules

Set # 1.



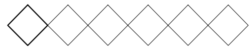
SR 1.
(Gh.) / (Mh.)



SR 2.
(Gv.) / (Mv.)

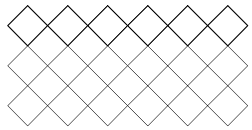
Shape Rule Applications

Step # 1.



SR 1.
(Gh.) x 5.

Step # 2.

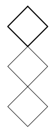


SR 2.
(Gv.) x 2.

Order of SRA of SR's resulting in same PD outcome:
Step #1 - Gh. (x5).
Step #2 - Gv. (x2).

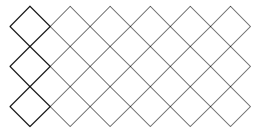
- (Gh. + Gh. + Gh. + Gh. + Gh.),
(Gv. + Gv.).

Step # 1.



SR 2.
(Gv.) x 2.

Step # 2.

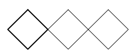


SR 1.
(Gh.) x 5.

Order of SRA of SR's resulting in same PD outcome:
Step #1 - Gv. (x2).
Step #2 - Gh. (x5).

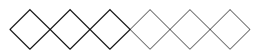
- (Gv. + Gv.),
(Gh. + Gh. + Gh. + Gh. + Gh.).

Step # 1.



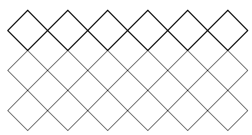
SR 1.
(Gh.) x 2.

Step # 2.



SR 1.
(Gh.) / (Mh.)

Step # 3.

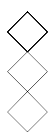


SR 2.
(Gv.) x 2.

Order of SRA of SR's resulting in same PD outcome:
Step #1 - Gh. (x2).
Step #2 - Gh./Mh..
Step #3 - Gv. (x2).

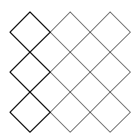
- (Gh. + Gh), Gh., (Gv. + Gv.).
- (Gh. + Gh), Mh., (Gv. + Gv.).

Step # 1.



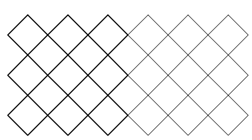
SR 2.
(Gv.) x 2.

Step # 2.



SR 1.
(Gh.) x 2.

Step # 3.

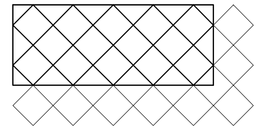


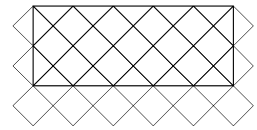
SR 1.
(Gh.) / (Mh.)

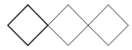
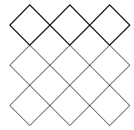
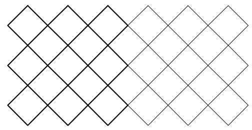
Order of SRA of SR's resulting in same PD outcome:
Step #1 - Gv. (x2).
Step #2 - Gh. (x2).
Step #3 - Mh.

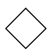
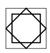
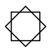
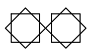
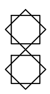
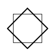
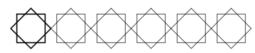
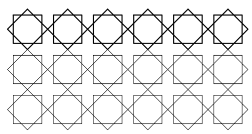
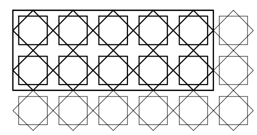
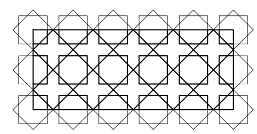
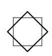
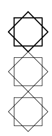
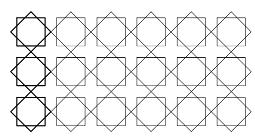
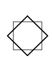
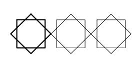
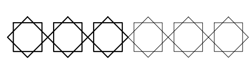
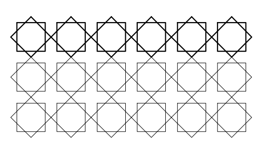
- (Gv. + Gv.), (Gh. + Gh.), Gh
- (Gv. + Gv.), (Gh. + Gh.), Mh.

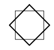
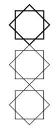
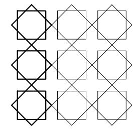
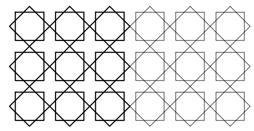
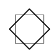
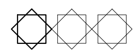
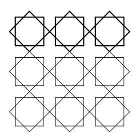
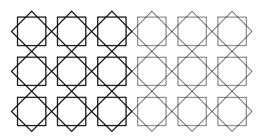
Framing the PD

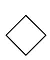
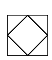
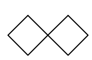
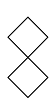
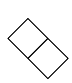
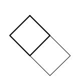
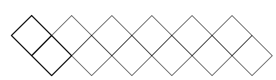
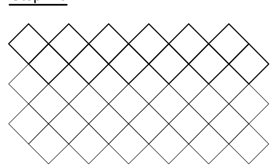
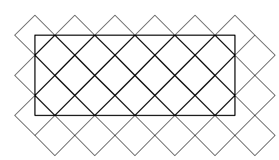
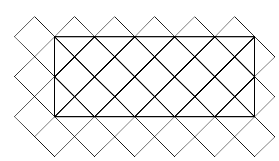


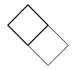
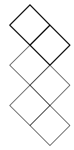
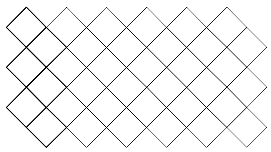
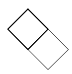
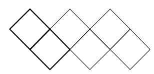
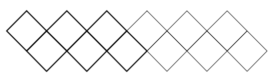
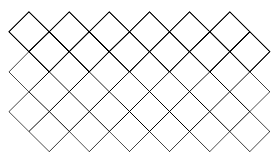
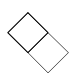
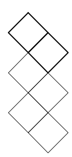
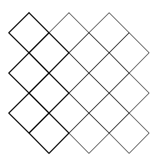
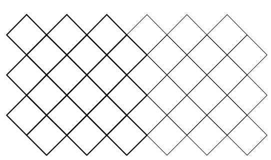


Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - Gh./Mh. - (Gh. + Gh.), (Gv. + Gv.), Gh. - (Gh. + Gh.), (Gv. + Gv.), Mh.	

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
 Initial Shape  PD Unit	Set # 2.  SR 1. (RO. 45)  SR 2. (Gh.) / (Mh.)  SR 3. (Gv.) / (Mv.)	Step # 1.  SR 1. (RO. 45) Step # 2.  SR 2. (Gh.) x 5. Step # 3.  SR 3. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gh. (x5). Step #3 - Gv. (x2). - RO 45., (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.).	 
		Step # 1.  SR 1. (RO. 45) Step # 2.  SR 3. (Gv.) x 2. Step # 3.  SR 2. (Gh.) x 5. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gv. (x2). Step #3 - Gh. (x5). - RO 45., (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.).	
		Step # 1.  SR 1. (RO. 45) Step # 2.  SR 2. (Gh.) x 2. Step # 3.  SR 2. (Gh.) / (Mh.) Step # 4.  SR 3. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gh. (x2). Step #3 - Gh./Mh. Step #4 - Gv. (x2). - RO 45., (Gh. + Gh), Gh., (Gv. + Gv.). - RO 45., (Gh. + Gh), Mh., (Gv. + Gv.).	

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (RO. 45) Step # 2.  SR 3. (Gv.) x 2. Step # 3.  SR 2. (Gh.) x 2. Step # 4.  SR 2. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gv. (x2). Step #3 - Gh. (x2). Step #4 - Gh./Mh. - RO 45., (Gv. + Gv.), (Gh. + Gh.), Gh. - RO 45., (Gv. + Gv.), (Gh. + Gh.), Mh.	
		Step # 1.  SR 1. (RO. 45) Step # 2.  SR 2. (Gh.) x 2. Step # 3.  SR 3. (Gv.) x 2. Step # 4.  SR 2. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gh. (x2). Step #3 - Gv. (x2). Step #4 - Gh./Mh. - RO 45., (Gh. + Gh.), (Gv. + Gv.), Gh. - RO 45., (Gh. + Gh.), (Gv. + Gv.), Mh.	

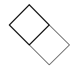
Initial Shape	Shape Rules	Shape Rule Applications - (SR 'GdO.50' used in Step #1.)	Framing the PD
 Initial Shape  PD Unit	Set # 3.  SR 1. (Gh.) / (Mh.)  SR 2. (Gv.) / (Mv.)  SR 3. (GdO. 50)	Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 1. (Gh.) x 5 Step # 3.  SR 2. (Gv.) x 2 Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO. 50. Step #2 - Gh. (x5). Step #3 - Gv. (x2). - GdO. 50., (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.).	 - *Same PD outcome as Set #1 of this IS.  - *Same PD outcome as Set #1 of this IS.

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		<u>Step # 1</u>.  SR 3. (GdO. 50) <u>Step # 2</u>.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO. 50. Step #2 - Gv. (x2). Step #3 - Gh. (x5). <u>Step # 3</u>.  SR 1. (Gh.) x 5. - GdO. 50., (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.).	
		<u>Step # 1</u>.  SR 3. (GdO. 50) <u>Step # 2</u>.  SR 1. (Gh.) x 2 <u>Step # 3</u>.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO.50. Step #2 - Gh. (x2).. Step #3 - Gh. Step #4 - .Gv. (x2). <u>Step # 4</u>.  SR 2. (Gv.) x 2. - GdO.50, (Gh. + Gh), Gh., (Gv. + Gv.).	- ** Mirror rule can not apply.
		<u>Step # 1</u>.  SR 3. (GdO. 50) <u>Step # 2</u>.  SR 2. (Gv.) x 2. <u>Step # 3</u>.  SR 1. (Gh.) x 2. <u>Step # 4</u>.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO.50. Step #2 - Gv. (x2).. Step #3 - Gh. (x2) Step #4 - Gh. - GdO.50, (Gv. + Gv), (Gh. + Gh.), Gh.	- ** Mirror rule can not apply.

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued			- ** Mirror rule can not apply.

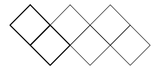
Shape Rule Applications

Step # 1.



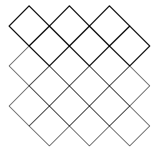
SR 3.
(GdO. 50)

Step # 2.



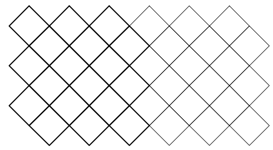
SR 1.
(Gh.) x 2

Step # 3.



SR 2.
(Gv.) x 2.

Step # 4.



SR 2.
(Gh.)

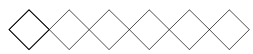
Order of SRA of SR's resulting in same PD outcome:

Step #1 - GdO.50.
Step #2 - Gh. (x2).
Step #3 - Gv. (x2).
Step #4 - Gh.

- GdO.50, (Gh. + Gh),
(Gv. + Gv.), Gh.

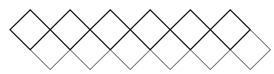
Shape Rule Applications - (SR 'GdO.50' used in Step #2.)

Step # 1.



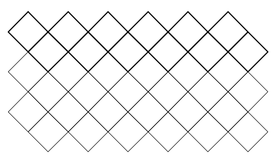
SR 1.
(Gh.) x 5.

Step # 2.



SR 3.
(GdO. 50)

Step # 3.



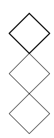
SR 2.
(Gv.) x 2

Order of SRA of SR's resulting in same PD outcome:

Step #1 - Gh. (x5).
Step #2 - GdO. 50.
Step #3 - Gv. (x2).

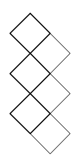
- (Gh. + Gh. + Gh. + Gh. + Gh.),
GdO. 50., (Gv. + Gv.).

Step # 1.



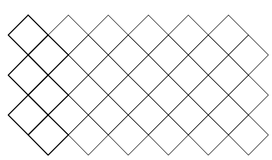
SR 2.
(Gv.) x 2.

Step # 2.



SR 3.
(GdO. 50)

Step # 3.

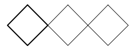
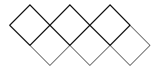
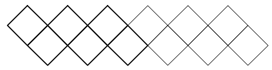
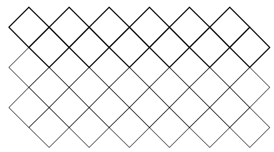
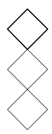
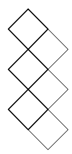
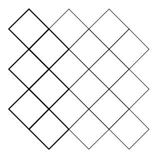
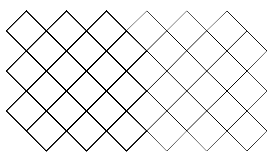
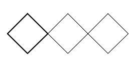
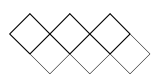
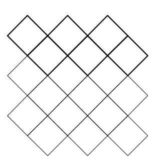
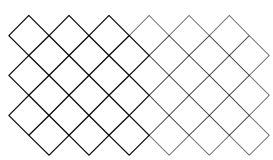


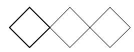
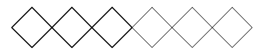
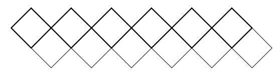
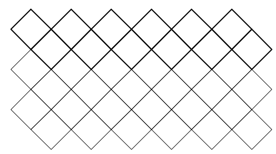
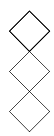
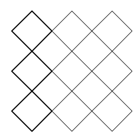
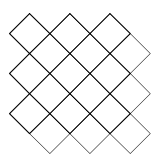
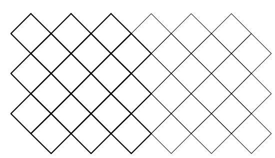
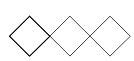
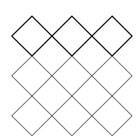
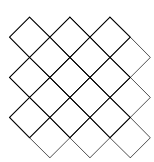
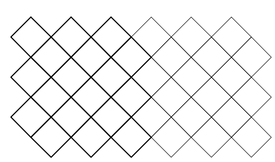
SR 1.
(Gh.) x 5.

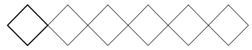
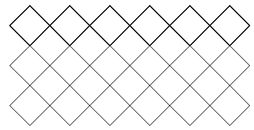
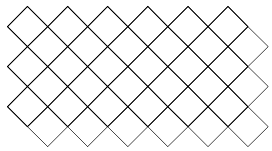
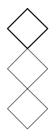
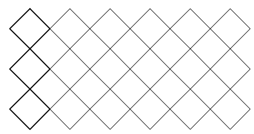
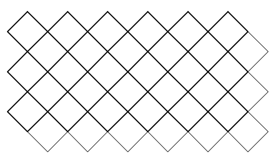
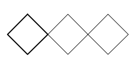
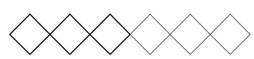
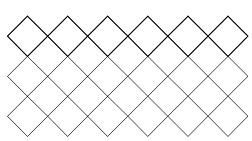
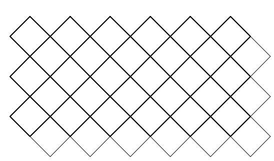
Order of SRA of SR's resulting in same PD outcome:

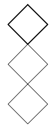
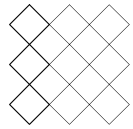
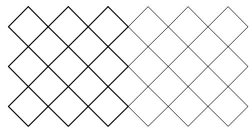
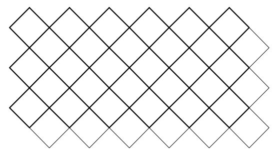
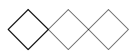
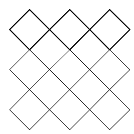
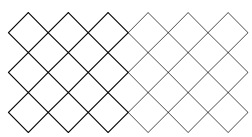
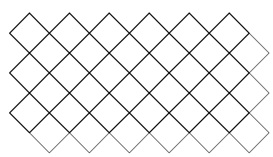
Step #1 - Gv. (x2).
Step #2 - GdO. 50.
Step #3 - Gh. (x5).

- (Gv. + Gv.), GdO. 50,
(Gh. + Gh. + Gh. + Gh. + Gh.),

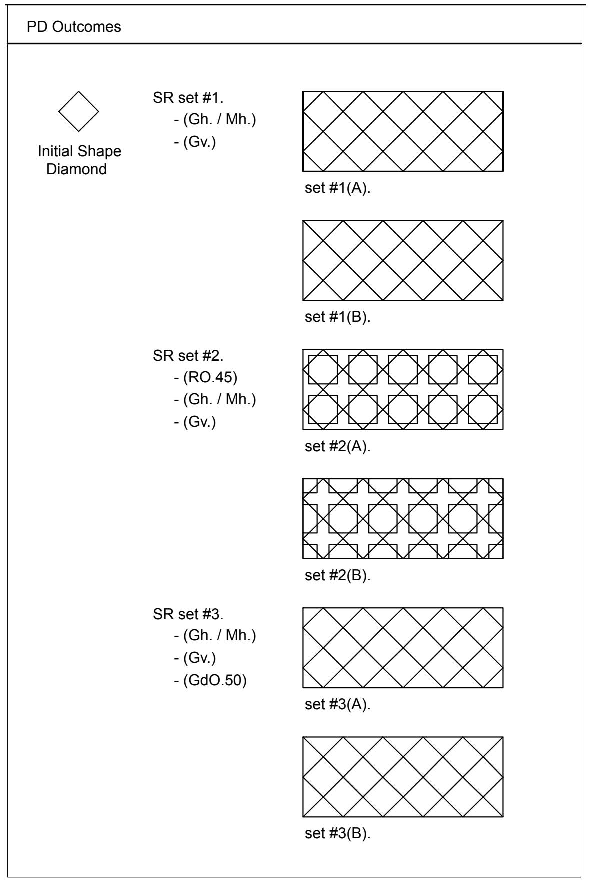
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - GdO.50. Step #3 - Gh./Mh Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - (Gh. + Gh.), GdO.50, Gh., (Gv. + Gv.). - (Gh. + Gh.), GdO.50, Mh., (Gv. + Gv.).	- ** Mirror rule can not apply.
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 1. (Gh.) x 2. Step # 4.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - GdO.50. Step #3 - Gh. (x2). Step #4 - Gh. - (Gv. + Gv), GdO.50, (Gh. + Gh.), Gh.	- ** Mirror rule can not apply.
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 2. (Gv.) x 2. Step # 4.  SR 2. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - GdO.50. Step #3 - Gv. (x2). Step #4 - Gh. - (Gh. + Gh), GdO.50, (Gv. + Gv.), Gh.	- ** Mirror rule can not apply.

Initial Shape	Shape Rules	Shape Rule Applications - (SR 'GdO.50' used in Step #3.)	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 1. (Gh.) / (Mh.) Step # 3.  SR 3. (GdO. 50) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gh./Mh. Step #3 - GdO.50. Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - (Gh. + Gh.), Gh.,GdO.50, (Gv. + Gv.). - (Gh. + Gh.), Mh.,GdO.50, (Gv. + Gv.).	
		Step # 1.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - GdO.50. Step #4 - Gh. Step # 2.  SR 1. (Gh.) x 2. Step # 3.  SR 3. (GdO. 50) Step # 4.  SR 1. (Gh.) - (Gv. + Gv.), (Gh. + Gh.), (GdO.50), Gh.	- ** Mirror rule can not apply.
		Step # 1.  SR 1. (Gh.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - GdO.50. Step #4 - Gh. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 3. (GdO.50) Step # 4.  SR 2. (Gh.) - (Gh. + Gh.), (Gv. + Gv.), (GdO.50), Gh.	- ** Mirror rule can not apply.

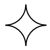
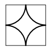
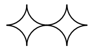
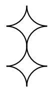
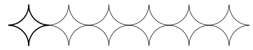
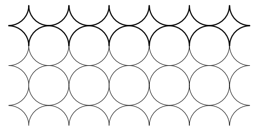
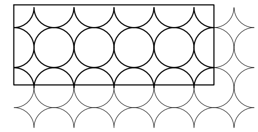
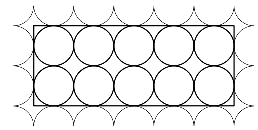
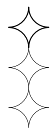
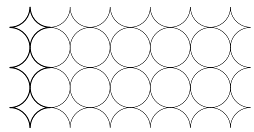
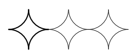
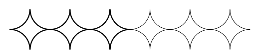
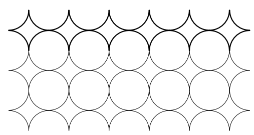
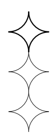
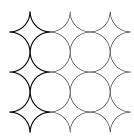
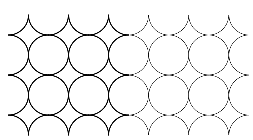
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 5. Step # 2.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x5). Step #2 - Gv. (x2). Step #3 - GdO.50. Step # 3.  SR 3. (GdO.50) - (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.), (GdO.50).	
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 1. (Gh.) x 5. Step # 3.  SR 3. (GdO.50) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x5). Step #3 - GdO.50. - (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.). (GdO.50).	
		Shape Rule Applications - (SR 'GdO.50' used in Step #4.)	
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 1. (Gh.) / (Mh.) Step # 3.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gh./Mh.. Step #3 - Gv. (x2). Step #4 - GdO.50. Step # 4.  SR 3. (GdO.50) - (Gh. + Gh), Gh., (Gv. + Gv.), (GdO.50). - (Gh. + Gh), Mh., (Gv. + Gv.), (GdO.50).	

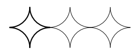
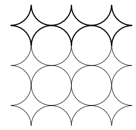
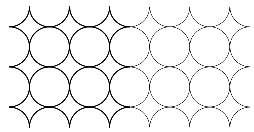
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 1. (Gh.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - Gh./Mh. Step #4 - GdO.50. - (Gv. + Gv.), (Gh. + Gh.), Gh., (GdO.50). - (Gv. + Gv.), (Gh. + Gh.), Mh., (GdO.50). Step # 4.  SR 3. (GdO.50)	
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - Gh./Mh. Step #4 - GdO.50. - (Gh. + Gh.), (Gv. + Gv.), Gh., (GdO.50). - (Gh. + Gh.), (Gv. + Gv.), Mh., (GdO.50). Step # 4.  SR 3. (GdO.50)	

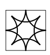
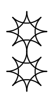
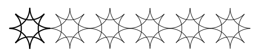
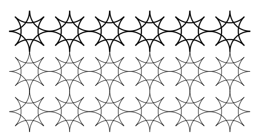
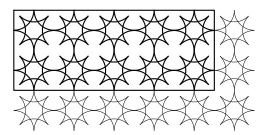
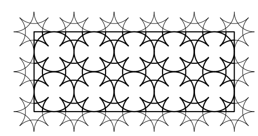
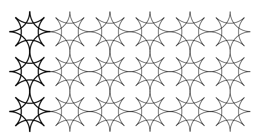
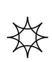
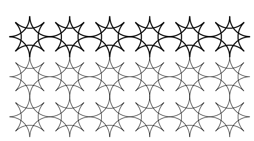
PD Formation: Initial Shape Diamond.

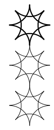
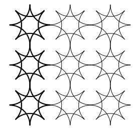
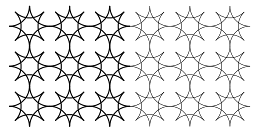
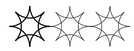
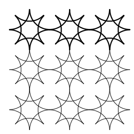
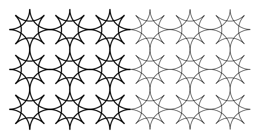


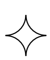
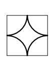
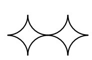
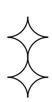
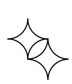
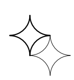
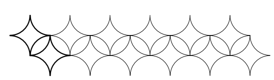
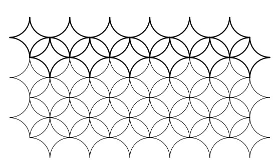
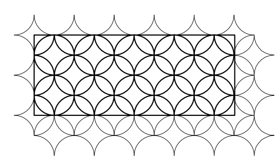
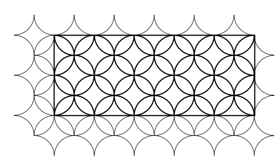
PD Framed Outcomes: Initial Shape Diamond.

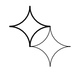
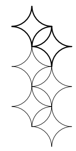
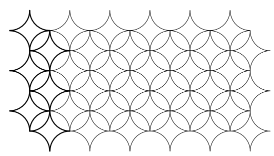
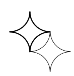
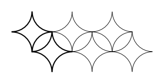
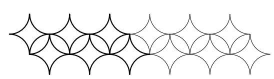
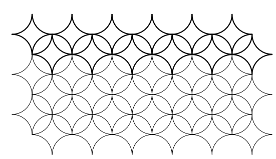
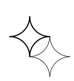
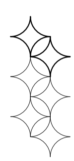
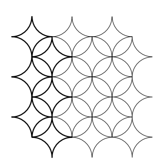
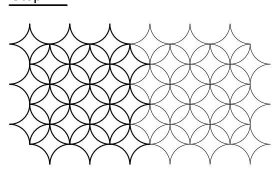
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
 Initial Shape  PD Unit	Set # 1.  SR 1. (Gh.) / (Mh.)  SR 2. (Gv.) / (Mv.)	Step # 1.  SR 1. (Gh.) x 5. Step # 2.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x5). Step #2 - Gv. (x2). - (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.).	 
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 1. (Gh.) x 5. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x5). - (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.).	
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 1. (Gh.) / (Mh.) Step # 3.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gh./Mh.. Step #3 - Gv. (x2). - (Gh. + Gh), Gh., (Gv. + Gv.). - (Gh. + Gh), Mh., (Gv. + Gv.).	
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 1. (Gh.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - Mh. - (Gv. + Gv.), (Gh. + Gh.), Gh. - (Gv. + Gv.), (Gh. + Gh.), Mh.	

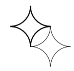
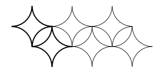
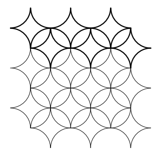
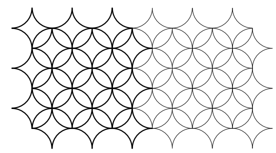
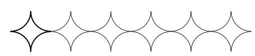
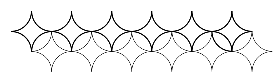
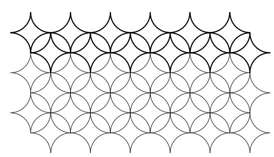
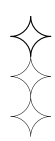
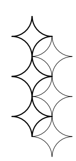
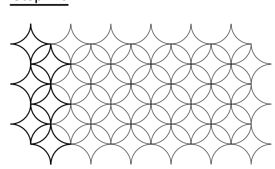
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - Gh./Mh. - (Gh. + Gh.), (Gv. + Gv.), Gh. - (Gh. + Gh.), (Gv. + Gv.), Mh.	

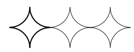
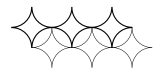
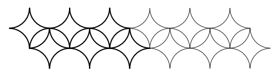
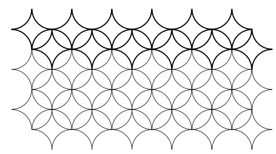
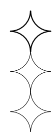
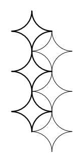
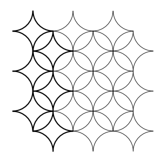
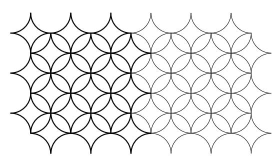
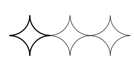
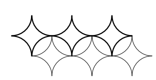
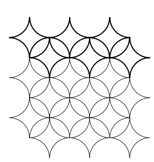
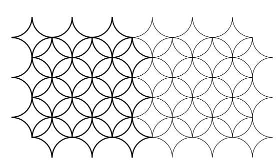
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
 Initial Shape  PD Unit	Set # 2.  SR 1. (RO. 45)  SR 2. (Gh.) / (Mh.)  SR 3. (Gv.) / (Mv.)	Step # 1.  SR 1. (RO. 45) Step # 2.  SR 2. (Gh.) x 5. Step # 3.  SR 3. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gh. (x5). Step #3 - Gv. (x2). - RO 45., (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.).	 
		Step # 1.  SR 1. (RO. 45) Step # 2.  SR 3. (Gv.) x 2. Step # 3.  SR 2. (Gh.) x 5. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gv. (x2). Step #3 - Gh. (x5). - RO 45., (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.).	
		Step # 1.  SR 1. (RO. 45) Step # 2.  SR 2. (Gh.) x 2. Step # 3.  SR 2. (Gh.) / (Mh.) Step # 4.  SR 3. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gh. (x2). Step #3 - Gh./Mh. Step #4 - Gv. (x2). - RO 45., (Gh. + Gh), Gh., (Gv. + Gv.). - RO 45., (Gh. + Gh), Mh., (Gv. + Gv.).	

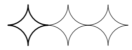
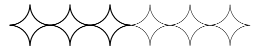
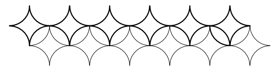
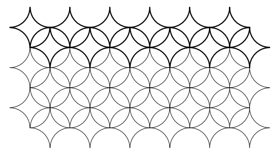
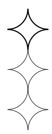
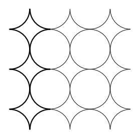
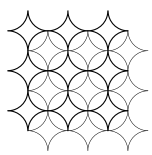
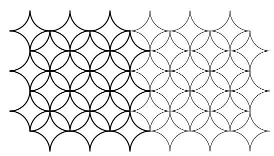
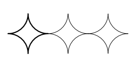
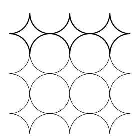
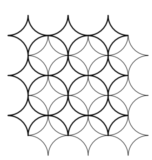
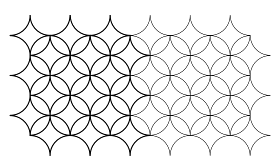
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (RO. 45) Step # 2.  SR 3. (Gv.) x 2. Step # 3.  SR 2. (Gh.) x 2. Step # 4.  SR 2. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gv. (x2). Step #3 - Gh. (x2). Step #4 - Gh./Mh. - RO 45., (Gv. + Gv.), (Gh. + Gh.), Gh. - RO 45., (Gv. + Gv.), (Gh. + Gh.), Mh.	
		Step # 1.  SR 1. (RO. 45) Step # 2.  SR 2. (Gh.) x 2. Step # 3.  SR 3. (Gv.) x 2. Step # 4.  SR 2. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - RO 45. Step #2 - Gh. (x2). Step #3 - Gv. (x2). Step #4 - Gh./Mh. - RO 45., (Gh. + Gh.), (Gv. + Gv.), Gh. - RO 45., (Gh. + Gh.), (Gv. + Gv.), Mh.	

Initial Shape	Shape Rules	Shape Rule Applications - (SR 'GdO.50' used in Step #1.)	Framing the PD
 Initial Shape  PD Unit	Set # 3.  SR 1. (Gh.) / (Mh.)  SR 2. (Gv.) / (Mv.)  SR 3. (GdO. 50)	Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 1. (Gh.) x 5 Step # 3.  SR 2. (Gv.) x 2 Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO. 50. Step #2 - Gh. (x5). Step #3 - Gv. (x2). - GdO. 50., (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.).	 - *Similar PD result as this set in IS Circle.  - *Similar PD result as this set in IS Circle.

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		**Step # 1.**  SR 3. (GdO. 50) **Step # 2.**  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO. 50. Step #2 - Gv. (x2). Step #3 - Gh. (x5). **Step # 3.**  SR 1. (Gh.) x 5. - GdO. 50., (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.).	
		Step # 1.  SR 3. (GdO. 50) **Step # 2.**  SR 1. (Gh.) x 2 **Step # 3.**  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO.50. Step #2 - Gh. (x2).. Step #3 - Gh. Step #4 - .Gv. (x2). **Step # 4.**  SR 2. (Gv.) x 2. - GdO.50, (Gh. + Gh), Gh., (Gv. + Gv.).	- ** Mirror rule can not apply.
		Step # 1.  SR 3. (GdO. 50) **Step # 2.**  SR 2. (Gv.) x 2. **Step # 3.**  SR 1. (Gh.) x 2. **Step # 4.**  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO.50. Step #2 - Gv. (x2).. Step #3 - Gh. (x2) Step #4 - Gh. - GdO.50, (Gv. + Gv), (Gh. + Gh.), Gh.	- ** Mirror rule can not apply.

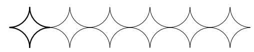
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 1. (Gh.) x 2 Step # 3.  SR 2. (Gv.) x 2. Step # 4.  SR 2. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO.50. Step #2 - Gh. (x2). Step #3 - Gv. (x2). Step #4 - Gh. - GdO.50, (Gh. + Gh), (Gv. + Gv.), Gh.	- ** Mirror rule can not apply.
		Shape Rule Applications - (SR 'GdO.50' used in Step #2.)	
		Step # 1.  SR 1. (Gh.) x 5. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 2. (Gv.) x 2 Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x5). Step #2 - GdO. 50. Step #3 - Gv. (x2). - (Gh. + Gh. + Gh. + Gh. + Gh.), GdO. 50., (Gv. + Gv.).	
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 1. (Gh.) x 5. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - GdO. 50. Step #3 - Gh. (x5). - (Gv. + Gv.), GdO. 50, (Gh. + Gh. + Gh. + Gh. + Gh.),	

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - GdO.50. Step #3 - Gh. Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - (Gh. + Gh.), GdO.50, Gh., (Gv. + Gv.).	- ** Mirror rule can not apply.
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 1. (Gh.) x 2. Step # 4.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - GdO.50. Step #3 - Gh. (x2). Step #4 - Gh. - (Gv. + Gv), GdO.50, (Gh. + Gh.), Gh.	- ** Mirror rule can not apply.
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 2. (Gv.) x 2. Step # 4.  SR 2. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - GdO.50. Step #3 - Gv. (x2). Step #4 - Gh. - (Gh. + Gh), GdO.50, (Gv. + Gv.), Gh.	- ** Mirror rule can not apply.

Initial Shape	Shape Rules	Shape Rule Applications - (SR 'GdO.50' used in Step #3.)	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 1. (Gh.) / (Mh.) Step # 3.  SR 3. (GdO. 50) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gh./Mh. Step #3 - GdO.50. Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - (Gh. + Gh.), Gh.,GdO.50, (Gv. + Gv.). - (Gh. + Gh.), Mh.,GdO.50, (Gv. + Gv.).	
		Step # 1.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - GdO.50. Step #4 - Gh. Step # 2.  SR 1. (Gh.) x 2. Step # 3.  SR 3. (GdO. 50) Step # 4.  SR 1. (Gh.) - (Gv. + Gv.), (Gh. + Gh.), (GdO.50), Gh.	- ** Mirror rule can not apply.
		Step # 1.  SR 1. (Gh.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - GdO.50. Step #4 - Gh. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 3. (GdO.50) Step # 4.  SR 2. (Gh.) - (Gh. + Gh.), (Gv. + Gv.), (GdO.50), Gh.	- ** Mirror rule can not apply.

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued			

Step # 1.

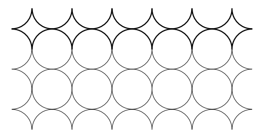


SR 1.
(Gh.) x 5.

Order of SRA of SR's resulting in same PD outcome:

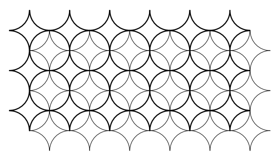
Step #1 - Gh. (x5).
Step #2 - Gv. (x2).
Step #3 - GdO.50.

Step # 2.



SR 2.
(Gv.) x 2.

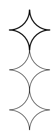
Step # 3.



SR 3.
(GdO.50)

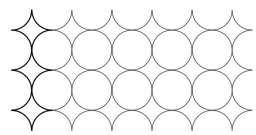
- (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.), (GdO.50).

Step # 1.



SR 2.
(Gv.) x 2.

Step # 2.

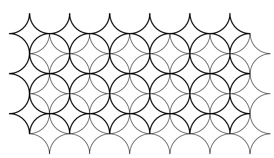


SR 1.
(Gh.) x 5.

Order of SRA of SR's resulting in same PD outcome:

Step #1 - Gv. (x2).
Step #2 - Gh. (x5).
Step #3 - GdO.50.

Step # 3.

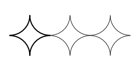


SR 3.
(GdO.50)

- (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.). (GdO.50).

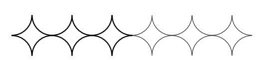
Shape Rule Applications - (SR 'GdO.50' used in Step #4.)

Step # 1.



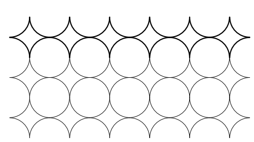
SR 1.
(Gh.) x 2.

Step # 2.



SR 1.
(Gh.) / (Mh.)

Step # 3.

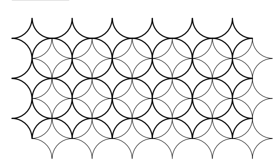


SR 2.
(Gv.) x 2.

Order of SRA of SR's resulting in same PD outcome:

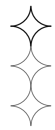
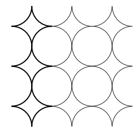
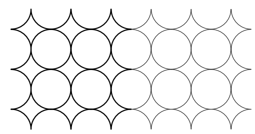
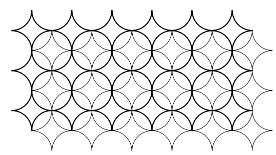
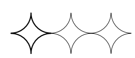
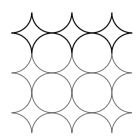
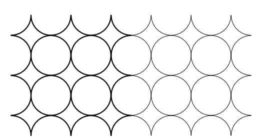
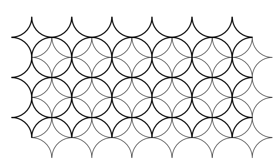
Step #1 - Gh. (x2).
Step #2 - Gh./Mh..
Step #3 - Gv. (x2).
Step #4 - GdO.50.

Step # 4.

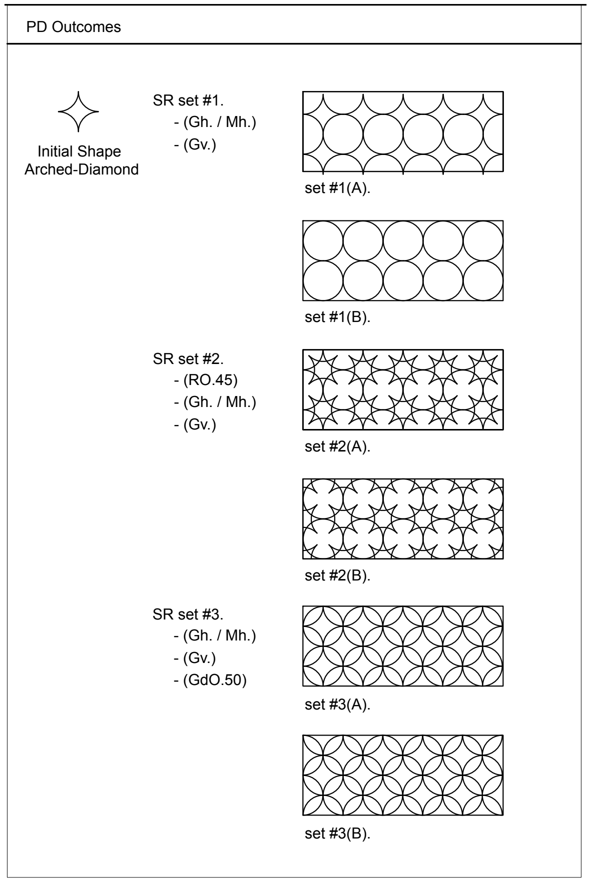


SR 3.
(GdO.50)

- (Gh. + Gh), Gh., (Gv. + Gv.), (GdO.50).
- (Gh. + Gh), Mh., (Gv. + Gv.), (GdO.50).

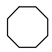
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 1. (Gh.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - Gh./Mh. Step #4 - GdO.50. - (Gv. + Gv.), (Gh. + Gh.), Gh., (GdO.50). - (Gv. + Gv.), (Gh. + Gh.), Mh., (GdO.50). Step # 4.  SR 3. (GdO.50)	
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - Gh./Mh. Step #4 - GdO.50. - (Gh. + Gh.), (Gv. + Gv.), Gh., (GdO.50). - (Gh. + Gh.), (Gv. + Gv.), Mh., (GdO.50). Step # 4.  SR 3. (GdO.50)	

PD Formation: Initial Shape Arched-Diamond.

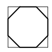


PD Framed Outcomes: Initial Shape Arched-Diamond.

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD

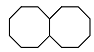


Initial Shape

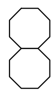


PD Unit

Set # 1.

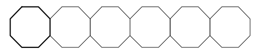


SR 1.
(Gh.) / (Mh.)



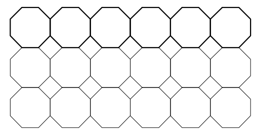
SR 2.
(Gv.) / (Mv.)

Step # 1.



SR 1.
(Gh.) x 5.

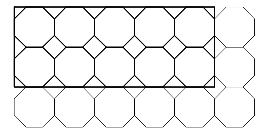
Step # 2.

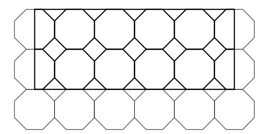


SR 2.
(Gv.) x 2.

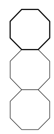
Order of SRA of SR's resulting in same PD outcome:
Step #1 - Gh. (x5).
Step #2 - Gv. (x2).

- (Gh. + Gh. + Gh. + Gh. + Gh.),
(Gv. + Gv.).





Step # 1.

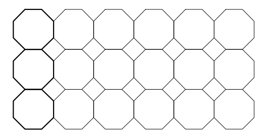


SR 2.
(Gv.) x 2.

Order of SRA of SR's resulting in same PD outcome:
Step #1 - Gv. (x2).
Step #2 - Gh. (x5).

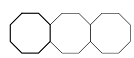
- (Gv. + Gv.),
(Gh. + Gh. + Gh. + Gh. + Gh.).

Step # 2.



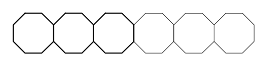
SR 1.
(Gh.) x 5.

Step # 1.



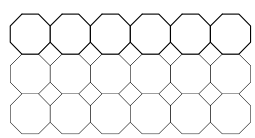
SR 1.
(Gh.) x 2.

Step # 2.



SR 1.
(Gh.) / (Mh.)

Step # 3.

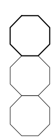


SR 2.
(Gv.) x 2.

Order of SRA of SR's resulting in same PD outcome:
Step #1 - Gh. (x2).
Step #2 - Gh./Mh..
Step #3 - Gv. (x2).

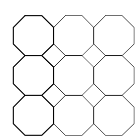
- (Gh. + Gh), Gh., (Gv. + Gv.).
- (Gh. + Gh), Mh., (Gv. + Gv.).

Step # 1.



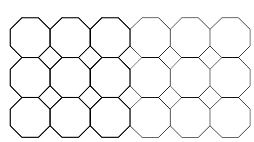
SR 2.
(Gv.) x 2.

Step # 2.



SR 1.
(Gh.) x 2.

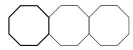
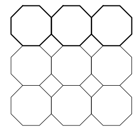
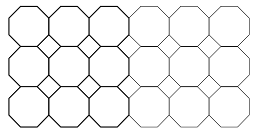
Step # 3.

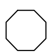
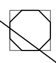
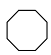
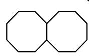
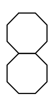
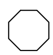
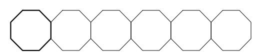
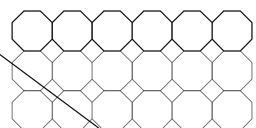
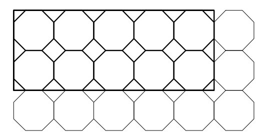
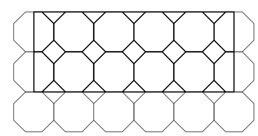
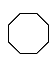
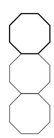
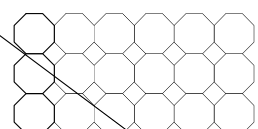
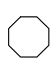
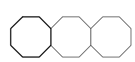
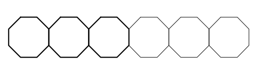
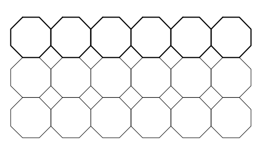


SR 1.
(Gh.) / (Mh.)

Order of SRA of SR's resulting in same PD outcome:
Step #1 - Gv. (x2).
Step #2 - Gh. (x2).
Step #3 - Mh.

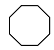
- (Gv. + Gv.), (Gh. + Gh.), Gh.
- (Gv. + Gv.), (Gh. + Gh.), Mh.

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - Gh./Mh. - (Gh. + Gh.), (Gv. + Gv.), Gh. - (Gh. + Gh.), (Gv. + Gv.), Mh.	

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
 Initial Shape  PD Unit - ** Rule (RO.) can not apply to IS Octagon. = same outcome.	Set # 2.  SR 1. (RO.)  SR 2. (Gh.) / (Mh.)  SR 3. (Gv.) / (Mv.)	Step # 1.  SR 1. (RO.) Step # 2.  SR 2. (Gh.) x 5. Step # 3.  SR 3. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO. Step #2 - Gh. (x5). Step #3 - Gv. (x2). - RO., (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.).	 
		Step # 1.  SR 1. (RO.) Step # 2.  SR 3. (Gv.) x 2. Step # 3.  SR 2. (Gh.) x 5. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO. Step #2 - Gv. (x2). Step #3 - Gh. (x5). - RO., (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.).	
		Step # 1.  SR 1. (RO.) Step # 2.  SR 2. (Gh.) x 2. Step # 3.  SR 2. (Gh.) / (Mh.) Step # 4.  SR 3. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - RO. Step #2 - Gh. (x2). Step #3 - Gh./Mh. Step #4 - Gv. (x2). - RO., (Gh. + Gh), Gh., (Gv. + Gv.). - RO., (Gh. + Gh), Mh., (Gv. + Gv.).	

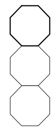
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued			

Step # 1.



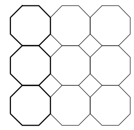
SR 1.
(RO.)

Step # 2.



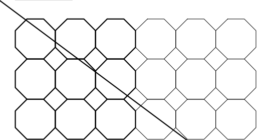
SR 3.
(Gv.) x 2.

Step # 3.



SR 2.
(Gh.) x 2.

Step # 4.

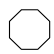


SR 2.
(Gh.) / (Mh.)

Order of SRA of SR's resulting in same PD outcome:
Step #1 - RO.
Step #2 - Gv. (x2).
Step #3 - Gh. (x2).
Step #4 - Gh./Mh.

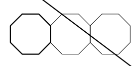
- RO., (Gv. + Gv.), (Gh. + Gh.), Gh.
- RO., (Gv. + Gv.), (Gh. + Gh.), Mh.

Step # 1.



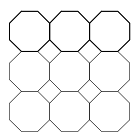
SR 1.
(RO.)

Step # 2.



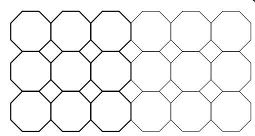
SR 2.
(Gh.) x 2.

Step # 3.



SR 3.
(Gv.) x 2.

Step # 4.

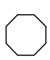


SR 2.
(Gh.) / (Mh.)

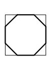
Order of SRA of SR's resulting in same PD outcome:
Step #1 - RO.
Step #2 - Gh. (x2).
Step #3 - Gv. (x2).
Step #4 - Gh./Mh.

- RO., (Gh. + Gh.), (Gv. + Gv.), Gh.
- RO., (Gh. + Gh.), (Gv. + Gv.), Mh.

Initial Shape	Shape Rules	Shape Rule Applications - (SR 'GdO.50' used in Step #1.)	Framing the PD

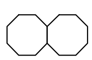


Initial Shape

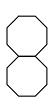


PD Unit

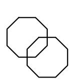
Set # 3.



SR 1.
(Gh.) / (Mh.)

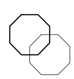


SR 2.
(Gv.) / (Mv.)



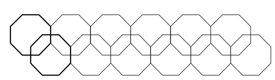
SR 3.
(GdO. 50)

Step # 1.



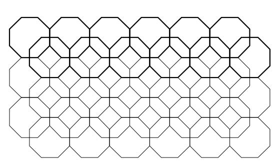
SR 3.
(GdO. 50)

Step # 2.



SR 1.
(Gh.) x 5

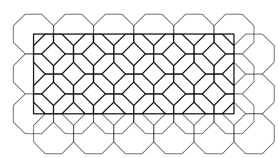
Step # 3.

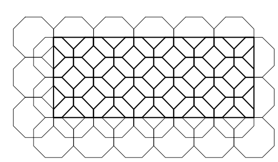


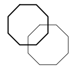
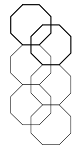
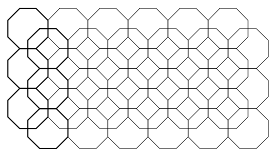
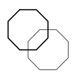
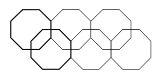
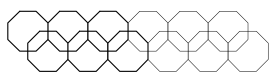
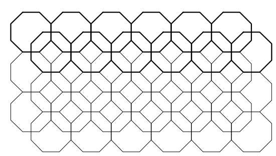
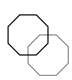
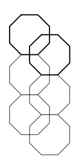
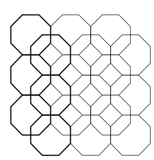
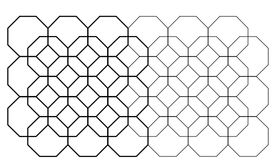
SR 2.
(Gv.) x 2

Order of SRA of SR's resulting in same PD outcome:
Step #1 - GdO. 50.
Step #2 - Gh. (x5).
Step #3 - Gv. (x2).

- GdO. 50.,
(Gh. + Gh. + Gh. + Gh. + Gh.),
(Gv. + Gv.).



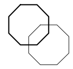


Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO. 50. Step #2 - Gv. (x2). Step #3 - Gh. (x5). Step # 3.  SR 1. (Gh.) x 5. - GdO. 50., (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.).	
		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 1. (Gh.) x 2 Step # 3.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO.50. Step #2 - Gh. (x2).. Step #3 - Gh. Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - GdO.50, (Gh. + Gh), Gh., (Gv. + Gv.).	- ** Mirror rule can not apply.
		Step # 1.  SR 3. (GdO. 50) Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - GdO.50. Step #2 - Gv. (x2).. Step #3 - Gh. (x2) Step #4 - Gh. Step # 4.  SR 1. (Gh.) - GdO.50, (Gv. + Gv), (Gh. + Gh.), Gh.	- ** Mirror rule can not apply.

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		(see below)	- ** Mirror rule can not apply.

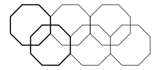
Shape Rule Applications

Step # 1.



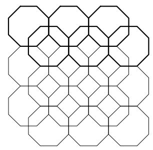
SR 3.
(GdO. 50)

Step # 2.



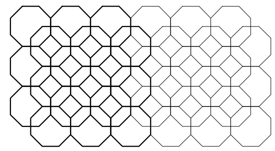
SR 1.
(Gh.) x 2

Step # 3.



SR 2.
(Gv.) x 2.

Step # 4.



SR 2.
(Gh.)

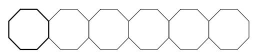
Order of SRA of SR's resulting in same PD outcome:

Step #1 - GdO.50.
Step #2 - Gh. (x2).
Step #3 - Gv. (x2).
Step #4 - Gh.

- GdO.50, (Gh. + Gh), (Gv. + Gv.), Gh.

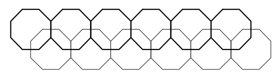
Shape Rule Applications - (SR 'GdO.50' used in Step #2.)

Step # 1.



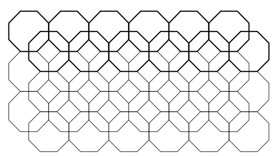
SR 1.
(Gh.) x 5.

Step # 2.



SR 3.
(GdO. 50)

Step # 3.



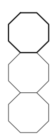
SR 2.
(Gv.) x 2

Order of SRA of SR's resulting in same PD outcome:

Step #1 - Gh. (x5).
Step #2 - GdO. 50.
Step #3 - Gv. (x2).

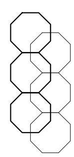
- (Gh. + Gh. + Gh. + Gh. + Gh.), GdO. 50., (Gv. + Gv.).

Step # 1.



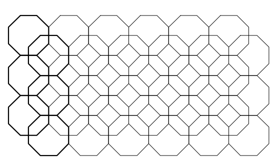
SR 2.
(Gv.) x 2.

Step # 2.



SR 3.
(GdO. 50)

Step # 3.

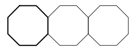
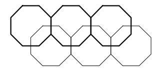
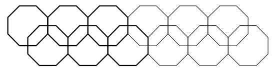
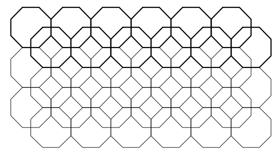
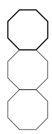
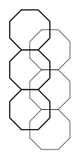
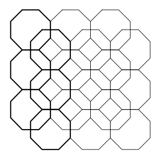
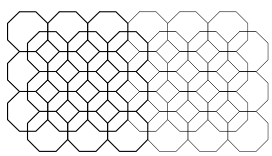
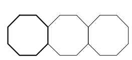
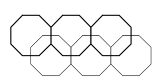
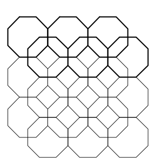
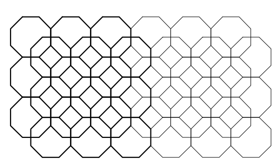


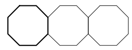
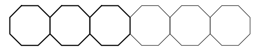
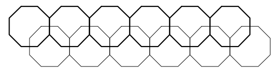
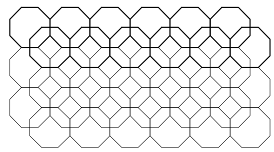
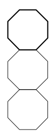
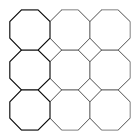
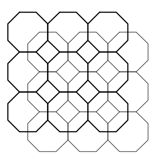
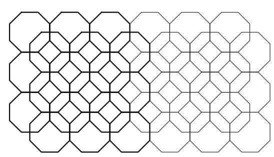
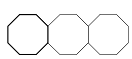
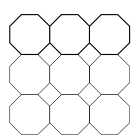
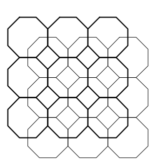
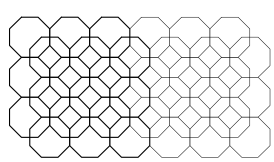
SR 1.
(Gh.) x 5.

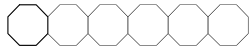
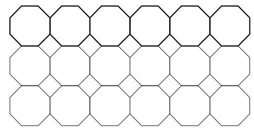
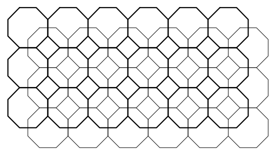
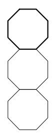
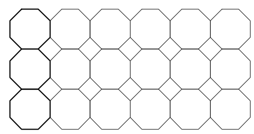
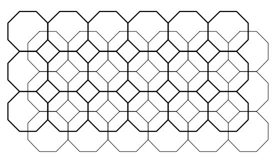
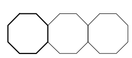
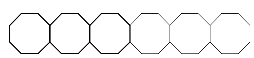
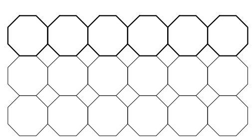
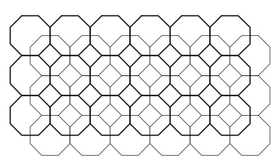
Order of SRA of SR's resulting in same PD outcome:

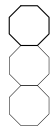
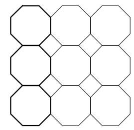
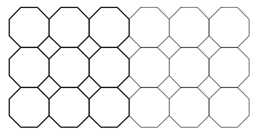
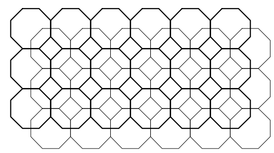
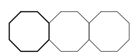
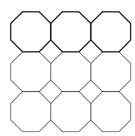
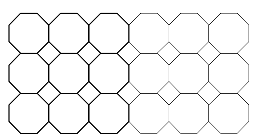
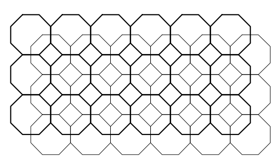
Step #1 - Gv. (x2).
Step #2 - GdO. 50.
Step #3 - Gh. (x5).

- (Gv. + Gv.), GdO. 50, (Gh. + Gh. + Gh. + Gh. + Gh.),

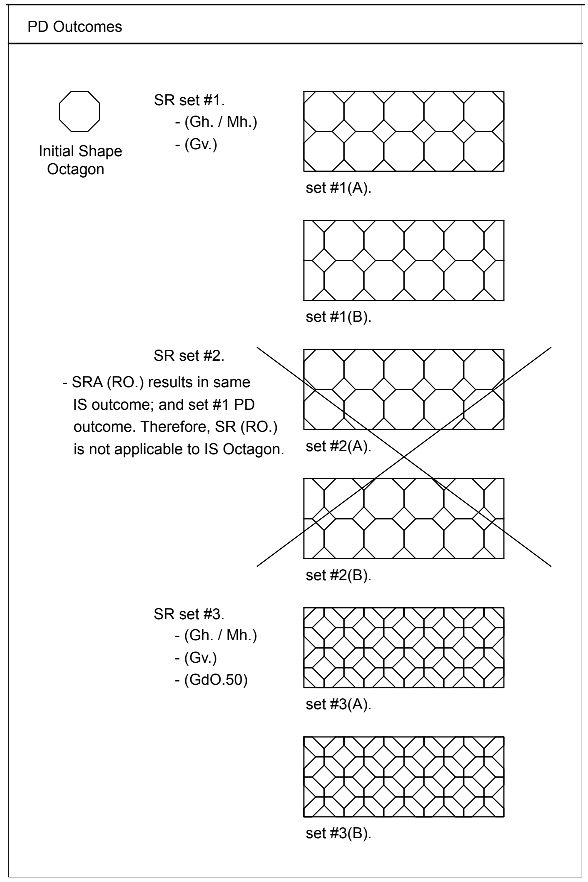
Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - GdO.50. Step #3 - Gh./Mh Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - (Gh. + Gh.), GdO.50, Gh., (Gv. + Gv.). - (Gh. + Gh.), GdO.50, Mh., (Gv. + Gv.).	- ** Mirror rule can not apply.
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 1. (Gh.) x 2. Step # 4.  SR 1. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - GdO.50. Step #3 - Gh. (x2). Step #4 - Gh. - (Gv. + Gv), GdO.50, (Gh. + Gh.), Gh.	- ** Mirror rule can not apply.
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 3. (GdO. 50) Step # 3.  SR 2. (Gv.) x 2. Step # 4.  SR 2. (Gh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - GdO.50. Step #3 - Gv. (x2). Step #4 - Gh. - (Gh. + Gh), GdO.50, (Gv. + Gv.), Gh.	- ** Mirror rule can not apply.

Initial Shape	Shape Rules	Shape Rule Applications - (SR 'GdO.50' used in Step #3.)	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 1. (Gh.) / (Mh.) Step # 3.  SR 3. (GdO. 50) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gh./Mh. Step #3 - GdO.50. Step #4 - .Gv. (x2). Step # 4.  SR 2. (Gv.) x 2. - (Gh. + Gh.), Gh.,GdO.50, (Gv. + Gv.). - (Gh. + Gh.), Mh.,GdO.50, (Gv. + Gv.).	
		Step # 1.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - GdO.50. Step #4 - Gh. Step # 2.  SR 1. (Gh.) x 2. Step # 3.  SR 3. (GdO. 50) Step # 4.  SR 1. (Gh.) - (Gv. + Gv.), (Gh. + Gh.), (GdO.50), Gh.	- ** Mirror rule can not apply.
		Step # 1.  SR 1. (Gh.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - GdO.50. Step #4 - Gh. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 3. (GdO.50) Step # 4.  SR 2. (Gh.) - (Gh. + Gh.), (Gv. + Gv.), (GdO.50), Gh.	- ** Mirror rule can not apply.

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 1. (Gh.) x 5. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x5). Step #2 - Gv. (x2). Step #3 - GdO.50. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 3. (GdO.50) - (Gh. + Gh. + Gh. + Gh. + Gh.), (Gv. + Gv.), (GdO.50).	
		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 1. (Gh.) x 5. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x5). Step #3 - GdO.50. Step # 3.  SR 3. (GdO.50) - (Gv. + Gv.), (Gh. + Gh. + Gh. + Gh. + Gh.). (GdO.50).	
		Shape Rule Applications - (SR 'GdO.50' used in Step #4.)	
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 1. (Gh.) / (Mh.) Step # 3.  SR 2. (Gv.) x 2. Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gh./Mh.. Step #3 - Gv. (x2). Step #4 - GdO.50. Step # 4.  SR 3. (GdO.50) - (Gh. + Gh), Gh., (Gv. + Gv.), (GdO.50). - (Gh. + Gh), Mh., (Gv. + Gv.), (GdO.50).	

Initial Shape	Shape Rules	Shape Rule Applications	Framing the PD
... continued		Step # 1.  SR 2. (Gv.) x 2. Step # 2.  SR 1. (Gh.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gv. (x2). Step #2 - Gh. (x2). Step #3 - Gh./Mh. Step #4 - GdO.50. - (Gv. + Gv.), (Gh. + Gh.), Gh., (GdO.50). - (Gv. + Gv.), (Gh. + Gh.), Mh., (GdO.50). Step # 4.  SR 3. (GdO.50)	
		Step # 1.  SR 1. (Gh.) x 2. Step # 2.  SR 2. (Gv.) x 2. Step # 3.  SR 1. (Gh.) / (Mh.) Order of SRA of SR's resulting in same PD outcome: Step #1 - Gh. (x2). Step #2 - Gv. (x2). Step #3 - Gh./Mh. Step #4 - GdO.50. - (Gh. + Gh.), (Gv. + Gv.), Gh., (GdO.50). - (Gh. + Gh.), (Gv. + Gv.), Mh., (GdO.50). Step # 4.  SR 3. (GdO.50)	

PD Formation: Initial Shape Octagon.

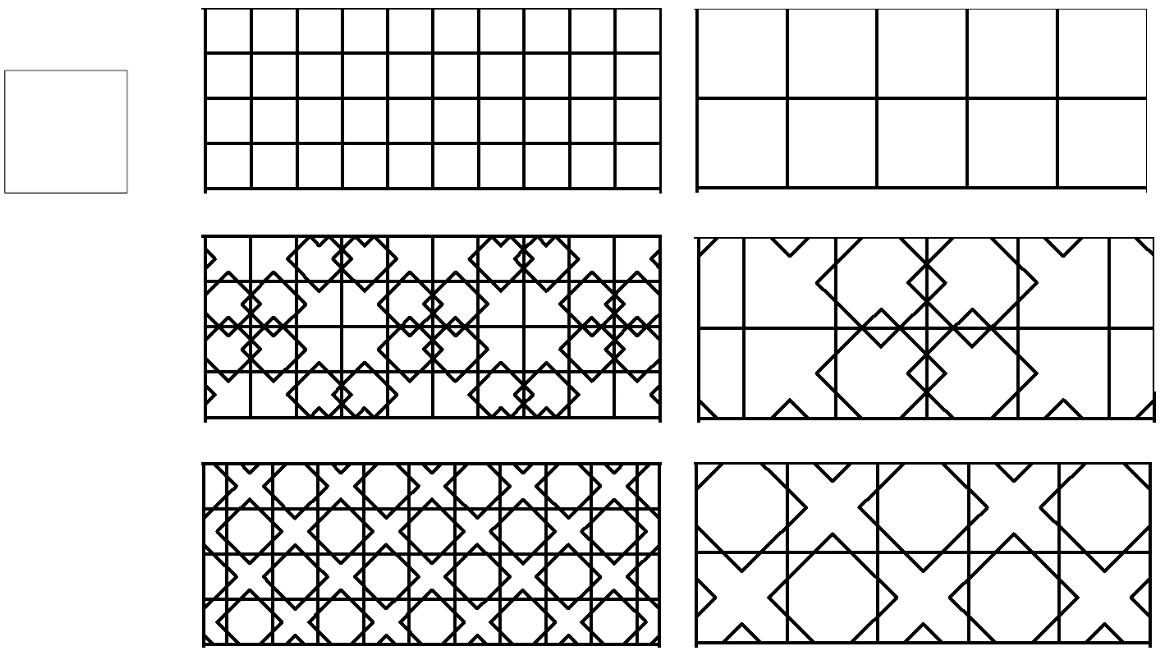


PD Framed Outcomes: Initial Shape Octagon.

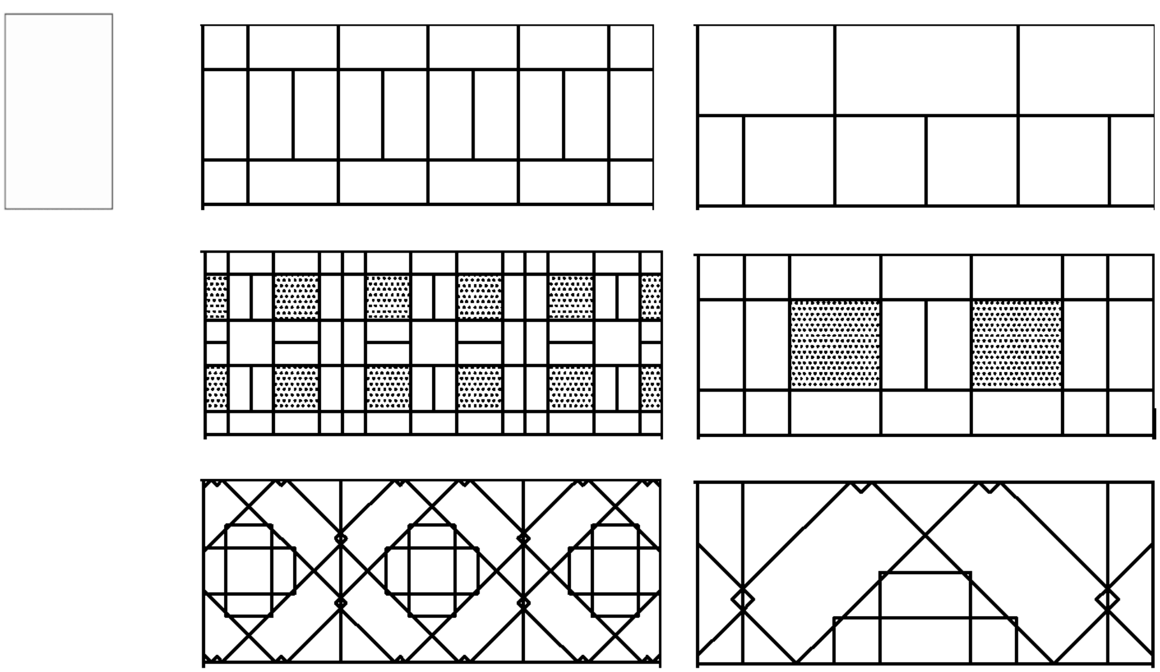
Appendix I: Pilot Study PD Illustrations

Pilot study PD illustrations from each of the ten initial shapes of the integrated IKEA-IG geometries:

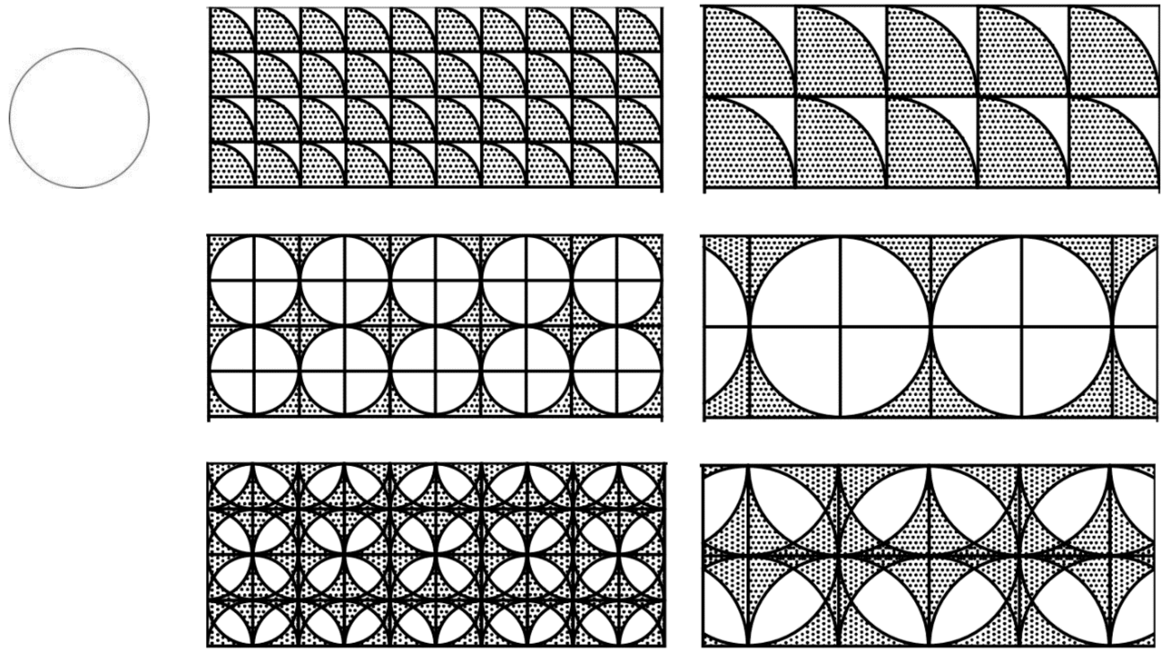
Square shape:



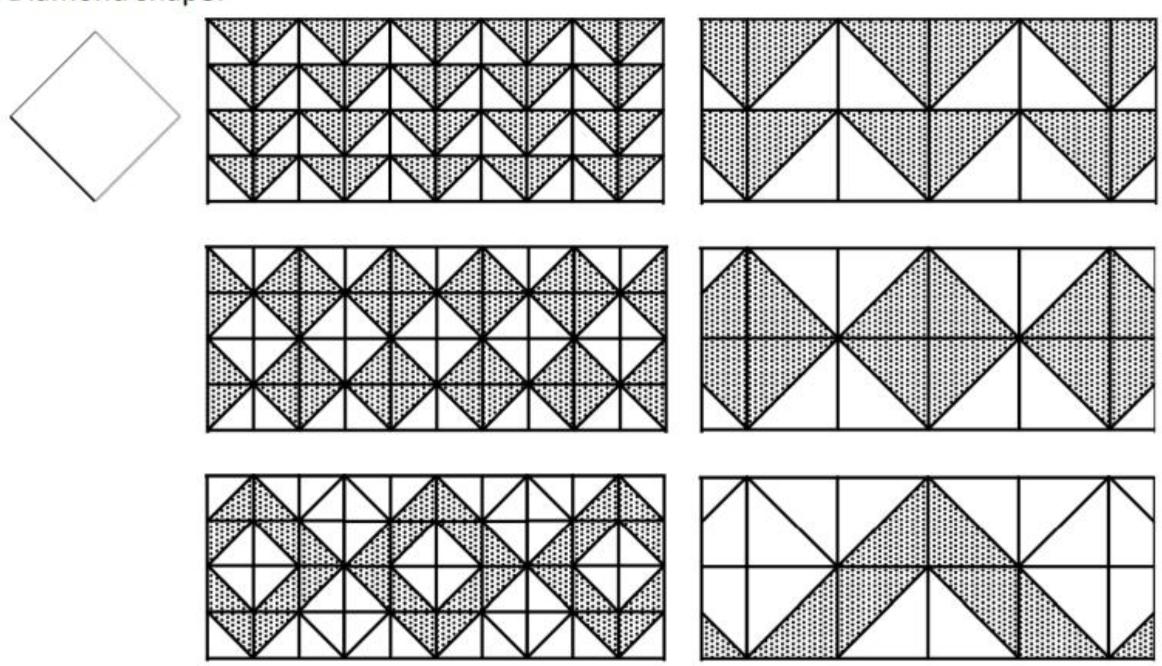
Rectangle shape:



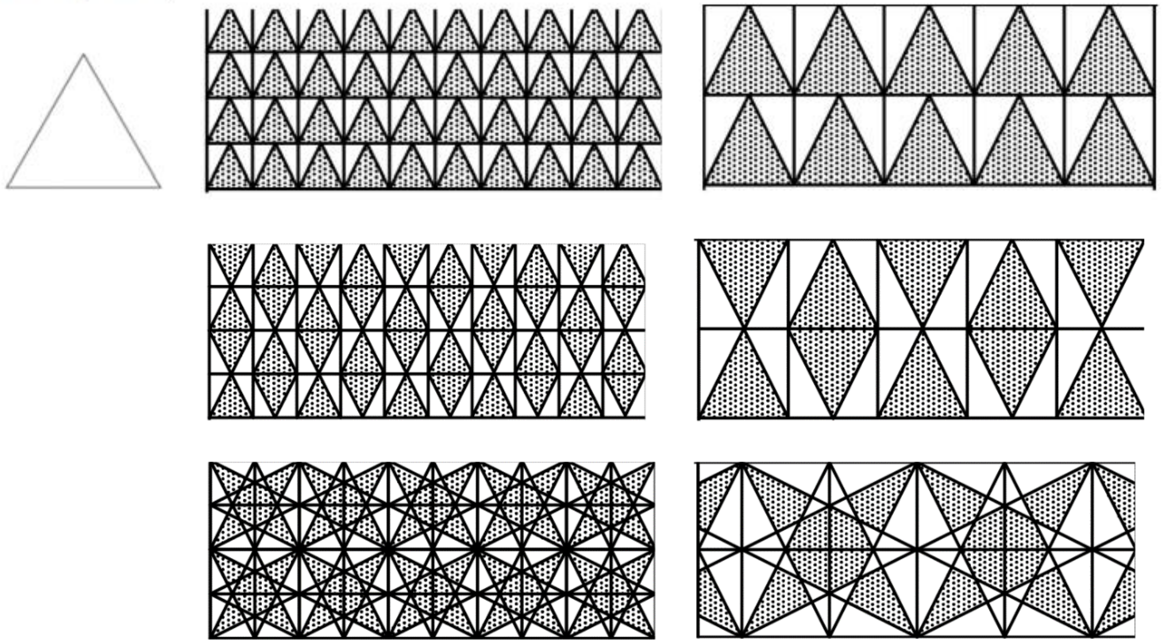
Circle shape:



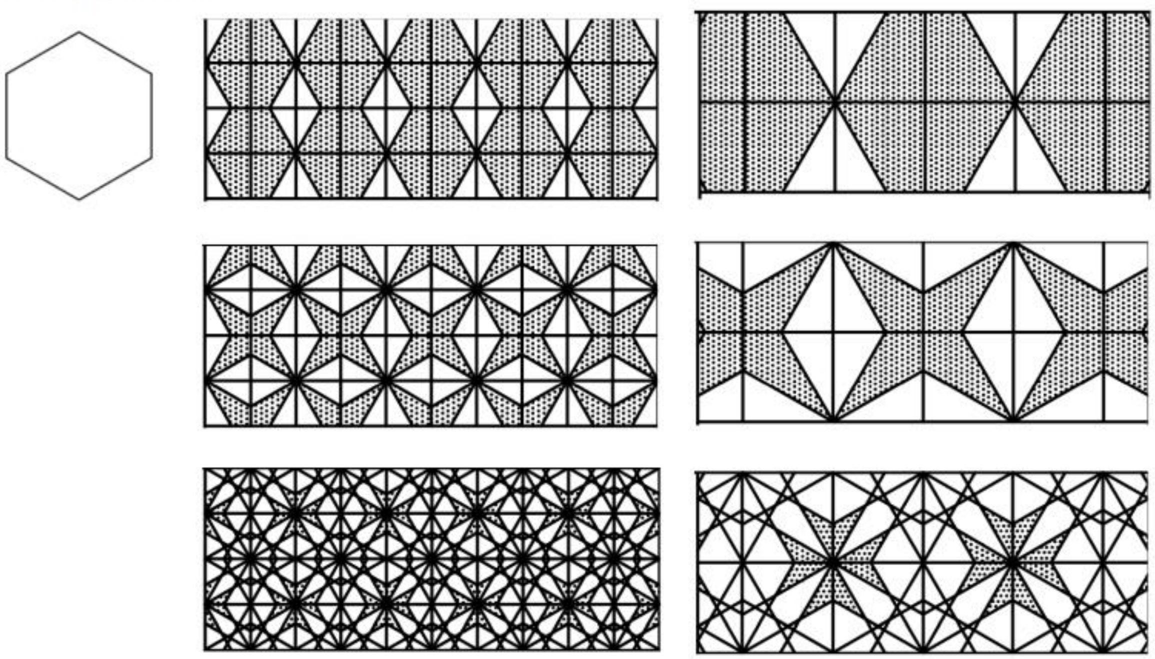
Diamond shape:



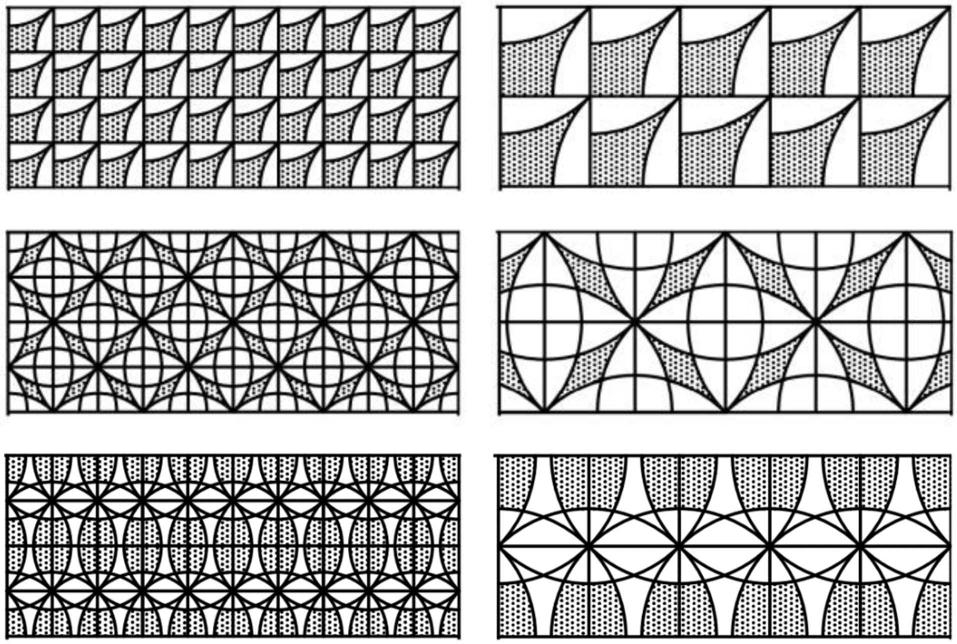
Triangle shape:



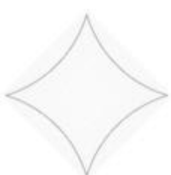
Hexagon shape:

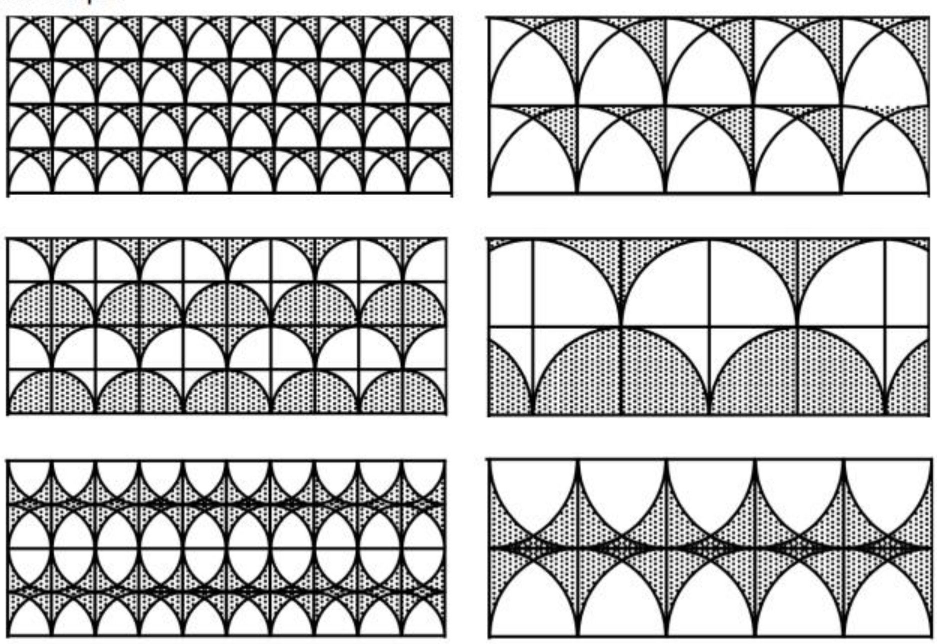


Arched-Square shape:

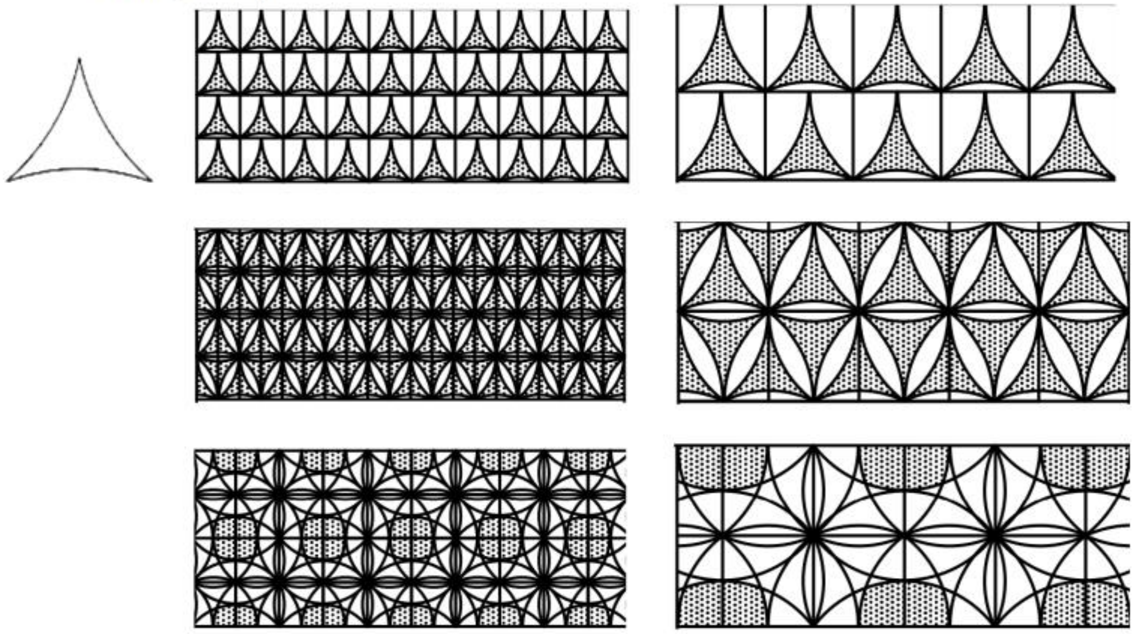


Arched-Diamond shape:





Arched-Triangle shape:



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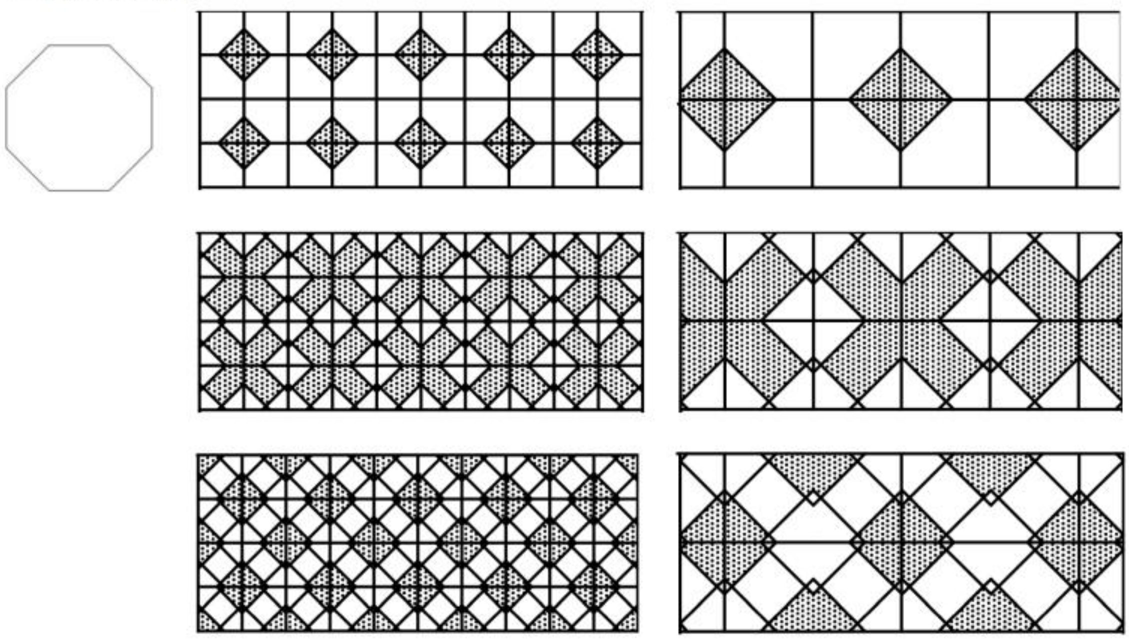


Appendix J: Main Study Questionnaire

After having presented a participant information sheet and a consent form, the main study was provided as follow:

<u>Participant Information Sheet</u>

Researcher: Maryam Alainati
PhD Student - Bournemouth University
malainati@bournemouth.ac.uk
Supervised by Prof. Siamak Noroozi
snoroozi@bournemouth.ac.uk

Reviving the Cultural Arts of the Islamic Geometries into Contemporary Interior Design.

You are being invited to take part in a research project. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. Ask if there is anything that is not clear or if you would like more information.

It is completely voluntary, and participants have the right to not answer any question if they choose not to. You also can choose to withdraw at any time. The information collected about participants will be kept strictly confidential. All the data will be used solely for the purpose of this research and future publication.

The aim of this research is to revive cultural art identity within contemporary design. From the cultural arts of this Middle Eastern region, this study focuses on the art of Islamic Geometries (IG); and, from the contemporary design world, on IKEA for its international success in today's home design industry. The balance between preserving the artistic soul of the IG and IKEA's vision is key.

This survey is to investigate the outcome of the two styles' engagement as well as to identify and analyse factors affecting individuals' preference. Distributed among 300 participants, the study is to take place in Kuwait in order to gather data relevant to the region. The questionnaire is designed in three parts, each of which having a brief description of the task and are to be answered by marking inside the tick-box for your selection.

The findings of this thesis will contribute to knowledge through providing the possibility of integrating the cultural arts of IG within the contemporary design of IKEA (IKEA-IG); to the practice of interior design by leading the possibility to explore other cultural art preservations; and, to society by ultimately being able to obtain cultural identity within present day.

All the information collected during the course of the research will be kept in accordance with the Data Protection Act 1998. You will not be able to be identified in any reports or publications. All data relating to this study will be kept for 5 years on a BU password protected secure network. If you have any concerns regarding this study, please contact Professor Siamak Noroozi by email snoroozi@bournemouth.ac.uk.

Thank you in advance for your time.

Sincerely yours,

Maryam Alainati
PhD Student
Bournemouth University
malainati@bournemouth.ac.uk

By completing the questionnaire you are consenting to take part in this research study.

<u>Survey Questionnaire</u>

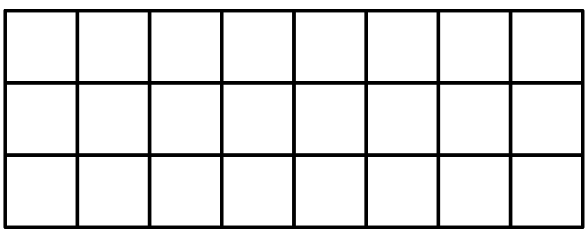
This questionnaire is designed in three parts. Kindly, read the quick description of each part and answer the questions that follow by marking inside the tick-box for your answer.

Part 1: (Pattern Designs)

For each of the IKEA-IG Pattern Designs (PD), rate from Strongly Disagree to Strongly Agree (please see Rating Scale) if:

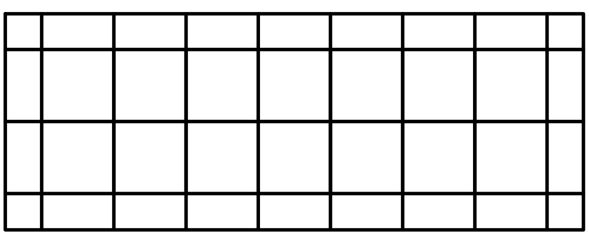
- the design style represents <u>IKEA</u>,
- the design style represents the Islamic Geometries (<u>IG</u>),
- you <u>LIKE</u> the design style.

Rating Scale:
1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree



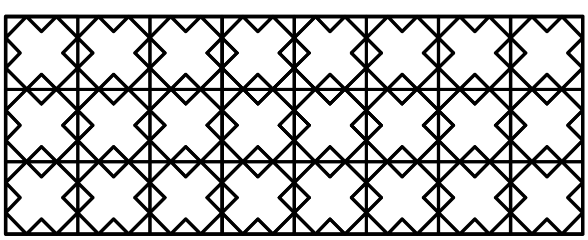
PD 1.

	1	2	3	4	5
01- IKEA	☐	☐	☐	☐	☐
02- IG	☐	☐	☐	☐	☐
03- LIKE	☐	☐	☐	☐	☐



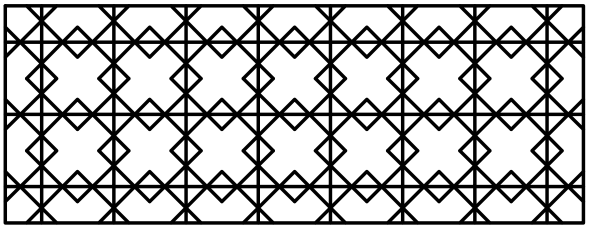
PD 2.

	1	2	3	4	5
04- IKEA	☐	☐	☐	☐	☐
05- IG	☐	☐	☐	☐	☐
06- LIKE	☐	☐	☐	☐	☐



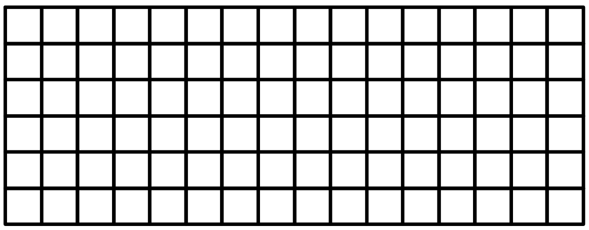
PD 3.

	1	2	3	4	5
07- IKEA	☐	☐	☐	☐	☐
08- IG	☐	☐	☐	☐	☐
09- LIKE	☐	☐	☐	☐	☐



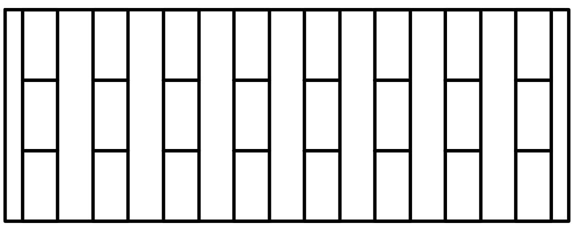
PD 4.

	1	2	3	4	5
10- IKEA	☐	☐	☐	☐	☐
11- IG	☐	☐	☐	☐	☐
12- LIKE	☐	☐	☐	☐	☐



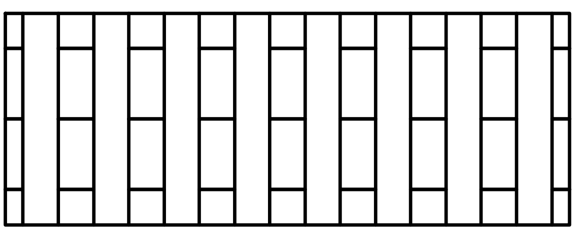
PD 5.

	1	2	3	4	5
13- IKEA	☐	☐	☐	☐	☐
14- IG	☐	☐	☐	☐	☐
15- LIKE	☐	☐	☐	☐	☐



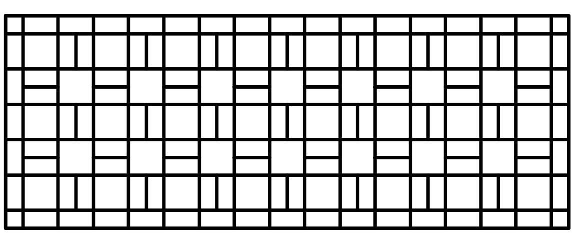
PD 6.

	1	2	3	4	5
16- IKEA	☐	☐	☐	☐	☐
17- IG	☐	☐	☐	☐	☐
18- LIKE	☐	☐	☐	☐	☐



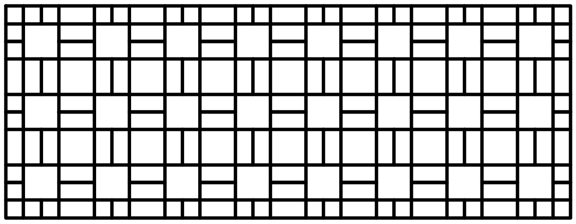
PD 7.

	1	2	3	4	5
19- IKEA	☐	☐	☐	☐	☐
20- IG	☐	☐	☐	☐	☐
21- LIKE	☐	☐	☐	☐	☐



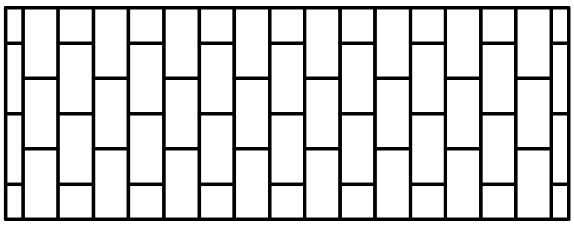
PD 8.

	1	2	3	4	5
22- IKEA	☐	☐	☐	☐	☐
23- IG	☐	☐	☐	☐	☐
24- LIKE	☐	☐	☐	☐	☐



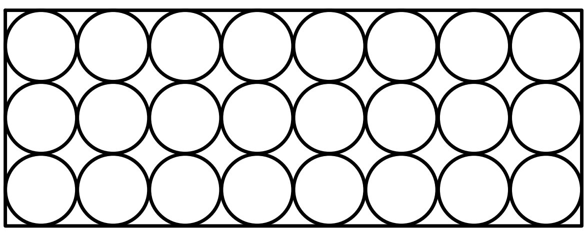
PD 9.

	1	2	3	4	5
25- IKEA					
26- IG					
27- LIKE					



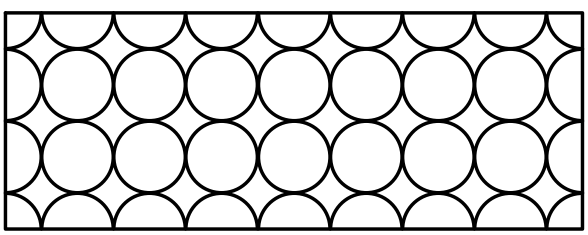
PD 10.

	1	2	3	4	5
28- IKEA					
29- IG					
30- LIKE					



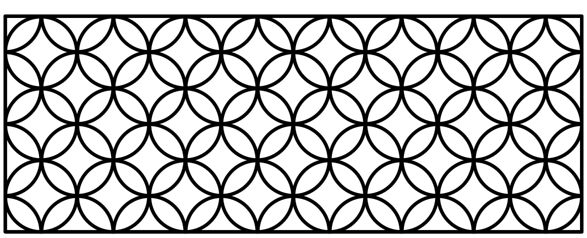
PD 11.

	1	2	3	4	5
31- IKEA					
32- IG					
33- LIKE					



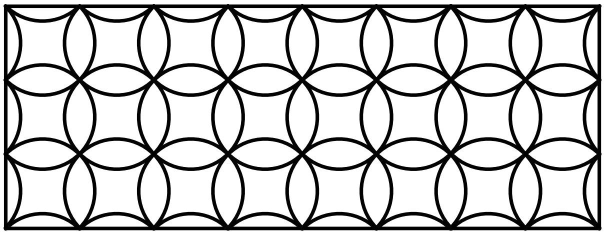
PD 12.

	1	2	3	4	5
34- IKEA					
35- IG					
36- LIKE					

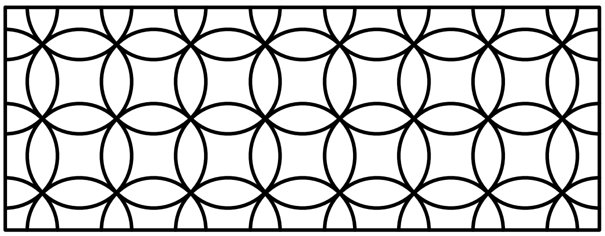


PD 13.

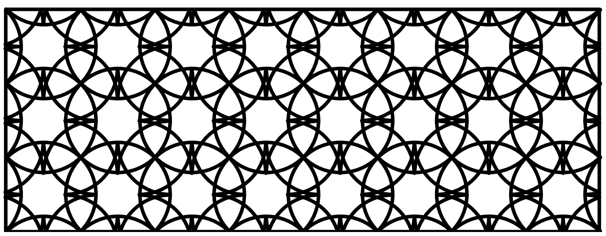
	1	2	3	4	5
37- IKEA					
38- IG					
39- LIKE					


PD 14.

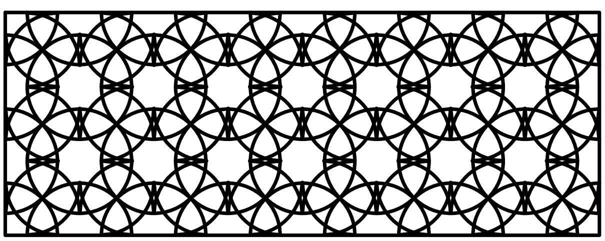
	1	2	3	4	5
40- IKEA	☐	☐	☐	☐	☐
41- IG	☐	☐	☐	☐	☐
42- LIKE	☐	☐	☐	☐	☐


PD 15.

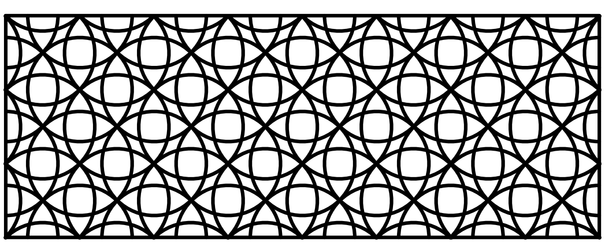
	1	2	3	4	5
43- IKEA	☐	☐	☐	☐	☐
44- IG	☐	☐	☐	☐	☐
45- LIKE	☐	☐	☐	☐	☐


PD 16.

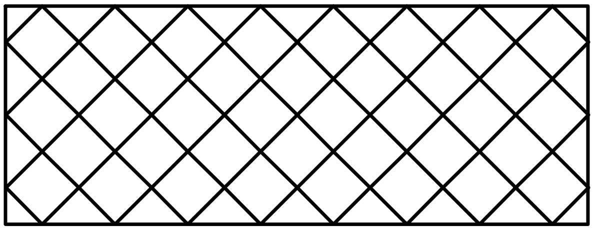
	1	2	3	4	5
46- IKEA	☐	☐	☐	☐	☐
47- IG	☐	☐	☐	☐	☐
48- LIKE	☐	☐	☐	☐	☐


PD 17.

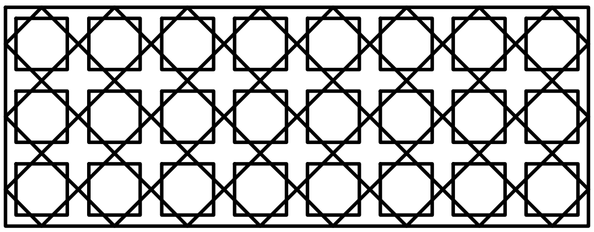
	1	2	3	4	5
49- IKEA	☐	☐	☐	☐	☐
50- IG	☐	☐	☐	☐	☐
51- LIKE	☐	☐	☐	☐	☐


PD 18.

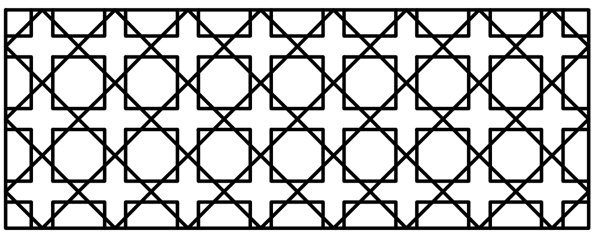
	1	2	3	4	5
52- IKEA	☐	☐	☐	☐	☐
53- IG	☐	☐	☐	☐	☐
54- LIKE	☐	☐	☐	☐	☐


PD 19.

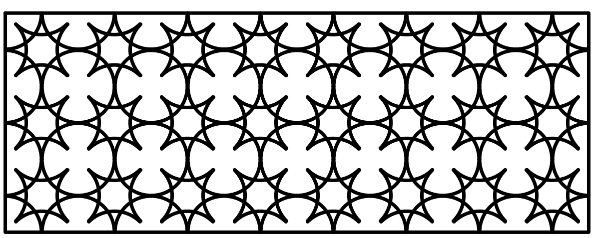
	1	2	3	4	5
55- IKEA	☐	☐	☐	☐	☐
56- IG	☐	☐	☐	☐	☐
57- LIKE	☐	☐	☐	☐	☐


PD 20.

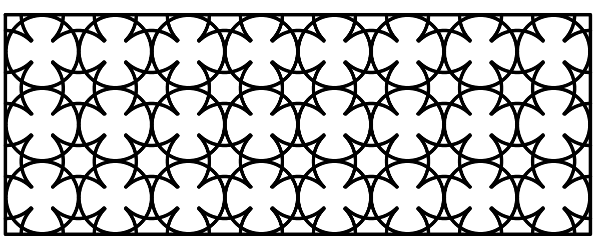
	1	2	3	4	5
58- IKEA	☐	☐	☐	☐	☐
59- IG	☐	☐	☐	☐	☐
60- LIKE	☐	☐	☐	☐	☐


PD 21.

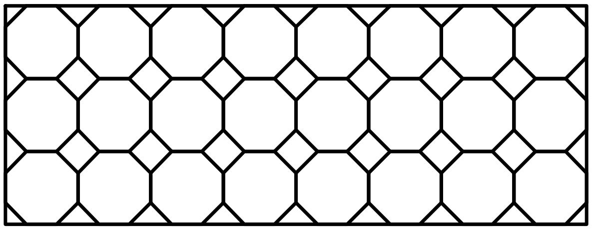
	1	2	3	4	5
61- IKEA	☐	☐	☐	☐	☐
62- IG	☐	☐	☐	☐	☐
63- LIKE	☐	☐	☐	☐	☐


PD 22.

	1	2	3	4	5
64- IKEA	☐	☐	☐	☐	☐
65- IG	☐	☐	☐	☐	☐
66- LIKE	☐	☐	☐	☐	☐

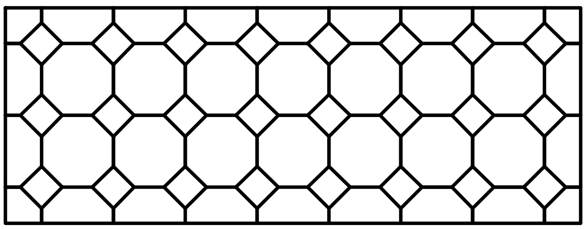

PD 23.

	1	2	3	4	5
67- IKEA	☐	☐	☐	☐	☐
68- IG	☐	☐	☐	☐	☐
69- LIKE	☐	☐	☐	☐	☐



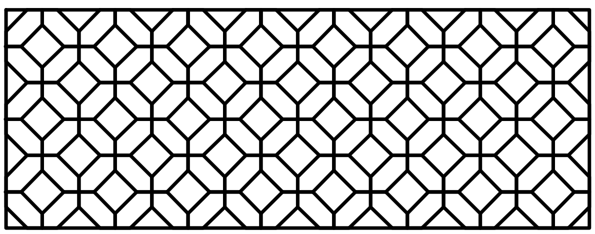
PD 24.

	1	2	3	4	5
70- IKEA	☐	☐	☐	☐	☐
71- IG	☐	☐	☐	☐	☐
72- LIKE	☐	☐	☐	☐	☐



PD 25.

	1	2	3	4	5
73- IKEA	☐	☐	☐	☐	☐
74- IG	☐	☐	☐	☐	☐
75- LIKE	☐	☐	☐	☐	☐



PD 26.

	1	2	3	4	5
76- IKEA	☐	☐	☐	☐	☐
77- IG	☐	☐	☐	☐	☐
78- LIKE	☐	☐	☐	☐	☐

Part 2: (Short Questions)

Short questions are presented about your preference to IKEA's furniture, and your preference to the inclusion of the IG style into IKEA's line of furniture. Please rate from Strongly Disagree to Strongly Agree (see Rating Scale) by selecting your answer:

Rating Scale:
1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

	1	2	3	4	5
79 – I like IKEA's furniture.	☐	☐	☐	☐	☐
80 – I would like to see IKEA-IG designs in the IKEA furniture line.	☐	☐	☐	☐	☐

Part 3: (Demographic Data)

For the democratic data, please select your answer to each of the following:

81 – Gender

- ☐ Male
- ☐ Female

82 – Age

- ☐ 19 – 29
- ☐ 30 – 39
- ☐ 40 – 49
- ☐ ≥ 50

83 – Province

- ☐ Capital
- ☐ Hawalli
- ☐ Farwania
- ☐ Ahmadi
- ☐ Jahra
- ☐ Mubarak Al-Kabeer

84 – Ethnicity

- ☐ Arabian
- ☐ Non-Arabian

85 – Religion

- ☐ Muslim
- ☐ Non-Muslim

86 – Educational Level

- ☐ Below High School
- ☐ High School
- ☐ Diploma (2 years)
- ☐ Bachelor (4 years)
- ☐ Graduate/ Postgrad.

87 – Occupation

- ☐ Student
- ☐ Employed
- ☐ Retired
- ☐ Other

88 – Organisation

- ☐ Public Sector (gov.)
- ☐ Private Sector
- ☐ Other (student)
- ☐ Does not apply

Appendix K: MSQ - Top PDs and Dependent Variables

Correlation among top PD items within each of the IKEA, IG, and LIKE constructs, as well as with the dependent variables:

Combination	r_p	Lower	Upper	*p*
IKEA_11 - IKEA_12	0.68	0.62	0.73	< .001
IKEA_11 - IKEA_19	0.47	0.39	0.55	< .001
IKEA_11 - IKEA_24	0.53	0.45	0.60	< .001
IKEA_11 - IKEA_25	0.43	0.35	0.51	< .001
IKEA_11 - Like_IKEA_Furniture	0.15	0.05	0.25	.003
IKEA_12 - IKEA_19	0.48	0.40	0.56	< .001
IKEA_12 - IKEA_24	0.50	0.42	0.57	< .001
IKEA_12 - IKEA_25	0.39	0.31	0.48	< .001
IKEA_12 - Like_IKEA_Furniture	0.21	0.11	0.31	< .001
IKEA_19 - IKEA_24	0.47	0.38	0.54	< .001
IKEA_19 - IKEA_25	0.43	0.34	0.50	< .001
IKEA_19 - Like_IKEA_Furniture	0.13	0.03	0.23	.009
IKEA_24 - IKEA_25	0.74	0.69	0.78	< .001
IKEA_24 - Like_IKEA_Furniture	0.24	0.14	0.33	< .001
IKEA_25 - Like_IKEA_Furniture	0.14	0.04	0.23	.008

Note. The confidence intervals were computed using $\alpha = 0.05$; $n = 378$; Holm corrections used to adjust *p*-values.

Table K1. Pearson Correlation among IKEA items and Like_IKEA_Furniture.

Combination	r_p	Lower	Upper	*p*
IG_16 - IG_17	0.65	0.58	0.70	< .001
IG_16 - IG_20	0.34	0.25	0.42	< .001
IG_16 - IG_21	0.26	0.16	0.35	< .001
IG_16 - IG_26	0.43	0.35	0.51	< .001
IG_16 - See_IKEA-IG	0.24	0.14	0.33	< .001
IG_17 - IG_20	0.32	0.23	0.41	< .001
IG_17 - IG_21	0.34	0.25	0.43	< .001
IG_17 - IG_26	0.43	0.34	0.51	< .001
IG_17 - See_IKEA-IG	0.22	0.12	0.32	< .001
IG_20 - IG_21	0.54	0.47	0.61	< .001
IG_20 - IG_26	0.19	0.09	0.28	< .001
IG_20 - See_IKEA-IG	0.23	0.13	0.32	< .001
IG_21 - IG_26	0.27	0.17	0.36	< .001
IG_21 - See_IKEA-IG	0.24	0.14	0.33	< .001
IG_26 - See_IKEA-IG	0.26	0.16	0.35	< .001

Note. The confidence intervals were computed using $\alpha = 0.05$; $n = 379$; Holm corrections used to adjust *p*-values.

Table K2. Pearson Correlation among IG items and See_IKEA-IG.

Combination	r_p	**Lower**	**Upper**	***p***
LIKE_13 - LIKE_17	0.48	0.40	0.56	< .001
LIKE_13 - LIKE_20	0.32	0.23	0.41	< .001
LIKE_13 - LIKE_21	0.36	0.27	0.44	< .001
LIKE_13 - LIKE_26	0.36	0.27	0.44	< .001
LIKE_17 - LIKE_20	0.47	0.39	0.55	< .001
LIKE_17 - LIKE_21	0.39	0.31	0.48	< .001
LIKE_17 - LIKE_26	0.37	0.28	0.46	< .001
LIKE_20 - LIKE_21	0.65	0.59	0.71	< .001
LIKE_20 - LIKE_26	0.44	0.35	0.52	< .001
LIKE_21 - LIKE_26	0.36	0.27	0.45	< .001

Note. The confidence intervals were computed using $\alpha = 0.05$; $n = 379$; Holm corrections used to adjust *p*-values.

Table K3. Pearson Correlation among LIKE items.

Variable	***B***	***SE***	**CI**	**β**	***t***	***p***
(Intercept)	3.21	0.18	[2.86, 3.56]	0.00	17.96	< .001
IKEA_11	-0.03	0.06	[-0.15, 0.08]	-0.04	-0.56	.573
IKEA_12	0.11	0.06	[0.00, 0.22]	0.15	2.04	.042
IKEA_19	0.00	0.05	[-0.09, 0.10]	0.00	0.06	.951
IKEA_24	0.21	0.07	[0.08, 0.34]	0.25	3.12	.002
IKEA_25	-007	0.06	[-0.19, 0.04]	-0.09	-1.23	.219

Note. CI is at the 95% confidence level. Results: $F(5,372) = 5.82$, $p< .001$, $R^2 = 0.07$ Unstandardized Regression Equation: Like_IKEA_Furniture = 3.21 - 0.03*IKEA_11 + 0.11*IKEA_12 + 0.00*IKEA_19 + 0.21*IKEA_24 - 0.07*IKEA_25

Table K4. Linear Regression for IKEA items predicting Like_IKEA_Furniture.

Variable	***B***	***SE***	**CI**	**β**	***t***	***P***
(Intercept)	2.11	0.27	[1.58, 2.64]	0.00	7.84	< .001
IG_16	0.09	0.06	[-0.04, 0.22]	0.09	1.40	.163
IG_17	0.02	0.06	[-0.10, 0.15]	0.02	0.36	.722
IG_20	0.10	0.06	[-0.02, 0.23]	0.10	1.65	.100
IG_21	0.11	0.06	[-0.01, 0.22]	0.11	1.86	.064
IG_26	0.16	0.05	[0.05, 0.26]	0.16	2.90	.004

Note. CI is at the 95% confidence level. Results: $F(5,373) = 10.10$, $p< .001$, $R^2 = 0.12$ Unstandardized Regression Equation: See_IKEA-IG = 2.11 + 0.09*IG_16 + 0.02*IG_17 + 0.10*IG_20 + 0.11*IG_21 + 0.16*IG_26

Table K5. Linear Regression for IG items predicting See_IKEA-IG_80.

Variable	*B*	*SE*	CI	β	*t*	*P*
(Intercept)	3.31	0.20	[2.91, 3.71]	0.00	16.17	< .001
LIKE_13	0.03	0.05	[-0.08, 0.13]	0.03	0.51	.613
LIKE_17	-0.05	0.05	[-0.14, 0.04]	-0.07	-1.04	.299
LIKE_20	0.16	0.06	[0.05, 0.27]	0.21	2.85	.005
LIKE_21	-0.06	0.05	[-0.16, 0.04]	-0.08	-1.24	.216
LIKE_26	0.10	0.05	[0.01, 0.19]	0.12	2.13	.034

Note. CI is at the 95% confidence level. Results: $F(5,372) = 4.01$, $p = .001$, $R^2 = 0.05$ Unstandardized Regression Equation: Like_IKEA_Furniture = 3.31 + 0.03*LIKE_13 - 0.05*LIKE_17 + 0.16*LIKE_20 - 0.06*LIKE_21 + 0.10*LIKE_26

Table K6. Linear Regression for LIKE items predicting Like_IKEA_Furniture.

Variable	*B*	*SE*	CI	β	*t*	*P*
(Intercept)	2.24	0.22	[1.81, 2.68]	0.00	10.09	< .001
LIKE_13	0.17	0.06	[0.06, 0.28]	0.17	2.96	.003
LIKE_17	0.09	0.05	[-0.01, 0.19]	0.11	1.81	.071
LIKE_20	0.10	0.06	[-0.01, 0.22]	0.12	1.72	.086
LIKE_21	0.04	0.05	[-0.06, 0.15]	0.05	0.82	.413
LIKE_26	0.06	0.05	[-0.04, 0.16]	0.07	1.22	.223

Note. CI is at the 95% confidence level. Results: $F(5,373) = 12.71$, $p < .001$, $R^2 = 0.15$ Unstandardized Regression Equation: See_IKEA-IG = 2.24 + 0.17*LIKE_13 + 0.09*LIKE_17 + 0.10*LIKE_20 + 0.04*LIKE_21 + 0.06*LIKE_26

Table K7. Linear Regression for LIKE items predicting See_IKEA-IG.

Appendix L: MSQ - Top PDs and Demographic Data

Correlation among top PD items of the IKEA, IG, LIKE, II, and ALL constructs, as a unit and individually, with the demographics:

Constructs vs Demographics:

Demographic	df	Approx. F	Trace Pillai	Num df	Den df	p
(Intercept)	1	1129.080	0.941	5	353.000	< .001
Gender	1	0.284	0.004	5	353.000	0.922
Age	3	0.881	0.037	15	1065.000	0.586
Province	5	1.780	0.122	25	1785.000	0.010
Ethnicity	1	1.843	0.025	5	353.000	0.104
Religion	1	1.511	0.021	5	353.000	0.185
Education	4	1.355	0.075	20	1424.000	0.135
Occupation	3	0.450	0.019	15	1065.000	0.964
Organisation	3	1.685	0.070	15	1065.000	0.048
Residuals	357					

Table L1. MANOVA: Pillai Test IKEA Top 5 PD's.

Demographic	df	Approx. F	Trace Pillai	Num df	Den df	p
(Intercept)	1	2147.509	0.968	5	353.000	< .001
Gender	1	3.339	0.045	5	353.000	0.006
Age	3	0.943	0.039	15	1065.000	0.515
Province	5	1.544	0.106	25	1785.000	0.042
Ethnicity	1	1.315	0.018	5	353.000	0.257
Religion	1	0.253	0.004	5	353.000	0.938
Education	4	0.999	0.055	20	1424.000	0.460
Occupation	3	0.432	0.018	15	1065.000	0.970
Organisation	3	0.731	0.031	15	1065.000	0.755
Residuals	357					

Table L2. MANOVA: Pillai Test IG Top 5 PD's.

Demographic	df	Approx. F	Trace Pillai	Num df	Den df	p
(Intercept)	1	1836.993	0.954	4	354.000	< .001
Gender	1	0.484	0.005	4	354.000	0.748
Age	3	1.530	0.051	12	1068.000	0.107

Province	5	1.062	0.059	20	1428.000	0.385
Ethnicity	1	0.759	0.009	4	354.000	0.553
Religion	1	0.621	0.007	4	354.000	0.648
Education	4	0.664	0.030	16	1428.000	0.831
Occupation	3	0.712	0.024	12	1068.000	0.741
Organizsation	3	0.745	0.025	12	1068.000	0.707
Residuals	357					

Table L3. MANOVA: Pillai Test LIKE Top 5 PD's.

Demographic	df	Approx. F	Trace Pillai	Num df	Den df	p
(Intercept)	1	2040.405	0.967	5	353.000	< .001
Gender	1	1.534	0.021	5	353.000	0.178
Age	3	1.448	0.060	15	1065.000	0.118
Province	5	1.334	0.092	25	1785.000	0.125
Ethnicity	1	1.125	0.016	5	353.000	0.347
Religion	1	0.444	0.006	5	353.000	0.818
Education	4	1.595	0.088	20	1424.000	0.046
Occupation	3	0.561	0.024	15	1065.000	0.905
Organisation	3	1.548	0.064	15	1065.000	0.082
Residuals	357					

Table L4. MANOVA: Pillai Test II Top 5 PD's.

Demographic	df	Approx. F	Trace Pillai	Num df	Den df	p
(Intercept)	1	2175.606	0.969	5	353.000	< .001
Gender	1	1.327	0.018	5	353.000	0.252
Age	3	1.272	0.053	15	1065.000	0.212
Province	5	0.959	0.066	25	1785.000	0.522
Ethnicity	1	0.977	0.014	5	353.000	0.432
Religion	1	0.387	0.005	5	353.000	0.858
Education	4	1.140	0.063	20	1424.000	0.301
Occupation	3	0.853	0.036	15	1065.000	0.618
Organisation	3	1.150	0.048	15	1065.000	0.306
Residuals	357					

Table L5. MANOVA: Pillai Test ALL Top 5 PD's.

Top IKEA PD Items vs Demographics:

Cases	Sum of Squares	df	Mean Square	F	p
(Intercept)	4569.541	1	4569.541	3609.530	< .001
Gender	1.191	1	1.191	0.941	0.333
Age	1.260	3	0.420	0.332	0.802
Province	8.837	5	1.767	1.396	0.225
Ethnicity	0.193	1	0.193	0.152	0.697
Religion	0.393	1	0.393	0.311	0.578
Education	3.008	4	0.752	0.594	0.667
Occupation	1.655	3	0.552	0.436	0.728
Organisation	5.973	3	1.991	1.573	0.196
Residuals	451.950	357	1.266		

Table L6. ANOVA for IKEA_19

Cases	Sum of Squares	df	Mean Square	F	p
(Intercept)	4486.586	1	4486.586	3703.270	< .001
Gender	0.949	1	0.949	0.783	0.377
Age	4.481	3	1.494	1.233	0.298
Province	7.460	5	1.492	1.231	0.294
Ethnicity	1.637	1	1.637	1.351	0.246
Religion	1.641	1	1.641	1.354	0.245
Education	9.186	4	2.297	1.896	0.111
Occupation	0.298	3	0.099	0.082	0.970
Organisation	9.249	3	3.083	2.545	0.056
Residuals	432.513	357	1.212		

Table L7. ANOVA for IKEA_11

Cases	Sum of Squares	df	Mean Square	F	p
(Intercept)	4295.979	1	4295.979	3652.243	< .001
Gender	1.169	1	1.169	0.994	0.319
Age	3.354	3	1.118	0.951	0.416
Province	14.203	5	2.841	2.415	0.036
Ethnicity	0.359	1	0.359	0.305	0.581
Religion	0.359	1	0.359	0.305	0.581
Education	7.962	4	1.991	1.692	0.151
Occupation	1.239	3	0.413	0.351	0.788

Organisation	3.451	3	1.150	0.978	0.403
Residuals	419.924	357	1.176		

Table L8. ANOVA for IKEA_24

Cases	Sum of Squares	df	Mean Square	F	p
(Intercept)	4188.918	1	4188.918	3290.230	< .001
Gender	0.466	1	0.466	0.366	0.546
Age	2.918	3	0.973	0.764	0.515
Province	10.985	5	2.197	1.726	0.128
Ethnicity	8.500	1	8.500	6.677	0.010
Religion	0.693	1	0.693	0.544	0.461
Education	5.052	4	1.263	0.992	0.412
Occupation	1.213	3	0.404	0.318	0.813
Organisation	12.744	3	4.248	3.337	0.020
Residuals	454.510	357	1.273		

Table L9. ANOVA for IKEA_12

Cases	Sum of Squares	df	Mean Square	F	p
(Intercept)	4109.509	1	4109.509	3065.467	< .001
Gender	0.962	1	0.962	0.718	0.398
Age	3.064	3	1.021	0.762	0.516
Province	5.572	5	1.114	0.831	0.528
Ethnicity	1.447	1	1.447	1.079	0.300
Religion	1.402	1	1.402	1.046	0.307
Education	7.126	4	1.781	1.329	0.259
Occupation	0.507	3	0.169	0.126	0.945
Organisation	3.824	3	1.275	0.951	0.416
Residuals	478.588	357	1.341		

Table L10. ANOVA for IKEA_25

Top IG PD Items vs Demographics:

Cases	Sum of Squares	df	Mean Square	F	p
(Intercept)	6168.446	1	6168.446	6600.840	< .001
Gender	0.003	1	0.003	0.004	0.952
Age	3.987	3	1.329	1.422	0.236
Province	15.597	5	3.119	3.338	0.006
Ethnicity	3.019	1	3.019	3.231	0.073
Religion	0.195	1	0.195	0.209	0.648
Education	4.286	4	1.072	1.147	0.334
Occupation	1.647	3	0.549	0.588	0.623
Organisation	0.205	3	0.068	0.073	0.974
Residuals	333.614	357	0.934		

Table L11. ANOVA for IG_20

Cases	Sum of Squares	df	Mean Square	F	p
(Intercept)	5920.855	1	5920.855	5244.309	< .001
Gender	0.638	1	0.638	0.565	0.453
Age	4.590	3	1.530	1.355	0.256
Province	7.521	5	1.504	1.332	0.250
Ethnicity	2.078	1	2.078	1.841	0.176
Religion	0.027	1	0.027	0.024	0.876
Education	1.999	4	0.500	0.443	0.778
Occupation	0.366	3	0.122	0.108	0.955
Organisation	0.869	3	0.290	0.257	0.857
Residuals	403.055	357	1.129		

Table L12. ANOVA for IG_21

Cases	Sum of Squares	df	Mean Square	F	p
(Intercept)	5509.301	1	5509.301	4991.750	< .001
Gender	10.129	1	10.129	9.178	0.003
Age	4.378	3	1.459	1.322	0.267
Province	14.241	5	2.848	2.581	0.026
Ethnicity	0.179	1	0.179	0.162	0.688
Religion	2.061e -4	1	2.061e -4	1.867e -4	0.989
Education	1.143	4	0.286	0.259	0.904
Occupation	0.325	3	0.108	0.098	0.961

Organisation	3.290	3	1.097	0.994	0.396
Residuals	394.014	357	1.104		

Table L13. ANOVA for IG_17

Cases	Sum of Squares	df	Mean Square	F	p
(Intercept)	5297.860	1	5297.860	4820.645	< .001
Gender	5.069	1	5.069	4.612	0.032
Age	5.410	3	1.803	1.641	0.180
Province	6.897	5	1.379	1.255	0.283
Ethnicity	0.768	1	0.768	0.698	0.404
Religion	0.129	1	0.129	0.117	0.732
Education	6.372	4	1.593	1.449	0.217
Occupation	0.305	3	0.102	0.093	0.964
Organisation	3.850	3	1.283	1.168	0.322
Residuals	392.341	357	1.099		

Table L14. ANOVA for IG_16

Cases	Sum of Squares	df	Mean Square	F	p
(Intercept)	4995.715	1	4995.715	4522.978	< .001
Gender	8.548	1	8.548	7.739	0.006
Age	6.343	3	2.114	1.914	0.127
Province	2.596	5	0.519	0.470	0.799
Ethnicity	0.008	1	0.008	0.007	0.932
Religion	0.777	1	0.777	0.704	0.402
Education	2.396	4	0.599	0.542	0.705
Occupation	2.149	3	0.716	0.649	0.584
Organisation	1.154	3	0.385	0.348	0.790
Residuals	394.313	357	1.105		

Table L15. ANOVA for IG_26

Top LIKE PD Items vs Demographics:

Cases	Sum of Squares	df	Mean Square	F	p
(Intercept)	5167.811	1	5167.811	4761.094	< .001
Gender	0.248	1	0.248	0.229	0.633
Age	9.794	3	3.265	3.008	0.030
Province	3.155	5	0.631	0.581	0.714
Ethnicity	0.257	1	0.257	0.236	0.627
Religion	0.075	1	0.075	0.069	0.793
Education	2.466	4	0.616	0.568	0.686
Occupation	1.546	3	0.515	0.475	0.700
Organsation	3.402	3	1.134	1.045	0.373
Residuals	387.497	357	1.085		

Table L16. ANOVA for LIKE_13

Cases	Sum of Squares	df	Mean Square	F	p
(Intercept)	5132.790	1	5132.790	3825.706	< .001
Gender	1.041	1	1.041	0.776	0.379
Age	13.811	3	4.604	3.431	0.017
Province	3.606	5	0.721	0.538	0.748
Ethnicity	2.042	1	2.042	1.522	0.218
Religion	0.240	1	0.240	0.179	0.673
Education	0.751	4	0.188	0.140	0.967
Occupation	4.561	3	1.520	1.133	0.336
Organisation	5.248	3	1.749	1.304	0.273
Residuals	478.972	357	1.342		

Table L17. ANOVA for LIKE_20

Cases	Sum of Squares	df	Mean Square	F	p
(Intercept)	5006.613	1	5006.613	3461.124	< .001
Gender	0.035	1	0.035	0.024	0.877
Age	13.979	3	4.660	3.221	0.023
Province	5.212	5	1.042	0.721	0.608
Ethnicity	2.612	1	2.612	1.805	0.180
Religion	1.165	1	1.165	0.805	0.370
Education	1.057	4	0.264	0.183	0.947
Occupation	0.819	3	0.273	0.189	0.904
Organisation	2.348	3	0.783	0.541	0.654
Residuals	516.411	357	1.447		

Table L18. ANOVA for LIKE_17

Cases	Sum of Squares	df	Mean Square	F	p
(Intercept)	4823.858	1	4823.858	3825.746	< .001
Gender	0.094	1	0.094	0.075	0.785
Age	10.544	3	3.515	2.788	0.041
Province	10.134	5	2.027	1.607	0.157
Ethnicity	0.010	1	0.010	0.008	0.930
Religion	0.601	1	0.601	0.477	0.490
Education	4.442	4	1.110	0.881	0.476
Occupation	0.906	3	0.302	0.239	0.869
Organisation	2.038	3	0.679	0.539	0.656
Residuals	450.139	357	1.261		

Table L19. ANOVA for LIKE_26

Appendix M: MSQ - Top PDs in Combined Constructs and Demographic

Detailed analysis of each of the demographic items in relation to the top 5 PDs in the combined construct ALL (IKEA + IG + LIKE):

Gender Demographic:

	t	df	p	Cohen's d
ALL20	0.432	377.000	0.666	0.045
ALL21	1.514	377.000	0.131	0.157
ALL13	-0.609	377.000	0.543	-0.063
ALL26	-0.795	377.000	0.427	-0.083
ALL17	-0.713	377.000	0.476	-0.074

Note. Student's t-test.
[a] Levene's test is significant ($p < .05$), suggesting a violation of the equal variance assumption

Table M1. Gender Demographic - Independent Samples T-Test

	Group	N	Mean	SD	SE
ALL20	Male	162	3.607	0.762	0.060
	Female	217	3.571	0.814	0.055
ALL21	Male	162	3.576	0.841	0.066
	Female	217	3.438	0.907	0.062
ALL13	Male	162	3.467	0.760	0.060
	Female	217	3.516	0.787	0.053
ALL26	Male	162	3.432	0.914	0.072
	Female	217	3.504	0.833	0.057
ALL17	Male	162	3.420	0.916	0.072
	Female	217	3.485	0.864	0.059

Table M2. Gender Demographic – Descriptive

Age Demographic:

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
						Lower Bound	Upper Bound		
ALL20	Less than 29	155	3.62	0.82	0.07	3.49	3.75	1.00	5.00
	30 - 39	112	3.50	0.81	0.08	3.34	3.65	1.00	5.00
	40 - 49	76	3.62	0.76	0.09	3.44	3.79	1.67	5.00
	≥ 50	36	3.64	0.63	0.11	3.42	3.85	1.67	5.00
	Total	379	3.59	0.79	0.04	3.51	3.67	1.00	5.00
ALL21	Less than 29	155	3.58	0.87	0.07	3.45	3.72	1.00	5.00
	30 - 39	112	3.40	0.88	0.08	3.23	3.56	1.00	5.00
	40 - 49	76	3.40	1.00	0.11	3.18	3.63	1.00	5.00
	≥ 50	36	3.62	0.58	0.10	3.43	3.82	2.33	5.00
	Total	379	3.50	0.88	0.05	3.41	3.59	1.00	5.00

ALL13	Less than 29	155	3.42	0.77	0.06	3.30	3.54	1.00	5.00
	30 - 39	112	3.51	0.81	0.08	3.36	3.66	1.00	5.00
	40 - 49	76	3.50	0.79	0.09	3.32	3.69	1.33	5.00
	≥ 50	36	3.75	0.56	0.09	3.56	3.94	3.00	4.67
	Total	379	3.50	0.77	0.04	3.42	3.57	1.00	5.00
ALL26	Less than 29	155	3.49	0.88	0.07	3.35	3.63	1.00	5.00
	30 - 39	112	3.36	0.95	0.09	3.18	3.54	1.00	5.00
	40 - 49	76	3.56	0.81	0.09	3.37	3.74	1.67	5.00
	≥ 50	36	3.57	0.66	0.11	3.35	3.80	2.00	4.67
	Total	379	3.47	0.87	0.04	3.39	3.56	1.00	5.00
ALL17	Less than 29	155	3.39	0.93	0.07	3.25	3.54	1.00	5.00
	30 - 39	112	3.44	0.92	0.09	3.27	3.62	1.00	5.00
	40 - 49	76	3.50	0.83	0.10	3.31	3.69	1.00	5.00
	≥ 50	36	3.68	0.63	0.10	3.46	3.89	2.33	5.00
	Total	379	3.46	0.89	0.05	3.37	3.55	1.00	5.00

Table M3. Age Demographic – Descriptive

		Sum of Squares	df	Mean Square	F	Sig.
ALL20	Between Groups	1.287	3	0.429	0.683	0.563
	Within Groups	235.508	375	0.628		
	Total	236.794	378			
ALL21	Between Groups	3.491	3	1.164	1.504	0.213
	Within Groups	290.144	375	0.774		
	Total	293.635	378			
ALL13	Between Groups	3.207	3	1.069	1.791	0.148
	Within Groups	223.757	375	0.597		
	Total	226.963	378			
ALL26	Between Groups	2.378	3	0.793	1.051	0.370
	Within Groups	282.766	375	0.754		
	Total	285.144	378			
ALL17	Between Groups	2.541	3	0.847	1.080	0.358
	Within Groups	294.186	375	0.784		
	Total	296.727	378			

Table M4. Age Demographic – ANOVA

Province Demographic:

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
						Lower Bound	Upper Bound		
ALL20	Capital	141	3.534	0.743	0.063	3.411	3.658	1.000	5.000
	Hawalli	94	3.727	0.785	0.081	3.566	3.888	2.000	5.000
	Farwania	50	3.447	1.009	0.143	3.160	3.733	1.000	5.000
	Ahmadi	46	3.739	0.785	0.116	3.506	3.972	2.000	5.000
	Jahra	14	3.286	0.804	0.215	2.821	3.750	2.000	4.333
	Mubarak Al-Kabeer	34	3.539	0.563	0.096	3.343	3.736	2.333	4.667

	Total	379	3.587	0.791	0.041	3.507	3.667	1.000	5.000
ALL21	Capital	141	3.414	0.858	0.072	3.271	3.557	1.000	5.000
	Hawalli	94	3.567	0.956	0.099	3.371	3.763	1.333	5.000
	Farwania	50	3.373	0.987	0.140	3.093	3.654	1.000	5.000
	Ahmadi	46	3.696	0.840	0.124	3.446	3.945	1.333	5.000
	Jahra	14	3.476	0.854	0.228	2.983	3.970	2.000	4.667
	Mubarak Al-Kabeer	34	3.569	0.612	0.105	3.355	3.782	2.333	5.000
	Total	379	3.497	0.881	0.045	3.408	3.586	1.000	5.000
ALL13	Capital	141	3.463	0.705	0.059	3.346	3.581	1.000	5.000
	Hawalli	94	3.443	0.829	0.085	3.274	3.613	1.333	5.000
	Farwania	50	3.447	0.821	0.116	3.213	3.680	1.000	5.000
	Ahmadi	46	3.754	0.738	0.109	3.534	3.973	2.000	5.000
	Jahra	14	3.333	0.978	0.261	2.768	3.898	1.000	4.667
	Mubarak Al-Kabeer	34	3.559	0.769	0.132	3.291	3.827	1.333	4.667
	Total	379	3.495	0.775	0.040	3.417	3.573	1.000	5.000
ALL26	Capital	141	3.428	0.859	0.072	3.285	3.571	1.000	5.000
	Hawalli	94	3.532	0.869	0.090	3.354	3.710	1.000	5.000
	Farwania	50	3.387	0.909	0.129	3.128	3.645	1.000	5.000
	Ahmadi	46	3.681	0.858	0.126	3.426	3.936	1.667	5.000
	Jahra	14	3.333	1.109	0.296	2.693	3.974	1.000	5.000
	Mubarak Al-Kabeer	34	3.402	0.747	0.128	3.141	3.662	1.333	4.667
	Total	379	3.473	0.869	0.045	3.385	3.561	1.000	5.000
ALL17	Capital	141	3.348	0.788	0.066	3.216	3.479	1.000	5.000
	Hawalli	94	3.553	0.927	0.096	3.363	3.743	1.000	5.000
	Farwania	50	3.420	1.030	0.146	3.127	3.713	1.000	5.000
	Ahmadi	46	3.746	0.861	0.127	3.491	4.002	1.667	5.000
	Jahra	14	3.238	0.999	0.267	2.661	3.815	1.000	4.667
	Mubarak Al-Kabeer	34	3.402	0.860	0.147	3.102	3.702	1.333	5.000
	Total	379	3.457	0.886	0.046	3.368	3.547	1.000	5.000

Table M5. Province Demographic – Descriptive

		Sum of Squares	df	Mean Square	F	Sig.
ALL20	Between Groups	5.631	5	1.126	1.817	0.109
	Within Groups	231.164	373	0.620		
	Total	236.794	378			
ALL21	Between Groups	4.204	5	0.841	1.084	0.369
	Within Groups	289.431	373	0.776		
	Total	293.635	378			
ALL13	Between Groups	4.091	5	0.818	1.369	0.235
	Within Groups	222.873	373	0.598		
	Total	226.963	378			
ALL26	Between Groups	3.424	5	0.685	0.907	0.477
	Within Groups	281.720	373	0.755		
	Total	285.144	378			
ALL17	Between Groups	7.254	5	1.451	1.869	0.099
	Within Groups	289.473	373	0.776		
	Total	296.727	378			

Table M6. Province Demographic – ANOVA

Ethnicity Demographic:

	t	df	p		Cohen's d
ALL20	-1.959	377.000	0.051		-0.219
ALL21	-2.173	377.000	0.030		-0.243
ALL13	-0.561	377.000	0.575		-0.063
ALL26	-0.824	377.000	0.411		-0.092
ALL17	-2.142	377.000	0.033	[a]	-0.240

Note. Student's t-test.
[a] Levene's test is significant ($p < .05$), suggesting a violation of the equal variance assumption

Table M7. Ethnicity Demographic – Independent Samples T-Test

	Group	N	Mean	SD	SE
ALL20	Arabian	265	3.535	0.769	0.047
	Non-Arabian	114	3.708	0.833	0.078
ALL21	Arabian	265	3.433	0.873	0.054
	Non-Arabian	114	3.646	0.886	0.083
ALL13	Arabian	265	3.481	0.775	0.048
	Non-Arabian	114	3.529	0.778	0.073
ALL26	Arabian	265	3.449	0.860	0.053
	Non-Arabian	114	3.529	0.890	0.083
ALL17	Arabian	265	3.394	0.843	0.052
	Non-Arabian	114	3.605	0.966	0.090

Table M8. Ethnicity Demographic – Descriptive

Religion Demographic:

	t	df	p		Cohen's d
ALL20	-0.951	377.000	0.342		-0.209
ALL21	-0.349	377.000	0.727	[a]	-0.077
ALL13	-0.408	377.000	0.684		-0.090
ALL26	-0.992	377.000	0.322		-0.218
ALL17	-0.398	377.000	0.691		-0.087

Note. Student's t-test.
[a] Levene's test is significant ($p < .05$), suggesting a violation of the equal variance assumption

Table M9. Religion Demographic – Independent Samples T-Test

	Group	N	Mean	SD	SE
ALL20	Muslim	357	3.577	0.782	0.041
	Non-Muslim	22	3.742	0.937	0.200
ALL21	Muslim	357	3.493	0.869	0.046
	Non-Muslim	22	3.561	1.081	0.230
ALL13	Muslim	357	3.491	0.780	0.041
	Non-Muslim	22	3.561	0.701	0.149
ALL26	Muslim	357	3.462	0.863	0.046

	Non-Muslim	22	3.652	0.962	0.205
ALL17	Muslim	357	3.453	0.881	0.047
	Non-Muslim	22	3.530	0.985	0.210

Table M10. Religion Demographic – Descriptive

Education Demographic:

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
						Lower Bound	Upper Bound		
ALL20	Below High School	9	3.370	0.949	0.316	2.641	4.100	2.000	5.000
	High School	64	3.734	0.782	0.098	3.539	3.930	1.667	5.000
	Diploma	74	3.577	0.810	0.094	3.389	3.764	1.667	5.000
	Bachelor	176	3.527	0.755	0.057	3.414	3.639	1.000	5.000
	Higher Education	56	3.655	0.862	0.115	3.424	3.886	1.000	5.000
	Total	379	3.587	0.791	0.041	3.507	3.667	1.000	5.000
ALL21	Below High School	9	3.556	0.882	0.294	2.878	4.233	2.000	5.000
	High School	64	3.604	0.873	0.109	3.386	3.822	1.000	5.000
	Diploma	74	3.369	1.005	0.117	3.137	3.602	1.000	5.000
	Bachelor	176	3.472	0.850	0.064	3.345	3.598	1.000	5.000
	Higher Education	56	3.613	0.813	0.109	3.395	3.831	1.667	5.000
	Total	379	3.497	0.881	0.045	3.408	3.586	1.000	5.000
ALL13	Below High School	9	3.296	1.020	0.340	2.512	4.080	1.333	4.333
	High School	64	3.411	0.790	0.099	3.214	3.609	1.000	5.000
	Diploma	74	3.550	0.712	0.083	3.385	3.714	1.333	5.000
	Bachelor	176	3.515	0.770	0.058	3.401	3.630	1.000	5.000
	Higher Education	56	3.488	0.826	0.110	3.267	3.709	1.000	5.000
	Total	379	3.495	0.775	0.040	3.417	3.573	1.000	5.000
ALL26	Below High School	9	3.333	0.645	0.215	2.837	3.830	2.000	4.000
	High School	64	3.536	0.931	0.116	3.304	3.769	1.000	5.000
	Diploma	74	3.536	0.748	0.087	3.363	3.709	1.333	5.000
	Bachelor	176	3.377	0.882	0.067	3.246	3.508	1.000	5.000
	Higher Education	56	3.643	0.916	0.122	3.397	3.888	1.000	5.000
	Total	379	3.473	0.869	0.045	3.385	3.561	1.000	5.000
ALL17	Below High School	9	3.370	1.073	0.358	2.546	4.195	1.333	4.667
	High School	64	3.448	1.046	0.131	3.187	3.709	1.000	5.000
	Diploma	74	3.617	0.791	0.092	3.434	3.800	2.000	5.000
	Bachelor	176	3.386	0.855	0.064	3.259	3.514	1.000	5.000
	Higher Education	56	3.494	0.874	0.117	3.260	3.728	1.333	5.000
	Total	379	3.457	0.886	0.046	3.368	3.547	1.000	5.000

Table M11. Education Demographic – Descriptive

		Sum of Squares	df	Mean Square	F	Sig.
ALL20	Between Groups	2.721	4	0.680	1.087	0.363
	Within Groups	234.073	374	0.626		
	Total	236.794	378			
ALL21	Between Groups	2.840	4	0.710	0.913	0.456
	Within Groups	290.796	374	0.778		
	Total	293.635	378			
ALL13	Between Groups	1.096	4	0.274	0.454	0.770
	Within Groups	225.867	374	0.604		
	Total	226.963	378			
ALL26	Between Groups	3.969	4	0.992	1.320	0.262
	Within Groups	281.175	374	0.752		
	Total	285.144	378			
ALL17	Between Groups	2.925	4	0.731	0.931	0.446
	Within Groups	293.802	374	0.786		
	Total	296.727	378			

Table M12. Education Demographic – ANOVA

Occupation Demographic:

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
						Lower Bound	Upper Bound		
ALL20	Student	103	3.693	0.796	0.078	3.537	3.848	1.667	5.000
	Employ	213	3.520	0.800	0.055	3.411	3.628	1.000	5.000
	Retired	32	3.656	0.690	0.122	3.407	3.905	1.667	5.000
	Other	31	3.624	0.802	0.144	3.330	3.918	1.667	4.667
	Total	379	3.587	0.791	0.041	3.507	3.667	1.000	5.000
ALL21	Student	103	3.583	0.823	0.081	3.422	3.743	1.000	5.000
	Employ	213	3.415	0.925	0.063	3.290	3.540	1.000	5.000
	Retired	32	3.677	0.647	0.114	3.444	3.911	2.333	5.000
	Other	31	3.591	0.946	0.170	3.245	3.938	1.000	4.667
	Total	379	3.497	0.881	0.045	3.408	3.586	1.000	5.000
ALL13	Student	103	3.424	0.826	0.081	3.263	3.585	1.000	5.000
	Employ	213	3.454	0.741	0.051	3.354	3.554	1.000	5.000
	Retired	32	3.781	0.711	0.126	3.525	4.038	2.000	5.000
	Other	31	3.720	0.821	0.148	3.419	4.022	2.000	5.000
	Total	379	3.495	0.775	0.040	3.417	3.573	1.000	5.000
ALL26	Student	103	3.537	0.856	0.084	3.370	3.704	1.000	5.000
	Employ	213	3.418	0.881	0.060	3.299	3.537	1.000	5.000
	Retired	32	3.552	0.832	0.147	3.252	3.852	1.667	5.000
	Other	31	3.559	0.871	0.156	3.240	3.879	1.667	4.667
	Total	379	3.473	0.869	0.045	3.385	3.561	1.000	5.000
ALL17	Student	103	3.356	0.955	0.094	3.169	3.543	1.000	5.000
	Employ	213	3.457	0.884	0.061	3.338	3.576	1.000	5.000

	Retired	32	3.604	0.700	0.124	3.352	3.857	2.333	5.000
	Other	31	3.645	0.821	0.147	3.344	3.946	2.000	4.667
	Total	379	3.457	0.886	0.046	3.368	3.547	1.000	5.000

Table M13. Occupation Demographic – Descriptive

		Sum of Squares	df	Mean Square	F	Sig.
ALL20	Between Groups	2.311	3	0.770	1.232	0.298
	Within Groups	234.483	375	0.625		
	Total	236.794	378			
ALL21	Between Groups	3.510	3	1.170	1.512	0.211
	Within Groups	290.126	375	0.774		
	Total	293.635	378			
ALL13	Between Groups	5.078	3	1.693	2.861	0.037
	Within Groups	221.885	375	0.592		
	Total	226.963	378			
ALL26	Between Groups	1.503	3	0.501	0.662	0.576
	Within Groups	283.641	375	0.756		
	Total	285.144	378			
ALL17	Between Groups	2.842	3	0.947	1.209	0.306
	Within Groups	293.886	375	0.784		
	Total	296.727	378			

Table M14. Occupation Demographic – ANOVA

Organisation Demographic:

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min.	Max.
						Lower Bound	Upper Bound		
ALL20	Public Sector (gov)	162	3.570	0.745	0.059	3.454	3.685	1.000	5.000
	Private Sector	87	3.536	0.893	0.096	3.346	3.727	1.000	5.000
	Other	57	3.655	0.771	0.102	3.450	3.860	1.667	5.000
	Not Applicable	73	3.630	0.791	0.093	3.446	3.815	1.667	5.000
	Total	379	3.587	0.791	0.041	3.507	3.667	1.000	5.000
ALL21	Public Sector (gov)	162	3.455	0.859	0.067	3.321	3.588	1.000	5.000
	Private Sector	87	3.490	0.975	0.105	3.283	3.698	1.000	5.000
	Other	57	3.561	0.850	0.113	3.336	3.787	1.000	5.000
	Not Applicable	73	3.548	0.849	0.099	3.350	3.746	1.000	5.000
	Total	379	3.497	0.881	0.045	3.408	3.586	1.000	5.000
ALL13	Public Sector (gov)	162	3.560	0.757	0.059	3.442	3.677	1.000	5.000
	Private Sector	87	3.375	0.781	0.084	3.209	3.542	1.333	5.000
	Other	57	3.573	0.742	0.098	3.376	3.770	2.000	4.667
	Not Applicable	73	3.434	0.825	0.097	3.241	3.626	1.000	5.000
	Total	379	3.495	0.775	0.040	3.417	3.573	1.000	5.000
ALL26	Public Sector (gov)	162	3.475	0.877	0.069	3.339	3.611	1.000	5.000
	Private Sector	87	3.414	0.876	0.094	3.227	3.600	1.000	5.000

	Other	57	3.544	0.840	0.111	3.321	3.767	1.667	5.000
	Not Applicable	73	3.484	0.875	0.102	3.280	3.688	1.000	5.000
	Total	379	3.473	0.869	0.045	3.385	3.561	1.000	5.000
ALL17	Public Sector (gov)	162	3.471	0.848	0.067	3.340	3.603	1.000	5.000
	Private Sector	87	3.552	0.903	0.097	3.359	3.744	1.333	5.000
	Other	57	3.567	0.871	0.115	3.336	3.798	1.333	5.000
	Not Applicable	73	3.228	0.936	0.110	3.010	3.447	1.000	5.000
	Total	379	3.457	0.886	0.046	3.368	3.547	1.000	5.000

Table M15. Organisation Demographic – Descriptive

		Sum of Squares	df	Mean Square	F	Sig.
ALL20	Between Groups	0.669	3	0.223	0.354	0.786
	Within Groups	236.126	375	0.630		
	Total	236.794	378			
ALL21	Between Groups	0.719	3	0.240	0.307	0.820
	Within Groups	292.916	375	0.781		
	Total	293.635	378			
ALL13	Between Groups	2.542	3	0.847	1.416	0.238
	Within Groups	224.422	375	0.598		
	Total	226.963	378			
ALL26	Between Groups	0.601	3	0.200	0.264	0.851
	Within Groups	284.543	375	0.759		
	Total	285.144	378			
ALL17	Between Groups	5.324	3	1.775	2.284	0.079
	Within Groups	291.403	375	0.777		
	Total	296.727	378			

Table M16. Organisation Demographic – ANOVA

Appendix N: PD Scale Reliability

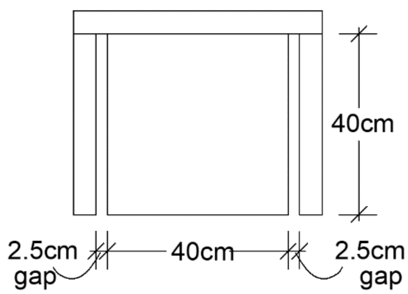
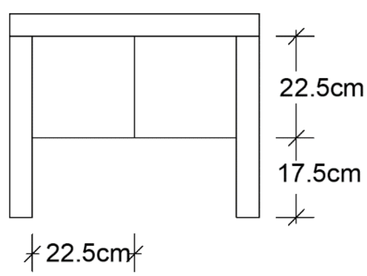
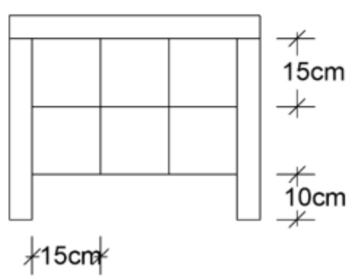
Reliability between the two different scale sizes for each of the same PDs. The scale size with the least reliability can be eliminated. Highlighted in bold are the most reliable scale sizes of each of the PDs.

PD	Question Sets	Scale Size	Reliability	Question Number	IKEA Mean	Question Number	IG Mean	Question Number	Like Mean
1	1,2,3	**S**	**0.344**	TS_1_IKEA	2.89	TS _2_IG	2.47	TS _3_LIKE	2.67
	4,5,6	L	0.278	SL_4_IKEA	3.19	SL_5_IG	2.19	SL_6_LIKE	2.64
2	7,8,9	S	0.007	TS _7_IKEA	1.94	TS _8_IG	4.14	TS _9_LIKE	3.69
	10,11,12	**L**	**0.296**	SL_10_IKEA	2.11	SL_11_IG	3.58	SL_12_LIKE	3.28
3	13,14,15	**S**	**0.143**	TS_13_IKEA	2.06	TS_14_IG	3.83	TS_15_LIKE	3.94
	16,17,18	L	-0.133	SL_16_IKEA	2.33	SL_17_IG	3.56	SL_18_LIKE	3.72
4	19,20,21	**S**	**0.573**	TS_19_IKEA	3.28	TS_20_IG	2.03	TS_21_LIKE	2.39
	22,23,24	L	0.253	SL_22_IKEA	3.17	SL_23_IG	2.03	SL_24_LIKE	2.33
5	25,26,27	**S**	**0.512**	TS_25_IKEA	2.36	TS_26_IG	3.19	TS_27_LIKE	3.31
	28,29,30	L	0.239	SL_28_IKEA	2.75	SL_29_IG	2.61	SL_30_LIKE	2.83
6	31,32,33	S	0.3	TS_31_IKEA	2.08	TS_32_IG	3.47	TS_33_LIKE	3.19
	34,35,36	**L**	**0.608**	SL_34_IKEA	2.17	SL_35_IG	2.58	SL_36_LIKE	2.44
7	37,38,39	**S**	**0.736**	CS_37_IKEA	2.14	CS_38_IG	2.39	CS_39_LIKE	2.58
	40,41,42	L	0.667	CL_40_IKEA	2.47	CL_41_IG	2.33	CL_42_LIKE	2.53
8	43,44,45	S	0.393	CS_43_IKEA	2.78	CS_44_IG	2.86	CS_45_LIKE	2.67
	46,47,48	**L**	**0.584**	CL_46_IKEA	2.67	CL_47_IG	2.67	CL_48_LIKE	2.56
9	49,50,51	S	0.613	CS_49_IKEA	1.92	CS_50_IG	3.31	CS_51_LIKE	3.17
	52,53,54	**L**	**0.657**	CL_52_IKEA	1.94	CL_53_IG	3.03	CL_54_LIKE	3.08
10	55,56,57	**S**	**0.744**	TS_55_IKEA	2.31	TS_56_IG	2.36	TS_57_LIKE	2.44
	58,59,60	L	0.683	SL_58_IKEA	2.31	SL_59_IG	2.44	SL_60_LIKE	2.33
11	61,62,63	S	-0.076	TS_61_IKEA	2.72	TS_62_IG	3.47	TS_63_LIKE	3.50
	64,65,66	**L**	**0.356**	SL_64_IKEA	2.94	SL_65_IG	2.81	SL_66_LIKE	3.14
12	67,68,69	S	0.241	TS_67_IKEA	2.53	TS_68_IG	3.39	TS_69_LIKE	3.33
	70,71,72	**L**	**0.7**	SL_70_IKEA	2.61	SL_71_IG	2.69	SL_72_LIKE	2.92
13	109,110,111	**S**	**0.727**	CS_109_IKEA	2.17	CS_110_IG	2.28	CS_111_LIKE	2.50
	112,113,114	L	0.658	CL_112_IKEA	2	CL_113_IG	2.17	CL_114_LIKE	2.47

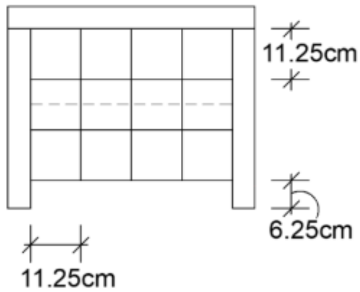
14	115,116,117	**S**	**0.541**	CS_115_IKEA	2.28	CS_116_IG	3.36	CS_117_LIKE	3.53
	118,119,120	L	0.484	CL_118_IKEA	2.33	CL_119_IG	2.78	CL_120_LIKE	3.25
15	121,122,123	S	0.522	CS_121_IKEA	2.25	CS_122_IG	3.06	CS_123_LIKE	3.08
	124,125,126	**L**	**0.593**	CL_124_IKEA	2.17	CL_125_IG	3.00	CL_126_LIKE	2.94
16	127,128,129	**S**	**0.7**	CS_127_IKEA	2.17	CS_128_IG	2.94	CS_129_LIKE	3.06
	130,131,132	L	0.603	CL_130_IKEA	2.33	CL_131_IG	2.78	CL_132_LIKE	3.03
17	133,134,135	S	0.493	CS_133_IKEA	2.47	CS_134_IG	3.00	CS_135_LIKE	3.25
	136,137,138	**L**	**0.519**	CL_136_IKEA	2.5	CL_137_IG	2.92	CL_138_LIKE	2.94
18	139,140,141	**S**	**0.606**	CS_139_IKEA	2.14	CS_140_IG	3.64	CS_141_LIKE	3.56
	142,143,144	L	0.559	CL_142_IKEA	2.22	CL_143_IG	3.36	CL_144_LIKE	3.36
19	163,164,165	S	0.388	TS_163_IKEA	2.75	TS_164_IG	3.58	TS_165_LIKE	3.39
	166,167,168	**L**	**0.542**	SL_166_IKEA	2.69	SL_167_IG	3.39	SL_168_LIKE	3.25
20	169,170,171	S	0.25	TS_169_IKEA	2.14	TS_170_IG	3.94	TS_171_LIKE	3.69
	172,173,174	**L**	**0.544**	SL_172_IKEA	2.14	SL_173_IG	3.53	SL_174_LIKE	3.31
21	175,176,177	**S**	**0.247**	TS_175_IKEA	2.08	TS_176_IG	3.92	TS_177_LIKE	3.75
	178,179,180	L	0.061	SL_178_IKEA	2.42	SL_179_IG	3.64	SL_180_LIKE	3.42

Appendix O: Unit Divisibility within Table-Panels

The size of the table panel determines the scale size of the pattern design. The established table-panel unit divisibility for the IKEA-IG PDs is: 8 by 6 (two table-panels) or 8 by 3 (one table-panel installation).

<table>
<tr><td colspan="2">Framing the PD Units –</td></tr>
<tr><td>1 by 1 PD Unit:
</td><td>Eliminated due to:
- no pattern creation
~ to create a PD, systematic repetition must be applied to an IS/Unit for a PD outcome to emerge/take place.
- space to fit a TP is 40cm x 45cm
~ fitting a square (PD Unit) leaves a 'gap' on the right and left side of the PD.</td></tr>
<tr><td>2 by 1 PD Unit:
</td><td>Eliminated due to:
- size of PD Units allows room for only One TP to fit table.
- distance between end of TP and floor
~ 17.5cm gap size (big gap)
~ gap size does not fall under IKEA nor IG design style (DS).</td></tr>
<tr><td>3 by 2 PD Unit:
</td><td>Eliminated due to:
- distance between end of TP and floor
~ 10cm gap size (big gap)
~ gap size does not fall under IKEA nor IG design style (DS).</td></tr>
</table>

4 by 3 PD Unit:

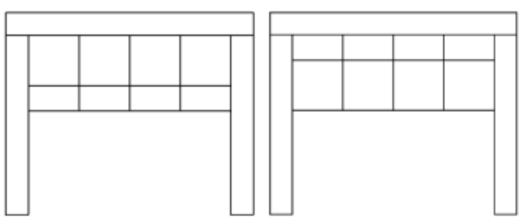


Eliminated due to:

- odd # of PD Units (vertically)
  - ~ trim line (dotted-line signifying where the two TP's meet) cuts through PD Units.
  - ~ one TP by itself does not have a symmetrical outcome.

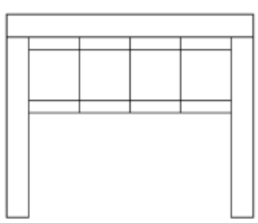
- Although 6.25cm is the ideal gap size between TP baseline and ground, the number of vertical PD Units is an odd number; 3. Only an even number of PD Units can be divisible between two TP's to maintain a whole PD Unit; not a fraction.
  - See following ex. on odd number of PD Units break-down:

One Table Panel (TP)



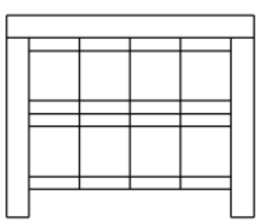
- 3 vertical PD Units can be applied to Two TP's; yet, a Single TP will hold 1.5 PD Units (vertically per TP).

One TP (PD Unit centred)



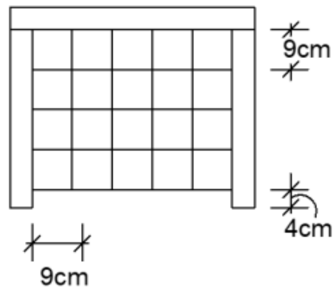
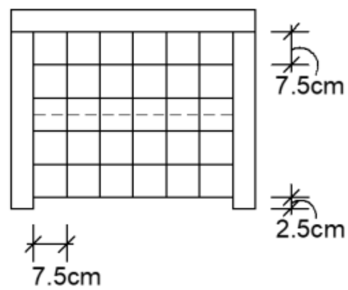
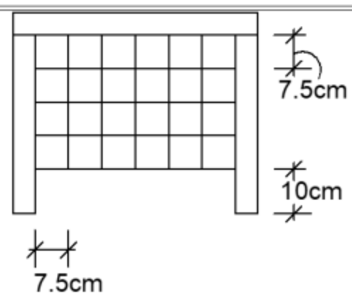
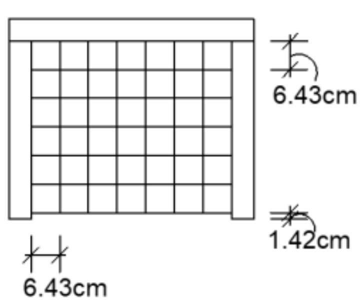
- Centring 1.5 PD Units (vertically) within One TP.
  ~ this leaves 25% of PD Unit on each end of the TP frame (vertically).

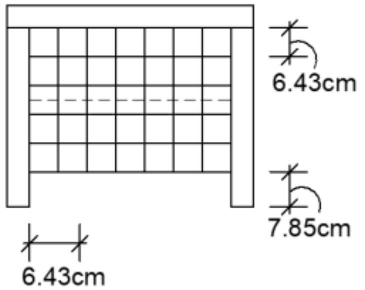
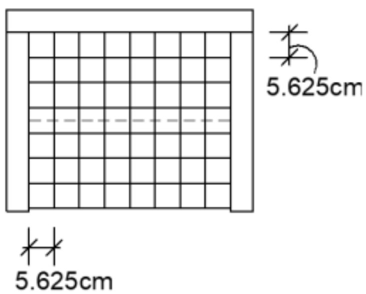
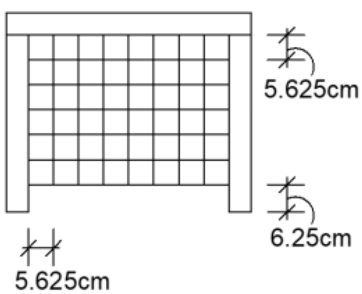
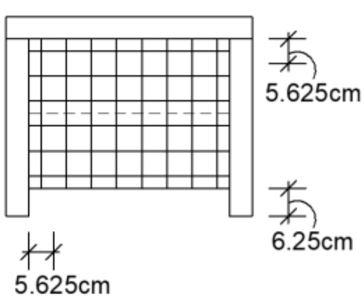
Two TP (PD Unit centred)



- Applying Two TP's.
  ~ the outcome is not a continuum of the symmetrical PD; therefor an even # of PD Units (vertically) is required.

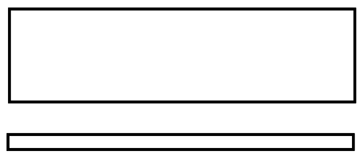
* The number of Vertical PD Units must be an even # for a whole # of PD Unit divisibility within the TP's.

5 by 4 PD Unit:  	Eliminated due to: - distance between end of TP and floor ~ 4cm gap size (close to ground).
6 by 5 PD Unit:  	Eliminated due to: - odd # of PD Units (vertically) - distance between end of TP and floor ~ 2.5cm gap size (close to ground).
Or, 6 by 4 PD Unit:	Eliminated due to: - even # of PD Units (vertically), yet distance between end of TP and floor is now 10cm gap size (big gap).
 	
7 by 6 PD Unit:  	Eliminated due to: - distance between end of TP and floor ~ 1.42cm gap size (close to ground).

Or, 7 by 5 PD Unit: 	Eliminated due to: - odd # of PD Units (vertically).
8 by 7 PD Unit: 	Eliminated due to: - odd # of PD Units (vertically). - distance between end of TP and floor ~ (very small gap).
Or, 8 by 6 PD Unit: 	* Established/Workable PD Unit to TP: - even # of PD Units (vertically & horizontally). - ideal distance between end of TP and floor ~ 6.25cm is the ideal gap size between TP and ground as it is the proportional ratio of IKEA (fixed with IKEA's Shape Grammars).
… also, 8 by 6 (50% shift): 	- The 50% shift of the PD Unit framing allows for the pattern to 'extend beyond the frame'; IG design quality. - Where the two TP's meet is the PD continuation. Therefore, using only One TP also allows for a symmetrical outcome.

The found 8 by 3 (per table-panel) unit divisibility of the IKEA-IG PD style dimensions is as follow:

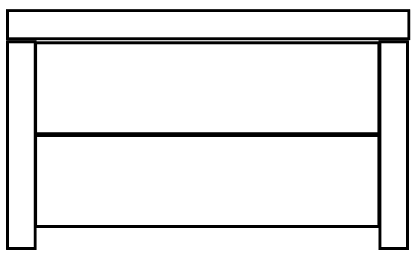
- Table-panel board dimensions:



45cm (length) x 16.875cm (height).

0.5cm (width/thick).

- Table dimensions – IKEA LACK side table:



55cm (length) x 55cm (width) x 45cm (height).

Table-top thickness: 5cm

Table-legs thickness: 5cm x 5cm

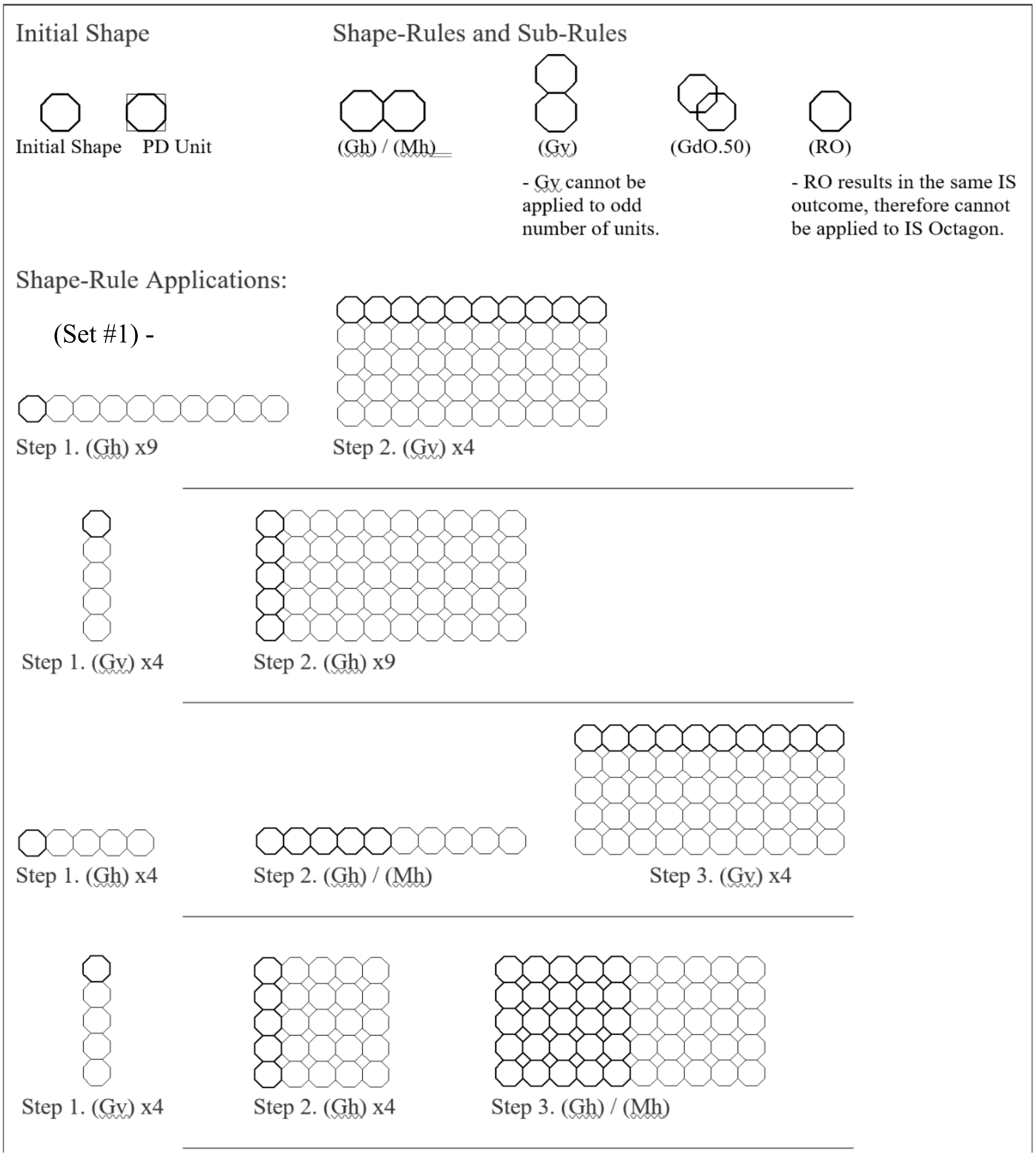
Table-panel installations can be one or two-layer paneling depending on style preference.

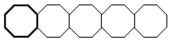
- Two-layer table-panel: 16.875 + 16.875 = 33.75cm.
- Floor gap with two-panels: 40 – 33.75 = 6.25cm.

Table-panel installations can be one or two-layer paneling depending on style preference.

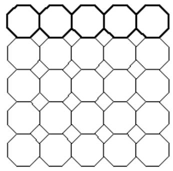
Appendix P: PD Formations and Outcomes for MSQ

Through shape-rule applications, Initial Shape Octagon used as an example to undergo shape grammar transformations to develop PD creation. The final IKEA-IG PD framed illustration outcomes from each of the seven IS are also presented and used for the Main Study:

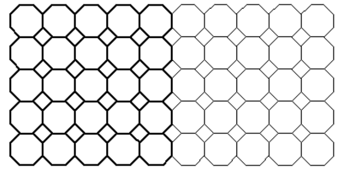




Step 1. (Gh) x4



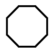
Step 2. (Gv) x4



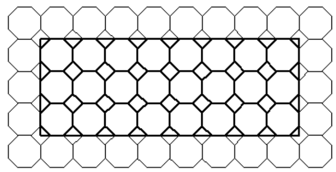
Step 3. (Gh) / (Mh)

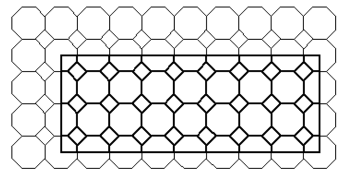
Framing variations and PD composition outcome:

Initial Shape



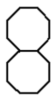
Octagon



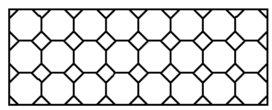


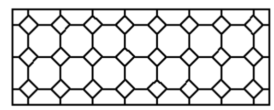
Shape-Rules and Sub-Rules

(Gh) / (Mh)



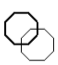
(Gv)



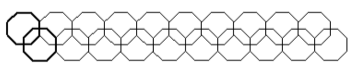


Shape-Rule Applications:

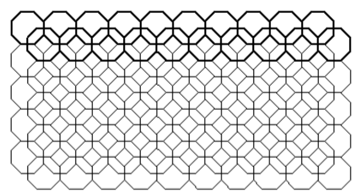
(Set #3) -



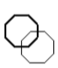
Step 1. (GdO.50)



Step 2. (Gh) x9

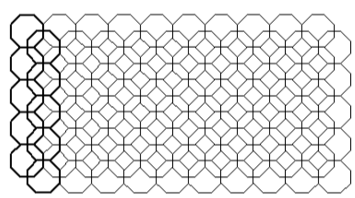


Step 3. (Gv) x4

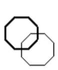


Step 1. (GdO.50)

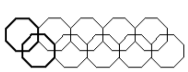
Step 2. (Gv) x4



Step 3. (Gh) x9



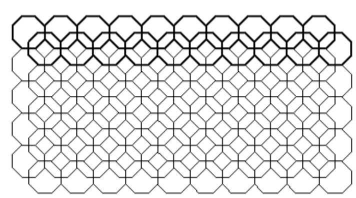
Step 1. (GdO.50)



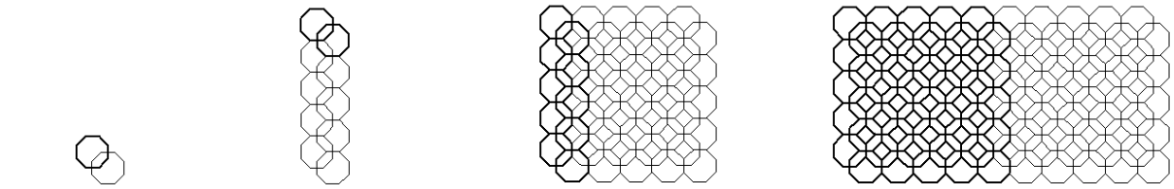
Step 2. (Gh) x4

Step 3. (Gh)

- Mh cannot apply

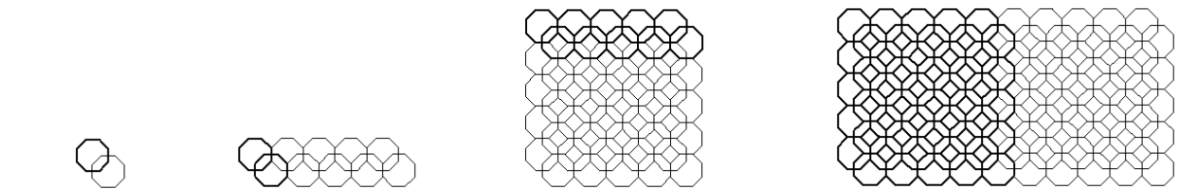


Step 4. (Gv) x4



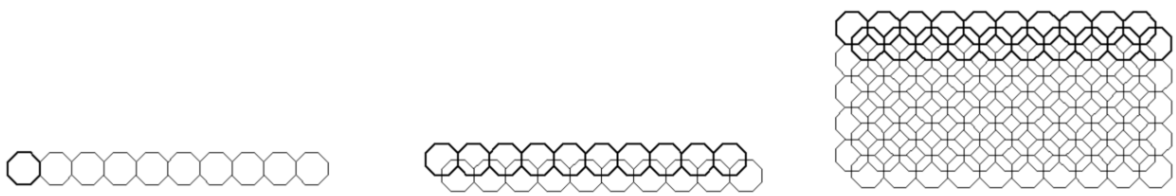
Step 1. (GdO.50) Step 2. (Gv) x4 Step 3. (Gh) x4 Step 4. (Gh)

- Mh cannot apply

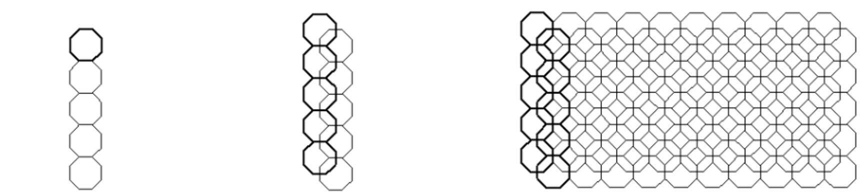


Step 1. (GdO.50) Step 2. (Gh) x4 Step 3. (Gv) x4 Step 4. (Gh)

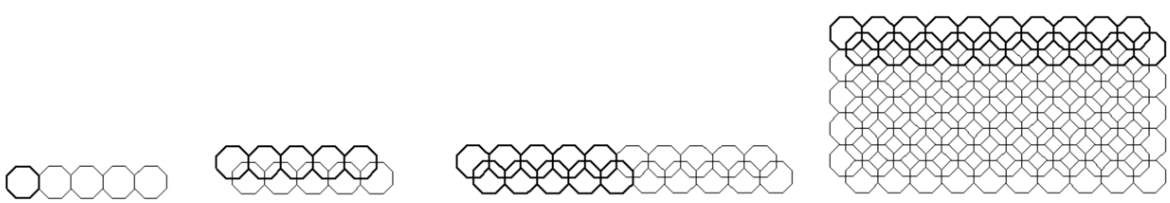
- Mh cannot apply



Step 1. (Gh) x9 Step 2. (GdO.50) Step 3. (Gv) x4

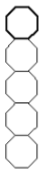


Step 1. (Gv) x4 Step 2. (GdO.50) Step 3. (Gh) x9

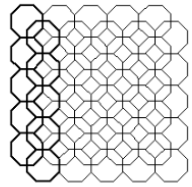


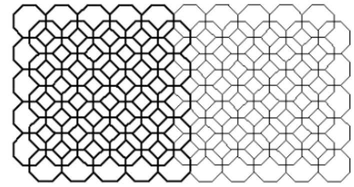
Step 1. (Gh) x4 Step 2. (GdO.50) Step 3. (Gh) Step 4. (Gv) x4

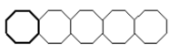
- Mh cannot apply


Step 1. (Gy) x4

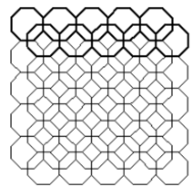

Step 2. (GdO.50)

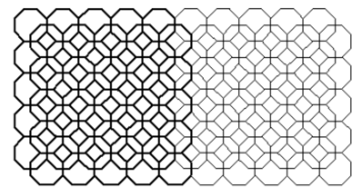

Step 3. (Gh) x4

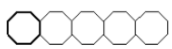

Step 4. (Gh)
- Mh cannot apply

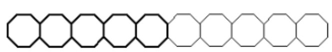

Step 1. (Gh) x4

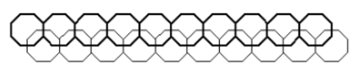

Step 2. (GdO.50)

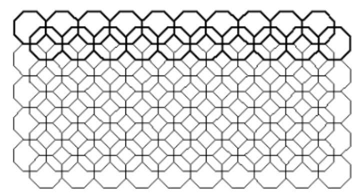

Step 3. (Gy) x4

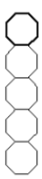

Step 4. (Gh)
- Mh cannot apply

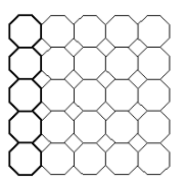

Step 1. (Gh) x4

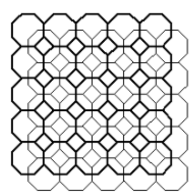

Step 2. (Gh) / (Mh)

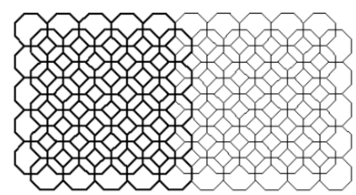

Step 3. (GdO.50)

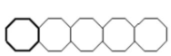

Step 4. (Gy) x4

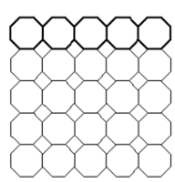

Step 1. (Gy) x4

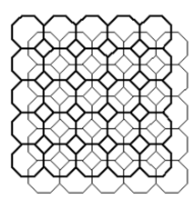

Step 2. (Gh) x4

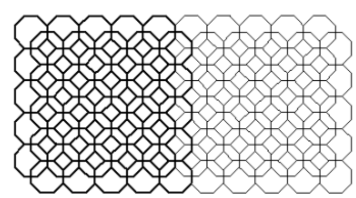

Step 3. (GdO.50)

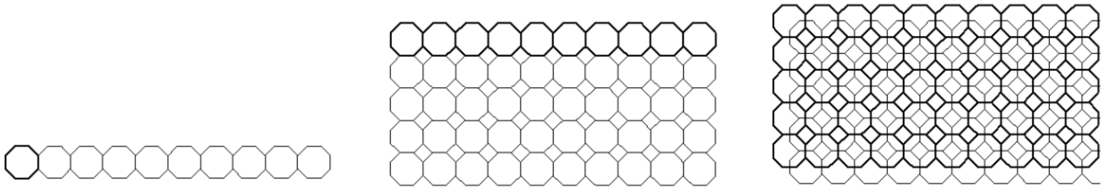

Step 4. (Gh)
- Mh cannot apply


Step 1. (Gh) x4

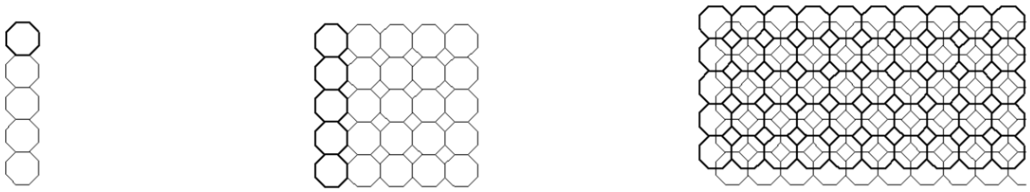

Step 2. (Gy) x4


Step 3. (GdO.50)

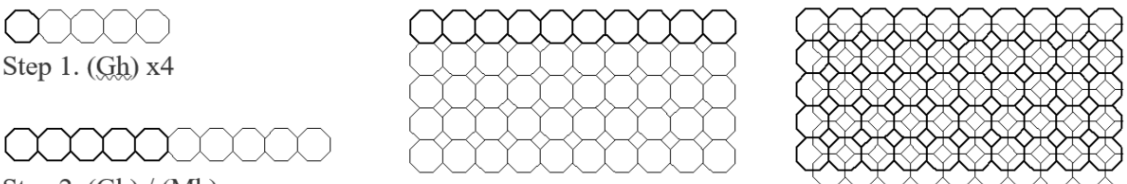

Step 4. (Gh)
- Mh cannot apply



Step 1. (Gh) x9 Step 2. (Gv) x4 Step 3. (GdO.50)



Step 1. (Gv) x4 Step 2. (Gh) x4 Step 3. (GdO.50)

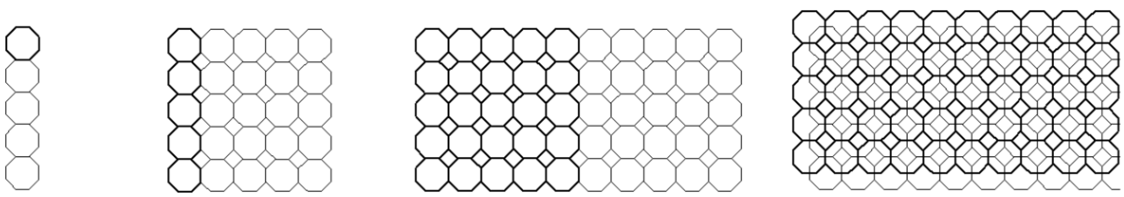


Step 1. (Gh) x4

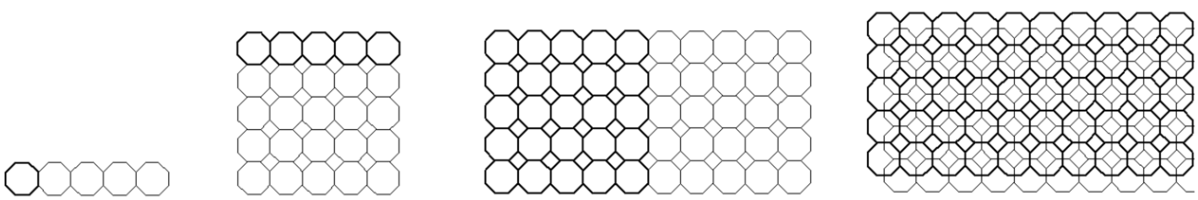
Step 2. (Gh) / (Mh)

Step 3. (Gv) x4

Step 4. (GdO.50)



Step 1. (Gv) x4 Step 2. (Gh) x4 Step 3. (Gh) / (Mh) Step 4. (GdO.50)



Step 1. (Gh) x4 Step 2. (Gv) x4 Step 3. (Gh) / (Mh) Step 4. (GdO.50)

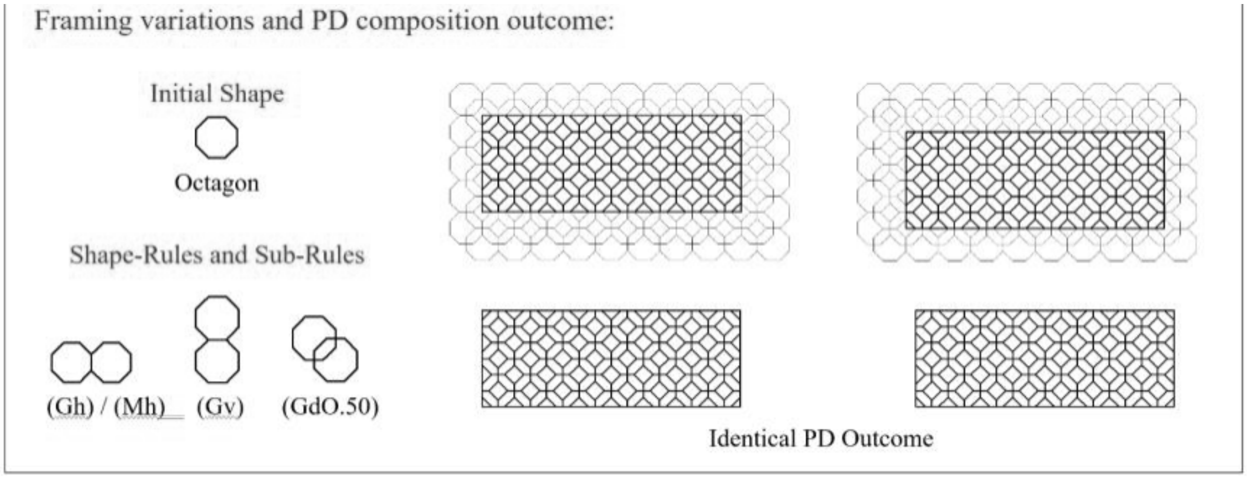
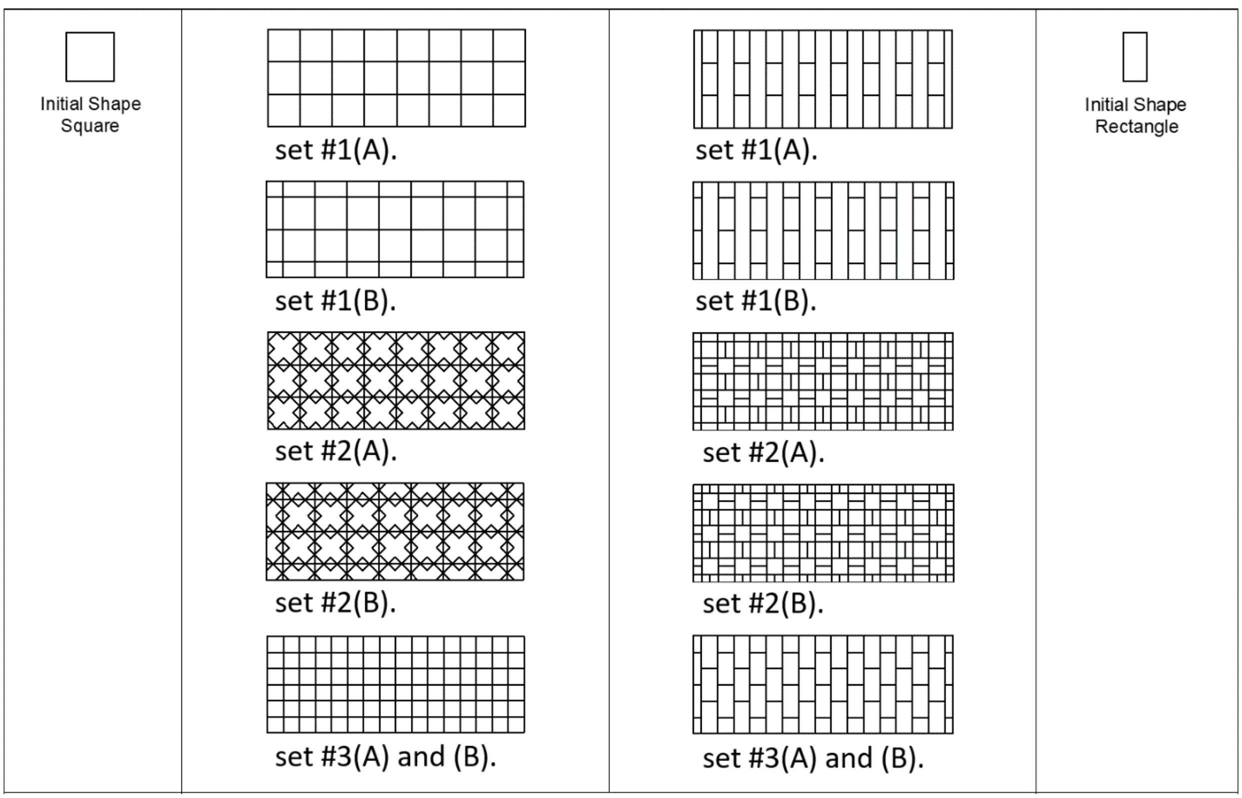


Figure P1. Initial Shape Octagon PD Formation.

PD outcomes from each of the seven IS:



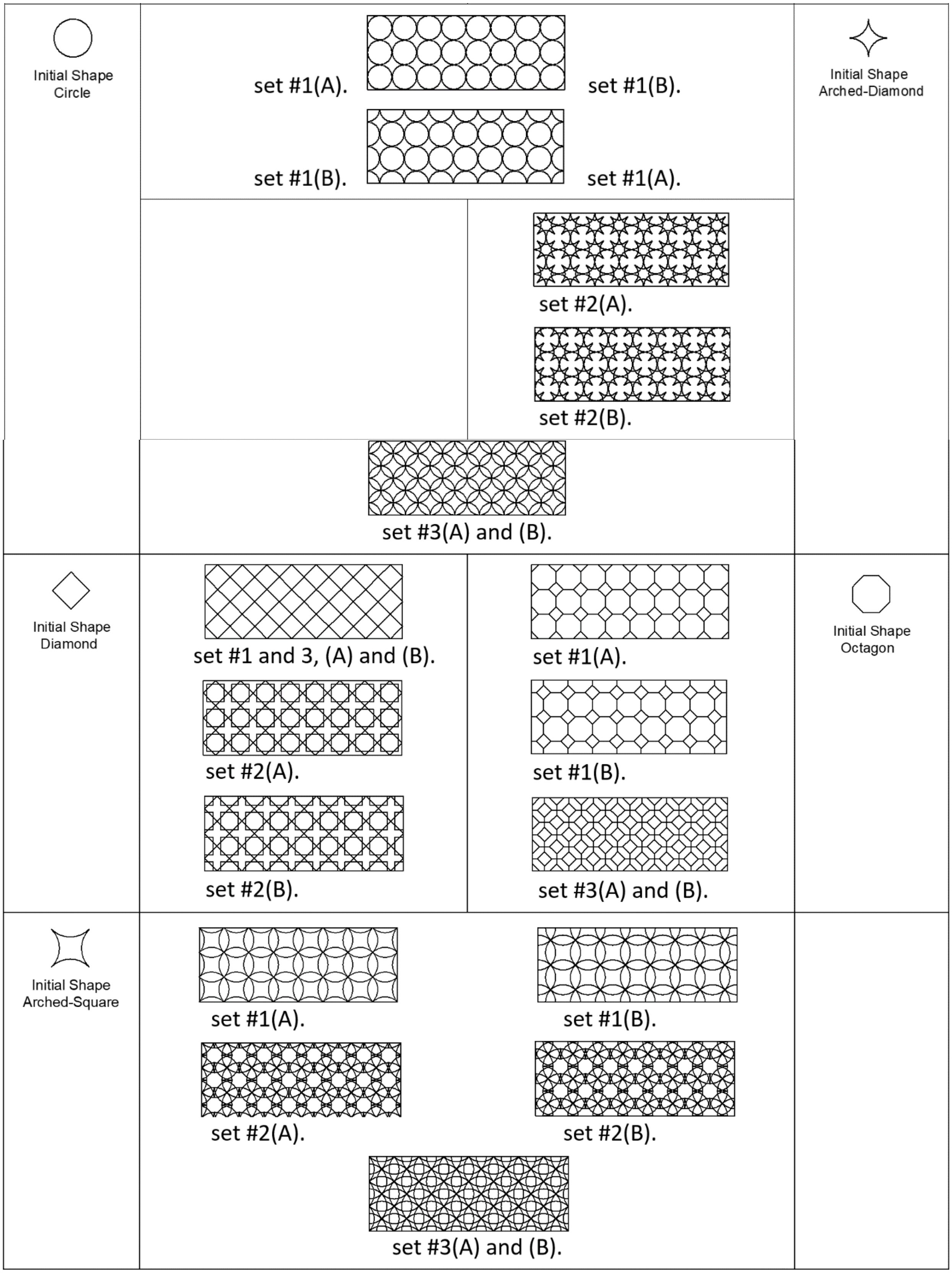


Figure P2. PD Outcomes of the IS for the MSQ.

Appendix Q: MSQ - Descriptive Statistics for Constructs IKEA, IG and LIKE

The three tables are the descriptive statistics results for the three constructs of this study:

	Mean	%	Rank	S.D.
IKEA_1_1	3.27	65.4	7	1.284
IKEA_2_4	3.06	61.2	17	1.199
IKEA_3_7	2.79	55.8	25	1.179
IKEA_4_10	2.44	55.4	26	1.224
IKEA_5_13	3.08	61.6	16	1.208
IKEA_6_16	3.18	63.8	13	1.212
IKEA_7_19	3.27	65.4	8	1.121
IKEA_8_22	3.23	64.4	10	1.174
IKEA_9_25	3.18	63.6	14	1.161
IKEA_10_28	3.25	65	9	1.139
IKEA_11_31	**3.44**	**68.8**	**2**	**1.112**
IKEA_12_34	**3.32**	**66.4**	**4**	**1.147**
IKEA_13_37	3.20	64	12	1.184
IKEA_14_40	3.28	65.6	6	1.158
IKEA_15_43	3.13	62.6	15	1.178
IKEA_16_46	3.00	60	19	1.267
IKEA_17_49	2.92	58.4	21	1.305
IKEA_18_52	2.85	57	23	1.199
IKEA_19_55	**3.47**	**69.4**	**1**	**1.120**
IKEA_20_58	3.05	61	18	1.287
IKEA_21_61	2.93	58.6	20	1.269
IKEA_22_64	2.90	57.8	22	1.216
IKEA_23_67	2.86	57	24	1.175
IKEA_24_70	**3.37**	**67.2**	**3**	**1.094**
IKEA_25_73	**3.29**	**65.8**	**5**	**1.153**
IKEA_26_76	3.22	64.2	11	1.213

Note: Bold is top five PD items in IKEA construct

Table Q1. Descriptive Statistic for all PD Items in IKEA Construct.

	Mean	%	Rank	S.D.
IG_1_2	2.35	47	26	1.132
IG_2_5	2.45	49	25	1.136
IG_3_8	3.21	64.2	15	1.084
IG_4_11	3.35	67	10	1.108
IG_5_14	2.53	50.6	23	1.118
IG_6_17	2.50	50	24	1.053
IG_7_20	2.60	52.2	22	1.087
IG_8_23	3.18	63.4	17	1.149
IG_9_26	3.20	64.2	16	1.114
IG_10_29	2.71	54.4	21	1.046
IG_11_32	2.82	56.4	20	1.088
IG_12_35	2.94	58.8	18	1.059
IG_13_38	3.59	71.8	6	1.061
IG_14_41	3.47	69.4	8	1.050
IG_15_44	3.29	65.8	13	1.064
IG_16_47	**3.74**	**74.8**	**4**	**1.056**
IG_17_50	**3.81**	**76.2**	**3**	**1.064**
IG_18_53	3.51	70.2	7	1.135
IG_19_56	2.88	57.6	19	1.098
IG_20_59	**4.03**	**80.8**	**1**	**0.979**
IG_21_62	**3.95**	**79.2**	**2**	**1.056**
IG_22_65	3.33	66.6	11	1.188
IG_23_68	3.25	65	14	1.176
IG_24_71	3.30	66	12	1.066
IG_25_74	3.36	67.2	9	1.090
IG_26_77	**3.63**	**72.6**	**5**	**1.052**

Note: Bold is top five PD items in IG construct

Table Q2. Descriptive Statistic for all PD Items in IG Construct.

Table 5.31 Descriptive Statistics for all PD items in LIKE construct

	Mean	%	Rank	S.D.
LIKE_1_3	2.665	53.2	26	1.191
LIKE_2_6	2.691	53.8	25	1.198
LIKE_3_9	3.133	62.6	19	1.181
LIKE_4_12	3.359	67.2	11	1.179
LIKE_5_15	2.771	55.4	24	1.229
LIKE_6_18	2.927	58.6	22	1.192
LIKE_7_21	2.935	58.6	23	1.167
LIKE_8_24	3.341	66.8	13	1.163
LIKE_9_27	3.396	68	8	1.139
LIKE_10_30	3.027	60.6	21	1.147
LIKE_11_33	3.113	62.2	20	1.155
LIKE_12_36	3.189	63.8	15	1.127
LIKE_13_39	**3.693**	**73.8**	**1**	**1.039**
LIKE_14_42	3.495	69.8	7	1.111
LIKE_15_45	3.326	66.6	14	1.133
LIKE_16_48	3.560	71.2	6	1.170
LIKE_17_51	**3.635**	**72.6**	**3**	**1.199**
LIKE_18_54	3.369	67.4	10	1.211
LIKE_19_57	3.137	62.8	18	1.174
LIKE_20_60	**3.680**	**73.6**	**2**	**1.162**
LIKE_21_63	**3.607**	**72.2**	**4**	**1.226**
LIKE_22_66	3.155	63.2	17	1.219
LIKE_23_69	3.165	63.4	16	1.183
LIKE_24_72	3.353	67	12	1.083
LIKE_25_75	3.382	67.6	9	1.101
LIKE_26_78	**3.568**	**71.4**	**5**	**1.126**

Note: Bold is top five PD items in LIKE construct

Table Q3. Descriptive Statistic for all PD Items in LIKE Construct.

Appendix R: MSQ - Principal Component Analysis Extraction Method

Principal component analysis (PCA) reveals that all result values are valid:

	Initial	Extraction
PD 1	1.000	0.684
PD 2	1.000	0.752
PD 3	1.000	0.498
PD 4	1.000	0.567
PD 5	1.000	0.722
PD 6	1.000	0.714
PD 7	1.000	0.706
PD 8	1.000	0.594
PD 9	1.000	0.668
PD 10	1.000	0.630
PD 11	1.000	0.665
PD 12	1.000	0.638
PD 13	1.000	0.722
PD 14	1.000	0.741
PD 15	1.000	0.712
PD 16	1.000	0.742
PD 17	1.000	0.712
PD 18	1.000	0.581
PD 19	1.000	0.562
PD 20	1.000	0.603
PD 21	1.000	0.533
PD 22	1.000	0.677
PD 23	1.000	0.655
PD 24	1.000	0.802
PD 25	1.000	0.765
PD 26	1.000	0.592

Extraction Method: Principal Component Analysis.

Appendix S: MSQ - Factor Analysis

Factor Analysis (FA) investigations to items within each of the three constructs:

Factor Analysis for IKEA construct:

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.918
Bartlett's Test of Sphericity	Approx. Chi-Square	6234.748
	df	325
	Sig.	0.000

Table S1. KMO and Barlett's Test for IKEA PD Items.

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Family Group	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
A	10.752	41.353	41.353	10.752	41.353	41.353	4.877	18.757	18.757
B	2.919	11.225	52.578	2.919	11.225	52.578	3.461	13.311	32.068
C	1.297	4.987	57.565	1.297	4.987	57.565	2.973	11.433	43.501
D	1.121	4.312	61.877	1.121	4.312	61.877	2.953	11.357	54.858
E	1.017	3.912	65.788	1.017	3.912	65.788	2.842	10.931	65.788

Table S2. Total Variance Explained for IKEA PD Items.

	Family Group				
	A	B	C	D	E
IKEA_16	0.773				
IKEA_14	0.749				
IKEA_13	0.735				
IKEA_15	0.730				
IKEA_17	0.704				
IKEA_18	0.598				
IKEA_12					
IKEA_22					
IKEA_23					
IKEA_1		0.866			
IKEA_2		0.845			
IKEA_5		0.726			
IKEA_19		0.542			
IKEA_11					

IKEA_4		0.757		
IKEA_3		0.729		
IKEA_21		0.550		
IKEA_20		0.539		
IKEA_7			0.743	
IKEA_6			0.713	
IKEA_8			0.648	
IKEA_10			0.611	
IKEA_9			0.586	
IKEA_25				0.817
IKEA_24				0.791
IKEA_26				0.545

Table S3. Rotated Component Matrix[a] for IKEA PD Items.

Factor Analysis for IG construct:

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.893
Bartlett's Test of Sphericity	Approx. Chi-Square	5373.954
	df	325
	Sig.	0.000

Table S4. KMO and Barlett's Test for IG PD Items.

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Family Group	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
A	8.871	34.119	34.119	8.871	34.119	34.119	5.729	22.036	22.036
B	3.782	14.547	48.666	3.782	14.547	48.666	4.137	15.912	37.948
C	1.393	5.359	54.025	1.393	5.359	54.025	2.358	9.070	47.018
D	1.198	4.606	58.632	1.198	4.606	58.632	2.169	8.343	55.361
E	1.097	4.218	62.850	1.097	4.218	62.850	1.947	7.489	62.850

Table S5. Total Variance Explained for IG PD Items.

	Family Group				
	A	B	C	D	E
IG_2	0.808				
IG_7	0.803				
IG_6	0.790				
IG_5	0.778				
IG_1	0.769				
IG_10	0.710				
IG_11	0.610				
IG_8	0.567				
IG_19	0.560				
IG_9	0.538				
IG_12	0.521				
IG_16		0.756			
IG_14		0.740			
IG_13		0.740			
IG_15		0.673			
IG_17		0.664			
IG_18		0.654			
IG_26					
IG_21			0.701		
IG_3			0.648		
IG_4			0.636		
IG_20			0.580		
IG_25				0.788	
IG_24				0.764	
IG_22					0.787
IG_23					0.785

Table S6. Rotated Component Matrix[a] for IKEA PD Items.

Factor Analysis for LIKE construct:

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.906
Bartlett's Test of Sphericity	Approx. Chi-Square	4688.241
	df	325
	Sig.	0.000

Table S7. KMO and Barlett's Test for LIKE PD Items.

Family Group	Initial Eigenvalues Total	% of Variance	Cumulative %	Extraction Sums of Squared Loadings Total	% of Variance	Cumulative %	Rotation Sums of Squared Loadings Total	% of Variance	Cumulative %
A	9.233	35.511	35.511	9.233	35.511	35.511	4.420	17.001	17.001
B	2.485	9.560	45.070	2.485	9.560	45.070	3.774	14.516	31.517
C	1.360	5.230	50.300	1.360	5.230	50.300	2.516	9.675	41.193
D	1.242	4.778	55.078	1.242	4.778	55.078	2.370	9.117	50.310
E	1.099	4.227	59.305	1.099	4.227	59.305	2.339	8.995	59.305

Table S8. Total Variance Explained for LIKE PD Items.

	Family Group				
	A	B	C	D	E
LIKE_5	0.731				
LIKE_2	0.720				
LIKE_6	0.712				
LIKE_7	0.689				
LIKE_1	0.662				
LIKE_10	0.617				
LIKE_11	0.536				
LIKE_19	0.513				
LIKE_12					
LIKE_16		0.732			
LIKE_14		0.714			
LIKE_15		0.712			
LIKE_13		0.674			
LIKE_17		0.638			
LIKE_9					
LIKE_24			0.756		
LIKE_25			0.739		
LIKE_26			0.542		
LIKE_3				0.709	
LIKE_4				0.663	
LIKE_20				0.538	
LIKE_8				0.527	
LIKE_21				0.515	
LIKE_22					0.747
LIKE_23					0.744

Table S9. Rotated Component Matrix[a] for LIKE PD Items.

Appendix T: MSQ - Correlation, GLM and Demographics

Correlation analysis to constructs IKEA, IG and LIKE amongst each of the PD family groups is presented, as well as to the dependent variables, and within each demographic:

Correlation Analysis:

		IKEA_A	IKEA_B	IKEA_C	IKEA_D	IKEA_E
IKEA_A	Pearson Correlation	1	0.322**	0.672**	0.549**	0.575**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000
	N	379	379	379	379	379
IKEA_B	Pearson Correlation	0.322**	1	0.334**	0.593**	0.445**
	Sig. (2-tailed)	0.000		0.000	0.000	0.000
	N	379	379	379	379	379
IKEA_C	Pearson Correlation	0.672**	0.334**	1	0.535**	0.591**
	Sig. (2-tailed)	0.000	00.000		0.000	0.000
	N	379	379	379	379	379
IKEA_D	Pearson Correlation	0.549**	0.593**	0.535**	1	0.537**
	Sig. (2-tailed)	0.000	0.000	0.000		0.000
	N	379	379	379	379	379
IKEA_E	Pearson Correlation	0.575**	0.445**	0.591**	0.537**	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	
	N	379	379	379	379	379

**. Correlation is significant at the 0.01 level (2-tailed).

Table T1. Correlation Analysis of IKEA Construct.

		IG_A	IG_B	IG_C	IG_D	IG_E
IG_A	Pearson Correlation	1	0.410**	0.329**	0.407**	0.246**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000
	N	379	379	379	379	379
IG_B	Pearson Correlation	0.410**	1	0.554**	0.498**	0.455**
	Sig. (2-tailed)	0.000		0.000	0.000	0.000
	N	379	379	379	379	379
IG_C	Pearson Correlation	0.329**	0.554**	1	0.444**	0.455**
	Sig. (2-tailed)	0.000	0.000		0.000	0.000
	N	379	379	379	379	379
IG_D	Pearson Correlation	0.407**	0.498**	0.444**	1	0.445**
	Sig. (2-tailed)	0.000	0.000	0.000		0.000
	N	379	379	379	379	379
IG_E	Pearson Correlation	0.246**	0.455**	0.455**	0.445**	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	
	N	379	379	379	379	379

**. Correlation is significant at the 0.01 level (2-tailed).

Table T2. Correlation Analysis of IG Construct.

		LIKE_A	LIKE_B	LIKE_C	LIKE_D	LIKE_E
LIKE_A	Pearson Correlation	1	0.423**	0.484**	0.506**	0.428**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000
	N	379	379	379	379	379
LIKE_B	Pearson Correlation	0.423**	1	0.525**	0.618**	0.567**
	Sig. (2-tailed)	0.000		0.000	0.000	0.000
	N	379	379	379	379	379
LIKE_C	Pearson Correlation	0.484**	0.525**	1	0.544**	0.486**
	Sig. (2-tailed)	0.000	0.000		0.000	0.000
	N	379	379	379	379	379
LIKE_D	Pearson Correlation	0.506**	0.618**	0.544**	1	0.543**
	Sig. (2-tailed)	0.000	0.000	0.000		0.000
	N	379	379	379	379	379
LIKE_E	Pearson Correlation	0.428**	0.567**	0.486**	0.543**	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	
	N	379	379	379	379	379

**. Correlation is significant at the 0.01 level (2-tailed).

Table T3. Correlation Analysis of LIKE Construct.

Parameter Estimates:

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	3.018	0.1911	2.644	3.393	249.415	1	0.000
IKEA_A	0.060	0.0642	-0.066	0.186	0.871	1	0.351
IKEA_B	0.045	0.0571	-0.067	0.157	0.622	1	0.430
IKEA_C	-0.034	0.0657	-0.162	0.095	0.262	1	0.609
IKEA_D	0.101	0.0709	-0.038	0.240	2.035	1	0.154
IKEA_E	.0112	0.0615	-0.009	0.232	3.302	1	0.069

Table T4. GLM between ‘Like_IKEA_Furniture’ with IKEA Construct.

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	3.144	0.2472	2.660	3.629	161.781	1	0.000
IG_A	-0.058	0.0648	-0.186	0.069	0.812	1	0.368
IG_B	0.075	0.0728	-0.067	0.218	1.067	1	0.302
IG_C	0.165	0.0743	0.019	0.311	4.938	1	**0.026**
IG_D	0.068	0.0569	-0.044	0.180	1.427	1	0.232
IG_E	-0.040	0.0498	-0.138	0.057	0.658	1	0.417

Table T5. GLM between ‘Like_IKEA_Furniture’ with IG Construct.

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	3.181	0.2198	2.750	3.612	209.541	1	0.000
LIKE_A	0.017	0.0658	-0.112	0.146	0.069	1	0.794
LIKE_B	-0.026	0.0708	-0.165	0.113	0.138	1	0.711
LIKE_C	0.124	0.0642	-0.002	0.250	3.717	1	0.054
LIKE_D	**0.184**	**0.0742**	**0.039**	**0.329**	**6.148**	**1**	**0.013**
LIKE_E	-0.076	0.0587	-0.192	0.039	1.694	1	0.193

Table T6. GLM between 'Like_IKEA_Furniture' with LIKE Construct.

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	3.116	0.2208	2.684	3.549	199.226	1	0.000
IKEA_A	0.064	0.0743	-0.082	0.209	0.732	1	0.392
IKEA_B	0.114	0.0660	-0.015	0.243	2.981	1	0.084
IKEA_C	0.091	0.0759	-0.058	0.240	1.432	1	0.231
IKEA_D	0.095	0.0820	-0.065	0.256	1.358	1	0.244
IKEA_E	-0.091	0.0710	-0.230	0.049	1.625	1	0.202

Table T7. GLM between 'See_IKEA-IG' with IKEA Construct.

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	2.151	0.2688	1.624	2.678	63.994	1	0.000
IG_A	-0.051	0.0704	-0.189	0.087	0.517	1	0.472
IG_B	0.241	0.0793	0.085	0.396	9.220	1	**0.002**
IG_C	0.292	0.0810	0.133	0.450	12.992	1	**0.000**
IG_D	0.109	0.0616	-0.012	0.230	3.110	1	0.078
IG_E	-0.104	0.0542	-0.210	0.002	3.680	1	0.055

Table T8. GLM between 'See_IKEA-IG' with IG Construct.

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	2.151	0.2688	1.624	2.678	63.994	1	0.000
IG_A	-0.051	0.0704	-0.189	0.087	0.517	1	0.472
IG_B	0.241	0.0793	0.085	0.396	9.220	1	**0.002**
IG_C	0.292	0.0810	0.133	0.450	12.992	1	**0.000**
IG_D	0.109	0.0616	-0.012	0.230	3.110	1	0.078
IG_E	-0.104	0.0542	-0.210	0.002	3.680	1	0.055

Table T9. GLM between 'See_IKEA-IG' with LIKE Construct.

Comparison Analysis between Demographics and IKEA construct:

	Male N=163	Female N=216	p-value
IKEA_A	3.16 (1.02)	3.07 (0.99)	0.371
IKEA_B	3.11 (1.03)	3.30 (0.95)	0.057
IKEA_C	2.93 (1.03)	2.85 (0.95)	0.402
IKEA_D	3.26 (0.97)	3.19 (0.86)	0.453
IKEA_E	3.27 (1.02)	3.31 (0.97)	0.717

Table T10. Descriptive – IKEA and Gender Demographic.

	≤ 18 N=52	19 – 29 N=102	30 - 39 N=113	40 - 49 N=76	≥ 50 N=36	p-value
IKEA_A	3.25 (0.90)	3.05 (1.03)	3.21 (0.99)	2.99 (1.11)	2.97 (0.91)	0.377
IKEA_B	3.04 (0.85)	3.24 (1.06)	3.29 (0.93)	3.31 (1.07)	3.01 (0.96)	0.335
IKEA_C	**3.27 (0.85)**	**2.87 (1.03)**	**2.87 (1.00)**	**2.75 (0.99)**	**2.69 (0.89)**	**0.027**
IKEA_D	3.30 (0.67)	3.24 (0.94)	3.15 (0.96)	3.31 (0.97)	3.11 (0.82)	0.672
IKEA_E	3.35 (0.87)	3.33 (1.03)	3.35 (1.04)	3.20 (1.01)	3.08 (0.85)	0.574

*3.27 (highest: ≤18) = they agree; 2.69 (lowest: ≥50) = they disagree.

Table T11. Descriptive – IKEA and Age Demographic.

	Capital N=141	Hawalli N=93	Farwania N=50	Ahmadi N=46	Jahra N=14	Mubarak Al-Kabeer N=34	p-value
IKEA_A	**2.79 (0.97)**	**3.27 (0.89)**	**3.24 (1.08)**	**3.49 (0.99)**	**3.19 (1.15)**	**3.20 (1.02)**	**<0.001**
IKEA_B	3.29 (0.98)	3.02 (0.91)	3.23 (0.99)	3.46 (1.05)	2.93 (1.16)	3.25 (1.04)	0.148
IKEA_C	**2.53 (0.87)**	**3.10 (0.94)**	**3.02 (1.02)**	**3.32 (1.01)**	**2.82 (1.16)**	**2.99 (1.01)**	**<0.001**
IKEA_D	3.17 (0.87)	3.17 (0.86)	3.29 (1.01)	3.57 (0.92)	2.84 (1.11)	3.18 (0.89)	0.063
IKEA_E	3.13 (1.00)	3.40 (0.90)	3.29 (1.17)	3.59 (0.92)	3.24 (1.14)	3.32 (0.87)	0.093

*3.49 (highest: Ahmadi) = agree; 2.79 (lowest: Capital) = disagree.
*3.10 (highest: Hawalli) = agree; 2.53 (lowest: Capital) = disagree.

Table T12. Descriptive – IKEA and Province Demographic.

	Arabian N=265	Non-Arabian N=102	3 N=12	p-value
IKEA_A	**2.95 (1.02)**	**3.57 (0.86)**	**2.60 (0.42)**	**<0.001**
IKEA_B	3.24 (1.03)	3.24 (0.87)	2.62 (0.83)	0.106
IKEA_C	**2.69 (0.95)**	**3.42 (0.89)**	**2.71 (0.82)**	**<0.001**
IKEA_D	**3.16 (0.91)**	**3.46 (0.87)**	**2.70 (0.75)**	**0.002**
IKEA_E	**3.21 (0.99)**	**3.57 (0.91)**	**2.56 (1.06)**	**<0.001**

Table T13. Descriptive – IKEA and Ethnicity Demographic.

	Muslim N=357	Non-Muslim N=22	p-value
IKEA_A	**3.08 (1.01)**	**3.49 (0.83)**	**0.037**
IKEA_B	3.23 (1.00)	3.06 (0.78)	0.333
IKEA_C	**2.85 (0.98)**	**3.52 (0.84)**	**0.001**
IKEA_D	3.22 (0.91)	3.31 (0.87)	0.636
IKEA_E	3.27 (0.99)	3.62 (1.04)	0.134

Table T14. Descriptive – IKEA and Religion Demographic.

	Below High School N=9	High School N=65	Diploma N=73	Bachelor N=176	Higher Education N=56	p-value
IKEA_A	3.09 (1.11)	3.12 (1.00)	3.40 (0.98)	2.99 (0.96)	3.08 (1.13)	0.073
IKEA_B	3.39 (0.72)	3.06 (0.93)	3.28 (0.99)	3.25 (1.00)	3.19 (1.05)	0.653
IKEA_C	**2.83 (0.97)**	**3.14 (1.04)**	**2.98 (1.01)**	**2.72 (0.93)**	**3.00 (1.02)**	**0.028**
IKEA_D	3.07 (0.84)	3.23 (0.80)	3.48 (0.79)	3.15 (0.96)	3.14 (0.99)	0.096
IKEA_E	3.63 (1.09)	3.22 (0.87)	3.40 (0.98)	3.20 (1.01)	3.45 (1.07)	0.290

Table T15. Descriptive – IKEA and Education Demographic.

	Student N=103	Employ N=213	Retired N=32	Other N=31	p-value
IKEA_A	3.07 (0.97)	3.11 (1.00)	3.01 (0.91)	3.31 (1.28)	0.635
IKEA_B	3.24 (0.89)	3.19 (1.02)	3.05 (0.95)	3.52 (1.09)	0.262
IKEA_C	3.02 (0.93)	2.80 (0.99)	2.81 (0.92)	3.11 (1.18)	0.142
IKEA_D	3.27 (0.78)	3.17 (0.95)	3.21 (0.81)	3.45 (1.09)	0.379
IKEA_E	3.35 (0.95)	3.26 (1.00)	3.19 (0.90)	3.43 (1.15)	0.676

Table T16. Descriptive – IKEA and Occupation Demographic.

	Public Sector (gov) N=161	Private Secor N=87	Other N=58	Not Applicable N=73	p-value
IKEA_A	**3.01 (1.02)**	**3.29 (0.92)**	**3.37 (1.07)**	**2.89 (0.97)**	**0.008**
IKEA_B	3.21 (1.03)	3.16 (0.93)	3.38 (1.07)	3.17 (0.90)	0.566
IKEA_C	**2.72 (0.95)**	**2.91 (0.98)**	**3.24 (1.09)**	**2.94 (0.91)**	**0.006**
IKEA_D	3.10 (0.93)	3.29 (0.89)	3.45 (0.98)	3.24 (0.79)	0.066
IKEA_E	3.19 (0.95)	3.32 (1.02)	3.48 (1.09)	3.31 (0.97)	0.300

Table T17. Descriptive – IKEA and Organisation Demographic.

Comparison Analysis between Demographics and IG construct:

	Male N=163	Female N=216	p-value
IG_A	2.84 (0.82)	2.67 (0.76)	0.051
IG_B	**3.45 (0.81)**	**3.66 (0.82)**	**0.016**
IG_C	3.65 (0.64)	3.63 (0.85)	0.765
IG_D	3.22 (0.97)	3.41 (1.01)	0.060
IG_D	3.22 (0.97)	3.41 (1.01)	0.060

Table T18. Descriptive – IG and Gender Demographic.

	≤ 18 N=52	19 – 29 N=102	30 - 39 N=113	40 - 49 N=76	≥ 50 N=36	p-value
IG_A	3.05 (0.65)	2.67 (0.85)	2.70 (0.76)	2.71 (0.83)	2.69 (0.79)	0.056
IG_B	**3.44 (0.72)**	**3.54 (0.83)**	**3.52 (0.78)**	**3.55 (0.94)**	**4.04 (0.64)**	**0.008**
IG_C	**3.44 (0.68)**	**3.70 (0.78)**	**3.54 (0.72)**	**3.70 (0.87)**	**3.91 (0.70)**	**0.027**
IG_D	3.14 (0.97)	3.24 (1.03)	3.30 (0.93)	3.46 (1.04)	3.71 (0.99)	0.052
IG_D	3.14 (0.97)	3.24 (1.03)	3.30 (0.93)	3.46 (1.04)	3.71 (0.99)	0.052

Table T19. Descriptive – IG and Age Demographic.

	Capital N=141	Hawalli N=93	Farwania N=50	Ahmadi N=46	Jahra N=14	Mubarak Al-Kabeer N=34	p-value
IG_A	**2.51 (0.77)**	**2.89 (0.72)**	**2.87 (0.82)**	**3.06 (0.74)**	**2.75 (0.98)**	**2.69 (0.83)**	**<0.001**
IG_B	3.64 (0.79)	3.54 (0.82)	3.31 (0.96)	3.77 (0.75)	3.26 (0.81)	3.61 (0.75)	0.056
IG_C	3.71 (0.79)	3.58 (0.79)	3.38 (0.83)	3.70 (0.72)	3.70 (0.60)	3.78 (0.62)	0.123
IG_D	3.32 (1.04)	3.41 (0.92)	3.22 (1.08)	3.48 (0.92)	2.86 (1.08)	3.32 (0.95)	0.376
IG_D	3.32 (1.04)	3.41 (0.92)	3.22 (1.08)	3.48 (0.92)	2.86 (1.08)	3.32 (0.95)	0.376

Table T20. Descriptive – IG and Province Demographic.

	Arabian N=265	Non-Arabian N=102	3 N=12	p-value
IG_A	**2.57 (0.77)**	**3.20 (0.67)**	**2.68 (0.67)**	**<0.001**
IG_B	**3.59 (0.85)**	**3.59 (0.72)**	**2.96 (0.78)**	**0.032**
IG_C	**3.68 (0.81)**	**3.62 (0.62)**	**2.96 (0.84)**	**0.006**
IG_D	**3.32 (1.05)**	**3.43 (0.82)**	**2.67 (0.89)**	**0.041**
IG_D	**3.32 (1.05)**	**3.43 (0.82)**	**2.67 (0.89)**	**0.041**

Table T21. Descriptive – IG and Ethnicity Demographic.

	Muslim N=357	Non-Muslim N=22	p-value
IG_A	**2.71 (0.79)**	**3.30 (0.66)**	**<0.001**
IG_B	3.57 (0.82)	3.55 (0.84)	0.889
IG_C	3.64 (0.77)	3.67 (0.77)	0.836
IG_D	3.33 (1.01)	3.34 (0.73)	0.950
IG_D	3.33 (1.01)	3.34 (0.73)	0.950

Table T22. Descriptive – IG and Religion Demographic.

	Below High School N=9	High School N=65	Diploma N=73	Bachelor N=176	Higher Education N=56	p-value
IG_A	**3.03 (0.75)**	**2.85 (0.73)**	**2.97 (0.82)**	**2.62 (0.77)**	**2.67 (0.84)**	**0.010**
IG_B	3.50 (0.79)	3.50 (0.75)	3.70 (0.67)	3.57 (0.90)	3.50 (0.81)	0.599
IG_C	3.39 (0.83)	3.67 (0.73)	3.64 (0.72)	3.65 (0.83)	3.58 (0.71)	0.849
IG_D	3.06 (0.77)	3.22 (0.96)	3.43 (0.90)	3.34 (1.05)	3.34 (1.02)	0.676
IG_D	3.06 (0.77)	3.22 (0.96)	3.43 (0.90)	3.34 (1.05)	3.34 (1.02)	0.676

Table T23. Descriptive – IG and Education Demographic.

	Student N=103	Employ N=213	Retired N=32	Other N=31	p-value
IG_A	2.71 (0.79)	2.71 (0.79)	2.88 (0.78)	2.96 (0.85)	0.275
IG_B	**3.47 (0.79)**	**3.52 (0.84)**	**4.03 (0.70)**	**3.76 (0.72)**	**0.003**
IG_C	3.60 (0.74)	3.65 (0.78)	3.91 (0.80)	3.44 (0.74)	0.096
IG_D	3.24 (0.95)	3.29 (1.04)	3.61 (0.99)	3.66 (0.80)	0.064
IG_D	3.24 (0.95)	3.29 (1.04)	3.61 (0.99)	3.66 (0.80)	0.064

Table T24. Descriptive – IG and Occupation Demographic.

	Public Sector (gov) N=161	Private Secor N=87	Other N=58	Not Applicable N=73	p-value
IG_A	**2.56 (0.76)**	**3.08 (0.72)**	**2.92 (0.79)**	**2.59 (0.80)**	**<0.001**
IG_B	3.65 (0.87)	3.52 (0.86)	3.59 (0.69)	3.44 (0.77)	0.316
IG_C	3.70 (0.80)	3.65 (0.79)	3.49 (0.65)	3.61 (0.77)	0.349
IG_D	3.28 (1.12)	3.34 (0.90)	3.53 (0.85)	3.27 (0.93)	0.408
IG_D	3.28 (1.12)	3.34 (0.90)	3.53 (0.85)	3.27 (0.93)	0.408

Table T25. Descriptive – IG and Organisation Demographic.

Comparison Analysis between Demographics and LIKE construct:

	Male N=163	Female N=216	p-value
LIKE_A	3.01 (0.84)	2.83 (0.83)	0.050
LIKE_B	3.54 (0.82)	3.54 (0.92)	0.959
LIKE_C	3.41 (0.88)	3.45 (0.94)	0.661
LIKE_D	3.51 (0.81)	3.36 (0.89)	0.095
LIKE_E	3.27 (0.97)	3.20 (1.01)	0.546

Table T26. Descriptive – LIKE and Gender Demographic.

	≤ 18 N=52	19 – 29 N=102	30 - 39 N=113	40 - 49 N=76	≥ 50 N=36	p-value
LIKE_A	3.05 (0.64)	2.92 (0.91)	2.88 (0.83)	2.90 (0.80)	2.77 (0.97)	0.639
LIKE_B	**3.50 (0.88)**	**3.34 (0.94)**	**3.47 (0.89)**	**3.75 (0.77)**	**3.94 (0.70)**	**0.001**
LIKE_C	**3.28 (0.91)**	**3.39 (0.96)**	**3.32 (0.92)**	**3.60 (0.80)**	**3.79 (0.84)**	**0.023**
LIKE_D	**3.60 (0.64)**	**3.37 (0.90)**	**3.27 (0.89)**	**3.49 (0.84)**	**3.67 (0.87)**	**0.048**
LIKE_E	**3.19 (0.91)**	**3.01 (1.06)**	**3.17 (1.00)**	**3.42 (0.85)**	**3.70 (1.01)**	**0.002**

Table T27. Descriptive – LIKE and Age Demographic.

	Capital N=141	Hawalli N=93	Farwania N=50	Ahmadi N=46	Jahra N=14	Mubarak Al-Kabeer N=34	p-value
LIKE_A	**2.76 (0.81)**	**2.99 (0.73)**	**2.90 (0.91)**	**3.23 (0.91)**	**2.74 (1.06)**	**2.94 (0.84)**	**0.026**
LIKE_B	3.52 (0.87)	3.54 (0.84)	3.41 (0.89)	3.69 (0.96)	3.37 (1.00)	3.68 (0.86)	0.581
LIKE_C	3.49 (0.86)	3.46 (0.94)	3.27 (0.90)	3.58 (1.02)	3.05 (1.07)	3.37 (0.79)	0.296
LIKE_D	3.41 (0.89)	3.50 (0.81)	3.24 (0.92)	3.61 (0.84)	3.26 (0.83)	3.37 (0.76)	0.321
LIKE_E	3.17 (1.00)	3.18 (1.00)	3.23 (1.06)	3.53 (0.97)	3.00 (1.13)	3.30 (0.83)	0.325

Table T28. Descriptive – LIKE and Province Demographic.

	Arabian N=265	Non-Arabian N=102	3 N=12	p-value
LIKE_A	**2.77 (0.81)**	**3.29 (0.82)**	**2.80 (0.52)**	**<0.001**
LIKE_B	3.55 (0.89)	3.58 (0.87)	3.12 (0.63)	0.225
LIKE_C	3.43 (0.90)	3.50 (0.94)	2.92 (0.88)	0.107
LIKE_D	**3.35 (0.88)**	**3.63 (0.80)**	**3.43 (0.58)**	**0.018**
LIKE_E	**3.16 (1.00)**	**3.46 (0.97)**	**2.94 (0.91)**	**0.020**

Table T29. Descriptive – LIKE and Ethnicity Demographic.

	Muslim N=357	Non-Muslim N=22	p-value
LIKE_A	**2.88 (0.84)**	**3.33 (0.62)**	**0.003**
LIKE_B	3.54 (0.89)	3.54 (0.68)	0.975
LIKE_C	3.43 (0.91)	3.45 (0.94)	0.919
LIKE_D	3.42 (0.87)	3.48 (0.66)	0.682
LIKE_E	3.21 (1.00)	3.55 (0.77)	0.065

Table T30. Descriptive – LIKE and Religion Demographic.

	Below High School N=9	High School N=65	Diploma N=73	Bachelor N=176	Higher Education N=56	p-value
LIKE_A	3.26 (0.65)	2.94 (0.83)	3.11 (0.85)	2.83 (0.83)	2.82 (0.84)	0.086
LIKE_B	3.47 (1.02)	3.46 (0.97)	3.57 (0.85)	3.56 (0.89)	3.57 (0.77)	0.932
LIKE_C	3.56 (0.97)	3.32 (0.90)	3.35 (0.88)	3.44 (0.92)	3.65 (0.89)	0.296
LIKE_D	3.71 (1.05)	3.57 (0.71)	3.42 (0.81)	3.36 (0.91)	3.42 (0.88)	0.407
LIKE_E	3.04 (0.87)	3.25 (0.99)	3.38 (0.93)	3.15 (1.01)	3.30 (1.04)	0.464

Table T31. Descriptive – LIKE and Education Demographic.

	Student N=103	Employ N=213	Retired N=32	Other N=31	p-value
LIKE_A	2.93 (0.75)	2.88 (0.85)	2.79 (0.77)	3.11 (1.05)	0.454
LIKE_B	**3.39 (0.91)**	**3.53 (0.85)**	**3.87 (0.78)**	**3.77 (0.99)**	**0.021**
LIKE_C	3.37 (0.92)	3.41 (0.93)	3.67 (0.82)	3.57 (0.79)	0.329
LIKE_D	3.50 (0.81)	3.37 (0.87)	3.59 (0.89)	3.41 (0.89)	0.391
LIKE_E	**2.98 (0.96)**	**3.23 (0.99)**	**3.51 (0.95)**	**3.75 (0.94)**	**0.001**

Table T32. Descriptive – LIKE and Occupation Demographic.

	Public Sector (gov) N=161	Private Secor N=87	Other N=58	Not Applicable N=73	p-value
LIKE_A	**2.77 (0.84)**	**3.03 (0.78)**	**3.12 (0.92)**	**2.90 (0.79)**	**0.016**
LIKE_B	**3.65 (0.82)**	**3.44 (0.92)**	**3.65 (0.89)**	**3.34 (0.91)**	**0.039**
LIKE_C	3.47 (0.92)	3.33 (0.96)	3.53 (0.78)	3.40 (0.91)	0.554
LIKE_D	3.42 (0.89)	3.38 (0.87)	3.45 (0.81)	3.48 (0.81)	0.903
LIKE_E	**3.22 (1.04)**	**3.32 (0.97)**	**3.62 (0.82)**	**2.84 (0.92)**	**<0.001**

Table T33. Descriptive – LIKE and Organisation Demographic.

Appendix U: Evaluative Study Questionnaire

The questionnaires took place inside of the IKEA stores (Kuwait and UK) where the IKEA-IG pattern design illustrations were showcased as physical table-panel prototype artifacts; the table-panels were displayed on IKEA's LACK side tables. The evaluative study questionnaire was presented after the participant information sheet and a consent form as follow:

Participant Information Sheet

Researcher: Maryam Alainati
PhD Student - Bournemouth University
malainati@bournemouth.ac.uk
Supervised by: Prof. Siamak Noroozi
snoroozi@bournemouth.ac.uk

Reviving the Cultural Arts of the Islamic Geometries into Contemporary Interior Design.

You are being invited to take part in a research project. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. Ask if there is anything that is not clear or if you would like more information.

It is completely voluntary, and participants have the right to not answer any question if they choose not to. You also can choose to withdraw at any time. The information collected about participants will be kept strictly confidential. All the data will be used solely for the purpose of this research and future publication.

The aim of this research is to revive cultural art identity within contemporary design. From the cultural arts of this Middle East region, this study focuses on the art of Islamic Geometries (IG); and, from the contemporary design world, on IKEA for its international success in todays home design industry. The balance between preserving the artistic soul of the IG and IKEA's vision is key. This research encompasses a semiotic study of both design styles as they are explored, investigated and analysed.

This survey is to investigate the outcome of the two styles' engagement as well as to identify and analyse factors affecting individuals' preference. Distributed among 30 participants, the study questionnaire is designed in three parts, each of which having a brief description of the task:

Part 1. Table-panel artifacts are presented. You are to answer three main questions on each table-panel pattern design reflecting to whether you think its style is IKEA or IG, and if you LIKE the design or not. The questions are rated on a Likert scale (from strongly disagree to strongly agree) to rate your preference.
Part 2. presents short questions about your preference to IKEA's furniture, familiarity to the IG style, preference to the IKEA-IG style, and your preference to IKEA's existing furniture line compared to it with the addition of the IKEA-IG style.
Part 3. is about your demographic data.

The findings of this thesis will contribute to knowledge through providing the possibility of integrating the cultural arts of IG with contemporary design of IKEA; to the practice of interior design leading to the possibility to explore other cultural art preservations; and to society by ultimately being able to obtain cultural identity within present day.

All the information that we collect about you during the course of the research will be kept in accordance with the Data Protection Act 1998. You will not be able to be identified in any reports or publications. All data relating to this study will be kept for 5 years on a BU password protected secure network.

A copy of the information sheet will be provided. If you have any concerns regarding this study, please contact Professor Siamak Noroozi by email snoroozi@bournemouth.ac.uk.

Thank you in advance for your time

Sincerely yours,

Maryam Alainati
PhD Student
Bournemouth University
malainati@bournemouth.ac.uk

By completing the questionnaire you are consenting to take part in this research study

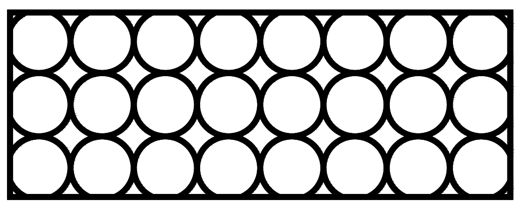
Survey Questionnaire

We greatly appreciate your valuable time by participating in this scientific research. This questionnaire was designed for the purpose of scientific research only. Designed in three parts, this questionnaire is a study of the Islamic Geometries (IG) and IKEA style. Kindly, read the quick description of each part and answer the following questions.

Part 1: (Pattern Designs)

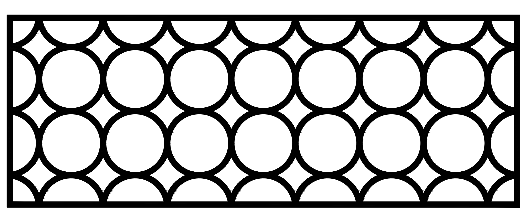
For each of the 12 IKEA-IG Pattern Designs (PD) presented, please rate from Strongly Disagree to Strongly Agree to each of three questions that follow.

PD 1.



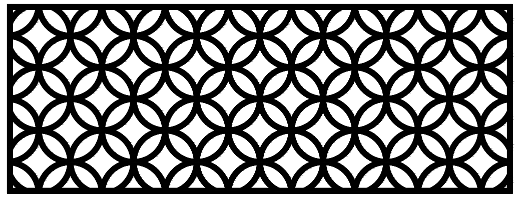
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
This is an IKEA style.					
This is an IG style.					
I like this pattern design.					

PD 2.



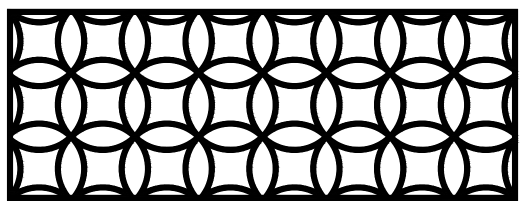
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
This is an IKEA style.					
This is an IG style.					
I like this pattern design.					

PD 3.



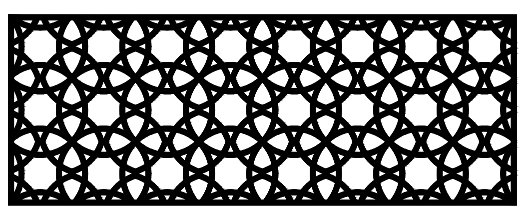
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
This is an IKEA style.	☐	☐	☐	☐	☐
This is an IG style.	☐	☐	☐	☐	☐
I like this pattern design.	☐	☐	☐	☐	☐

PD 4.



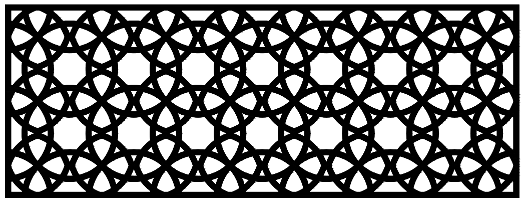
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
This is an IKEA style.	☐	☐	☐	☐	☐
This is an IG style.	☐	☐	☐	☐	☐
I like this pattern design.	☐	☐	☐	☐	☐

PD 5.



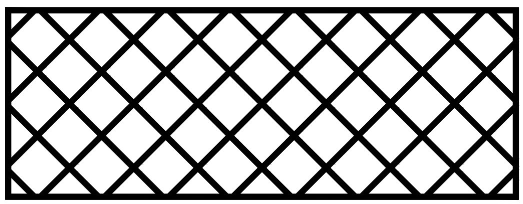
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
This is an IKEA style.	☐	☐	☐	☐	☐
This is an IG style.	☐	☐	☐	☐	☐
I like this pattern design.	☐	☐	☐	☐	☐

PD 6.



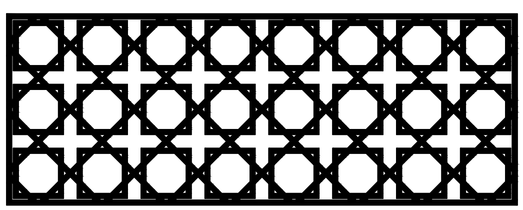
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
This is an IKEA style.	☐	☐	☐	☐	☐
This is an IG style.	☐	☐	☐	☐	☐
I like this pattern design.	☐	☐	☐	☐	☐

PD 7.



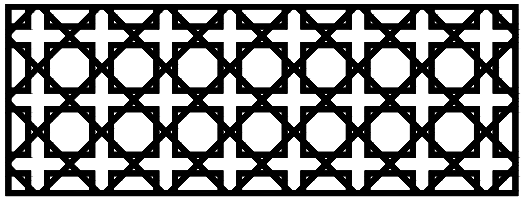
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
This is an IKEA style.	☐	☐	☐	☐	☐
This is an IG style.	☐	☐	☐	☐	☐
I like this pattern design.	☐	☐	☐	☐	☐

PD 8.



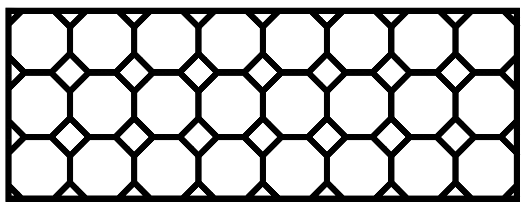
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
This is an IKEA style.	☐	☐	☐	☐	☐
This is an IG style.	☐	☐	☐	☐	☐
I like this pattern design.	☐	☐	☐	☐	☐

PD 9.



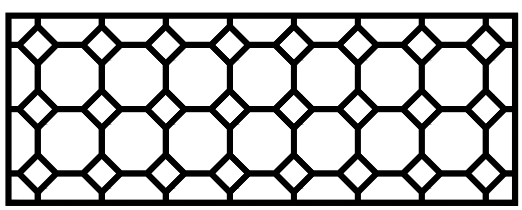
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
This is an IKEA style.					
This is an IG style.					
I like this pattern design.					

PD 10.

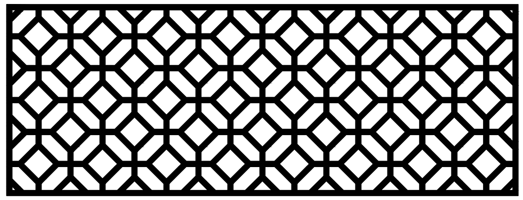


	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
This is an IKEA style.					
This is an IG style.					
I like this pattern design.					

PD 11.



	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
This is an IKEA style.					
This is an IG style.					
I like this pattern design.					

PD 12. 

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
This is an IKEA style.	☐	☐	☐	☐	☐
This is an IG style.	☐	☐	☐	☐	☐
I like this pattern design.	☐	☐	☐	☐	☐

Part 2: (Short Questions)

For the following questions towards IKEA's furniture, the IG style, the IKEA-IG style and its inclusion into IKEA's line of furniture, please rate from Strongly Disagree to Strongly Agree.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
– I like IKEA's furniture.	☐	☐	☐	☐	☐
– I am familiar with the IG style.	☐	☐	☐	☐	☐
– I like the IKEA-IG style.	☐	☐	☐	☐	☐
– I prefer IKEA's LACK table without the attachment designs.	☐	☐	☐	☐	☐

- Why?

Part 3: (Demographic Data)

For the democratic data, please select your answer to each of the following:

– Gender

☐ Male ☐ Female

– Age

☐ 19 – 29 ☐ 30 – 39 ☐ 40 – 49 ☐ ≥ 50

– County

☐ Dorset ☐ Hampshire ☐ Isle of Wight ☐ Wiltshire ☐ Somerset

☐ Sussex ☐ Surrey ☐ Other

– Ethnicity

☐ Arabian ☐ Non-Arabian

– Religion

☐ Muslim ☐ Non-Muslim

– Educational Level

☐ Below High School ☐ High School ☐ Diploma (2 years) ☐ Bachelor (4 years) ☐ Graduate/ Postgrad.

– Occupation

☐ Student ☐ Employed ☐ Retired ☐ Other

– Organisation

☐ Public Sector (gov.) ☐ Private Sector ☐ Other (student) ☐ Does not apply

THE END!
… thank you.

The following is the Arabic version of the Evaluative Study Questionnaire:

<u>ورقة معلومات المشارك</u>

الباحث: مريم العييناتي
طالب دكتوراه - جامعة بورنموث
malainati@bournemouth.ac.uk
اشراف: البروفسور سياماك نوروزي
snoroozi@bournemouth.ac.uk

إحياء الفنون الثقافية للهندسة الإسلامية من خلال التصميم الداخلي المعاصر.

ندعوكم للمشاركة في بحث علمي. وقبل الموافقة على ذلك، من المهم أن تفهم سبب إجراء هذا البحث وما سيتضمنه، لذلك يرجى أخذ الوقت الكافي لقراءة المعلومات التالية بعناية. كما أنه يمكنكم السؤال في حالة عدم وضوح أي شيئ معين أو في حال إذا كنت ترغب في الحصول على مزيد من المعلومات.

المشاركة في هذا البحث يعتبر أمراً تطوعياً تمامًا، ويحق للمشاركين عدم الإجابة عن أي سؤال إذا اختاروا عدم الإجابة، كما يمكنكم أيضًا الانسحاب في أي وقت شئتم. علماً بأن المعلومات التي يتم جمعها حول المشاركين سيتم الاحتفاظ بها بسرية تامة، وسيتم استخدام جميع البيانات فقط لغرض هذا البحث والنشر في المستقبل.

إن الهدف من هذا البحث هو إحياء هوية الفن التقليدي من خلال التصميم المعاصر. بناءً على الفنون الثقافية في هذه المنطقة الشرقية، تركز هذه الدراسة تحديداً على فن الهندسة الإسلامية ؛ وبناءً على عالم التصميم المعاصر وبناءً على نجاح شركة ايكيا الدولي في صناعة التصميم المنزلي الحديث فإن التوازن بين الحفاظ على الروح الفنية للفن الإسلامي ورؤية ايكيا هو مفتاح المطلوب.

إن الهدف من هذا الاستبيان هو التحقق من كلا الأشكال (الفن الإسلامي وتصاميم إيكيا) بالإضافة إلى تحديد العوامل التي تؤثر على أفضلية إختيار المشاركين لهذه الأشكال وتحليل تلك البيانات. ولذلك ستوزع هذه الدراسة على 30 مشارك تقريباً، وسيتم جمع البيانات من الكويت وذلك لتجميع البيانات من أصحاب الصلة (بالفن الإسلامي وتصاميم إيكيا) في المنطقة. كما تم تصميم الاستبيان على ثلاثة أجزاء يحتوي كل منها على وصف مختصر للمهمة، ويتم الرد عليها من خلال اختباركم ووضع علامة داخل المربع.

ستساهم نتائج هذا البحث في زيادة المعرفة من خلال توفير إمكانية دمج الفنون الثقافية كالموجودة بالفن الإسلامي مع التصميم المعاصر كالذي هو موجود بتصميم إيكيا. كما ستساهم نتائج هذا البحث عملياً في مجال التصميم الداخلي وذلك عن طريق توفير الإمكانية لاستكشاف فنون ثقافية أخرى محافظ عليها. كما ستساهم نتائج هذا البحث في المجتمع من خلال القدرة على الحصول على الهوية الثقافية في غضون وقتنا الحاضر.

علماً بأنه سيتم الاحتفاظ بجميع المعلومات التي يتم جمعها أثناء البحث وفقًا لقانون حماية البيانات لعام 1998. ولا يمكن تحديد هوية أي مشارك في أي تقارير أو منشورات، بل سيتم الاحتفاظ بجميع البيانات المتعلقة بهذه الدراسة لمدة 5 سنوات على شبكة آمنة محمية بكلمة مرور خاصة بالجامعة (جامعة بورنموث). وإذا كان لديك أي استفسارات بشأن هذه الدراسة، يرجى الاتصال بالبروفسور سيامك نوروزي عن طريق البريد الإلكتروني التلي: .
snoroozi@bournemouth.ac.uk

شكرا مقدما على مشاركتم.

مع خالص التقدير والاحترام

مريم العييناتي
طالب دكتوراه
جامعة بورنموث
malainati@bournemouth.ac.uk

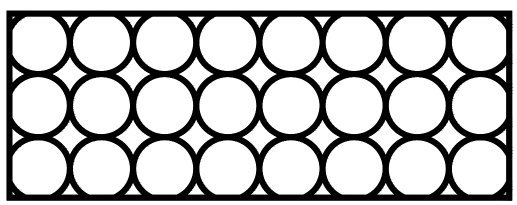
عند استكمال الاستبيان فأنت توافق على المشاركة في هذه الدراسة البحثية.

أسئلة الإستبيان

نحن نقدر كثيرا وقتك الثمين من خلال المشاركة في هذا البحث العلمي. تم تصميم هذا الاستبيان لغرض البحث العلمي فقط. تحتوي هذه الدراسة على ثلاثة أجزاء تختص بدراسة الفن الإسلامية وتصاميم ايكيا. يرجى قراءة الوصف السريع لكل جزء والإجابة على الأسئلة التالية عن طريق وضع علامة داخل المربع لكل جزء والإجابة على الأسئلة التالية.

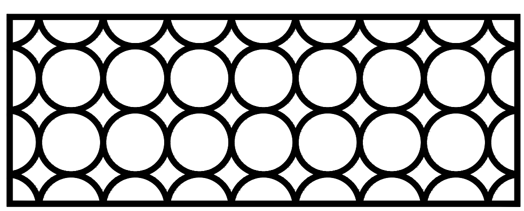
<u>الجزء الأول:</u> (نماذج التصميم)

يرجى تقييم كل نموذج من التصاميم التالية بناءً على تقديركم باستخدام المقاييس مابين أرفض بشدة إلى أوافق بشدة لقياس التالي:



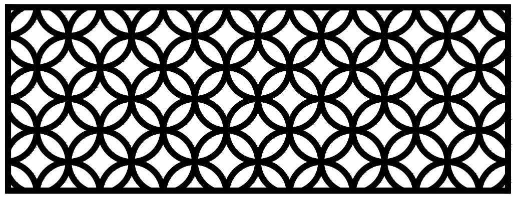
تصميم 1.

	أرفض بشدة	أرفض	محايد	أوافق	أوافق بشدة
شكل تصميم إيكيا	☐	☐	☐	☐	☐
شكل تصميم فن إسلامي	☐	☐	☐	☐	☐
يعجبني هذا التصميم	☐	☐	☐	☐	☐



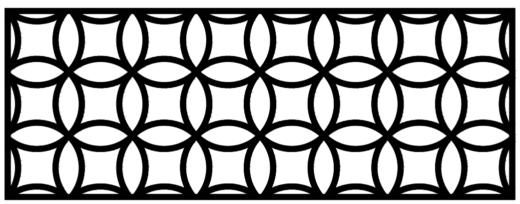
تصميم 2.

	أرفض بشدة	أرفض	محايد	أوافق	أوافق بشدة
شكل تصميم إيكيا	☐	☐	☐	☐	☐
شكل تصميم فن إسلامي	☐	☐	☐	☐	☐
يعجبني هذا التصميم	☐	☐	☐	☐	☐



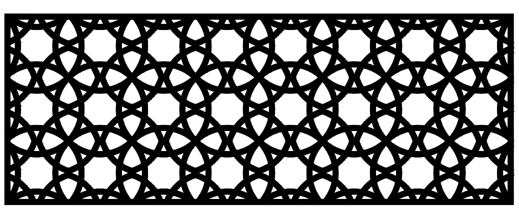
تصميم .3

	أرفض بشدة	أرفض	محايد	أوافق	أوافق بشدة
شكل تصميم إيكيا	☐	☐	☐	☐	☐
شكل تصميم فن إسلامي	☐	☐	☐	☐	☐
يعجبني هذا التصميم	☐	☐	☐	☐	☐



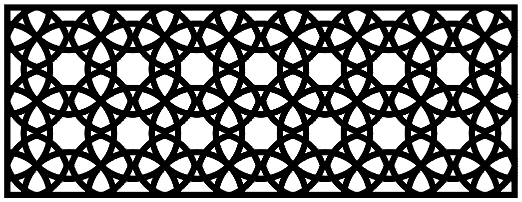
تصميم .4

	أرفض بشدة	أرفض	محايد	أوافق	أوافق بشدة
شكل تصميم إيكيا	☐	☐	☐	☐	☐
شكل تصميم فن إسلامي	☐	☐	☐	☐	☐
يعجبني هذا التصميم	☐	☐	☐	☐	☐



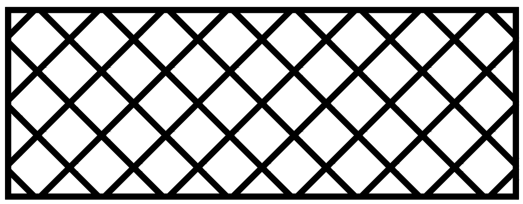
تصميم .5

	أرفض بشدة	أرفض	محايد	أوافق	أوافق بشدة
شكل تصميم إيكيا	☐	☐	☐	☐	☐
شكل تصميم فن إسلامي	☐	☐	☐	☐	☐
يعجبني هذا التصميم	☐	☐	☐	☐	☐



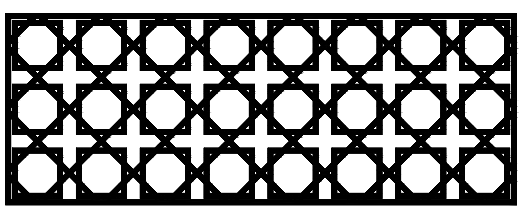
تصميم 6.

	أرفض بشدة	أرفض	محايد	أوافق	أوافق بشدة
شكل تصميم إيكيا	☐	☐	☐	☐	☐
شكل تصميم فن إسلامي	☐	☐	☐	☐	☐
يعجبني هذا التصميم	☐	☐	☐	☐	☐



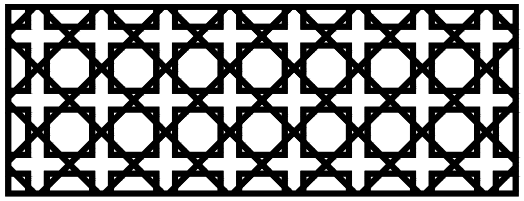
تصميم 7.

	أرفض بشدة	أرفض	محايد	أوافق	أوافق بشدة
شكل تصميم إيكيا	☐	☐	☐	☐	☐
شكل تصميم فن إسلامي	☐	☐	☐	☐	☐
يعجبني هذا التصميم	☐	☐	☐	☐	☐



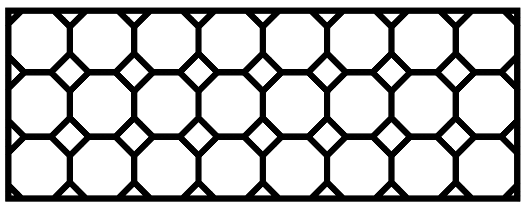
تصميم 8.

	أرفض بشدة	أرفض	محايد	أوافق	أوافق بشدة
شكل تصميم إيكيا	☐	☐	☐	☐	☐
شكل تصميم فن إسلامي	☐	☐	☐	☐	☐
يعجبني هذا التصميم	☐	☐	☐	☐	☐



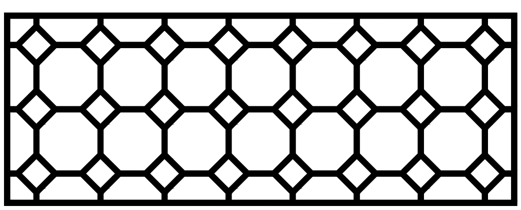
تصميم .9

	أرفض بشدة	أرفض	محايد	أوافق	أوافق بشدة
شكل تصميم إيكيا	☐	☐	☐	☐	☐
شكل تصميم فن إسلامي	☐	☐	☐	☐	☐
يعجبني هذا التصميم	☐	☐	☐	☐	☐



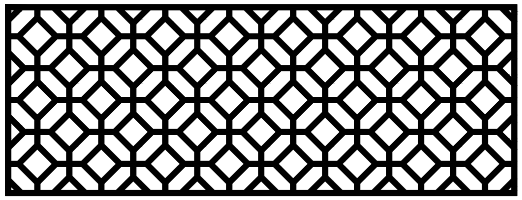
تصميم .10

	أرفض بشدة	أرفض	محايد	أوافق	أوافق بشدة
شكل تصميم إيكيا	☐	☐	☐	☐	☐
شكل تصميم فن إسلامي	☐	☐	☐	☐	☐
يعجبني هذا التصميم	☐	☐	☐	☐	☐



تصميم .11

	أرفض بشدة	أرفض	محايد	أوافق	أوافق بشدة
شكل تصميم إيكيا	☐	☐	☐	☐	☐
شكل تصميم فن إسلامي	☐	☐	☐	☐	☐
يعجبني هذا التصميم	☐	☐	☐	☐	☐



تصميم .12

	أرفض بشدة	أرفض	محايد	أوافق	أوافق بشدة
شكل تصميم إيكيا	☐	☐	☐	☐	☐
شكل تصميم فن إسلامي	☐	☐	☐	☐	☐
يعجبني هذا التصميم	☐	☐	☐	☐	☐

الجزء الثاني: (أسئلة قصيرة)

أسئلة قصيرة تقدم حول تفضيلك لأثاث ايكيا، ومدى تفضيلك لإدخال الهندسة الإسلامية في تصميمات أثاث ايكيا. ولذلك يرجى تحديد إجابتك من الخيارات المتوفرة.

	أرفض بشدة	أرفض	محايد	أوافق	أوافق بشدة
تعجبني تصاميم إيكيا	☐	☐	☐	☐	☐
أنا على معرفة بالفن الاسلامي	☐	☐	☐	☐	☐
تعجبني هذه التصاميم	☐	☐	☐	☐	☐
أفضل طاولة إيكيا بدون إضافات	☐	☐	☐	☐	☐

لماذا؟

الجزء الثالث: (البيانات الديموغرافية أو بيانات المشارك)

لبيانات المشارك، يرجى تحديد إجابتك من الخيارات المتوفرة.

- الجنس

☐ ذكر ☐ أنثي

- العمر

☐ 19 - 29 ☐ 30 - 39 ☐ 40 - 49 ☐ ≥ 50

- المحافظة

☐ العاصمة ☐ حولي ☐ الفروانية ☐ الأحمدي ☐ الجهراء

☐ مبارك الكبير

- الجنسية

☐ خليجي ☐ غير خليجي

- الديانة

☐ مسلم ☐ غير مسلم

- المستوي التعليمي

☐ أقل من ثانوي ☐ ثانوي ☐ دبلوم (سنتين) ☐ بكالوريوس (4 سنوات) ☐ دراسات عليا

- الحالة الوظيفة

☐ طالب ☐ موظف ☐ متقاعد ☐ أخرى

- نوع المؤسسة الوظيفية

☐ قطاع حكومي ☐ قطاع خاص ☐ أخرى (للطلبة) ☐ لا ينطبق

نهاية الإستبيان

شكرا لكم

Appendix V: ESQ - Item-Total Statistics for both ESQs

Results from both the ESQ-1 (Kuwait group) and the ESQ-2 (UK group) are compared.

Item-Total Statistics for each of the PD items in constructs IKEA, IG and LIKE are presented:

Group		Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
KWT	IKEA_11_1	33.09	93.210	0.447	0.929
	IKEA_12_4	33.33	88.792	0.678	0.920
	IKEA_13_7	33.61	86.996	0.759	0.916
	IKEA_14_10	33.42	87.502	0.785	0.916
	IKEA_16_13	34.58	90.002	0.556	0.925
	IKEA_17_16	34.39	90.809	0.555	0.925
	IKEA_19_19	32.58	94.002	0.523	0.925
	IKEA_20_22	33.82	85.091	0.803	0.914
	IKEA_21_25	33.88	85.735	0.782	0.915
	IKEA_24_28	33.03	88.155	0.800	0.915
	IKEA_25_31	33.03	88.093	0.712	0.918
	IKEA_26_34	33.58	85.002	0.850	0.912
UK	IKEA_11_1	33.07	40.340	0.089	0.822
	IKEA_12_4	33.37	38.447	0.262	0.809
	IKEA_13_7	33.67	33.816	0.567	0.782
	IKEA_14_10	33.53	34.602	0.619	0.778
	IKEA_16_13	33.97	35.757	0.484	0.790
	IKEA_17_16	34.07	34.892	0.516	0.787
	IKEA_19_19	32.50	41.500	0.004	0.824
	IKEA_20_22	33.83	34.006	0.563	0.782
	IKEA_21_25	33.87	34.120	0.527	0.786
	IKEA_24_28	33.23	35.564	0.547	0.785
	IKEA_25_31	33.30	35.321	0.555	0.784
	IKEA_26_34	33.47	33.085	0.627	0.775

Table V1. Item-Total Statistics for IKEA Construct PDs.

Group		Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
KWT	IG_11_2	44.73	35.830	0.632	0.848
	IG_12_5	44.45	37.568	0.488	0.859
	IG_13_8	43.42	41.502	0.402	0.862
	IG_14_11	44.21	36.922	0.677	0.845
	IG_16_14	43.45	42.506	0.304	0.866
	IG_17_17	43.48	40.008	0.546	0.855
	IG_19_20	45.03	33.530	0.602	0.856
	IG_20_23	43.45	40.631	0.470	0.859
	IG_21_26	43.42	40.564	0.527	0.857

	IG_24_29	44.36	36.739	0.634	0.848
	IG_25_32	44.21	34.860	0.758	0.838
	IG_26_35	43.76	39.314	0.639	0.851
UK	IG_11_2	40.00	19.517	0.428	0.741
	IG_12_5	39.60	19.972	0.268	0.761
	IG_13_8	38.67	21.747	0.121	0.769
	IG_14_11	39.17	19.661	0.426	0.741
	IG_16_14	39.03	17.137	0.607	0.714
	IG_17_17	38.87	19.775	0.376	0.746
	IG_19_20	40.23	19.013	0.415	0.742
	IG_20_23	38.90	19.610	0.465	0.738
	IG_21_26	39.07	18.547	0.610	0.721
	IG_24_29	39.70	19.872	0.327	0.752
	IG_25_32	39.50	19.224	0.413	0.742
	IG_26_35	38.80	20.924	0.289	0.755

Table V2. Item-Total Statistics for IG Construct PDs.

Group		**Scale Mean if Item Deleted**	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**
KWT	LIKE_11_3	45.48	46.383	0.472	0.885
	LIKE_12_6	45.48	44.633	0.420	0.889
	LIKE_13_9	44.97	43.280	0.666	0.875
	LIKE_14_12	45.39	45.309	0.535	0.882
	LIKE_16_15	45.27	47.080	0.328	0.891
	LIKE_17_18	45.18	40.278	0.778	0.867
	LIKE_19_21	45.82	43.841	0.441	0.888
	LIKE_20_24	45.12	40.922	0.738	0.870
	LIKE_21_27	45.12	40.422	0.784	0.867
	LIKE_24_30	45.45	44.068	0.527	0.882
	LIKE_25_33	45.55	38.506	0.818	0.864
	LIKE_26_36	45.15	43.570	0.589	0.879
UK	LIKE_11_3	41.40	30.938	0.602	0.793
	LIKE_12_6	41.23	31.702	0.586	0.795
	LIKE_13_9	40.70	34.010	0.453	0.807
	LIKE_14_12	41.03	33.068	0.471	0.805
	LIKE_16_15	40.97	32.723	0.499	0.802
	LIKE_17_18	40.93	32.616	0.492	0.803
	LIKE_19_21	41.33	32.851	0.383	0.813
	LIKE_20_24	41.17	30.420	0.582	0.794
	LIKE_21_27	41.40	29.903	0.576	0.795
	LIKE_24_30	41.37	33.206	0.370	0.814
	LIKE_25_33	41.03	33.551	0.342	0.816
	LIKE_26_36	40.60	35.283	0.289	0.817

Table V3. Item-Total Statistics for LIKE Construct PDs.

Appendix W: ESQ – Independent Sample T-test Analysis

Both evaluative study questionnaire group results are presented. For significant items from constructs IKEA, IG and LIKE, Two-Tailed Independent Sample T-Tests are presented for significant items from constructs IKEA, IG and LIKE; along with a bar plot of item mean amongst the Kuwait and UK groups. Descriptive statistics within each of the three constructs, as well as combined constructs II and ALL, amongst the Kuwait and UK groups are also presented:

IKEA Construct:

Variables	**Mean Difference**	**Std. Error Difference**	**t**	**df**	***p***	**Confidence Interval Lower**	**Upper**
IKEA_11_1	0.018	0.262	0.069	61	0.945	-0.505	0.542
IKEA_12_4	0.076	0.259	0.293	61	0.771	-0.442	0.593
IKEA_13_7	0.103	0.282	0.365	61	0.716	-0.436	0.587
IKEA_14_10	0.152	0.255	0.595	61	0.554	-0.460	0.666
IKEA_16_13	-0.567	0.280	-2.021	61	**0.048**	-0.358	0.661
IKEA_17_16	-0.285	0.279	-1.023	61	0.311	-1.127	-0.006
IKEA_19_19	-0.033	0.217	-0.154	61	0.878	-0.842	0.272
IKEA_20_22	0.058	0.290	0.199	61	0.843	-0.466	0.400
IKEA_21_25	0.030	0.292	0.104	61	0.918	-0.521	0.637
IKEA_24_28	0.245	0.243	1.011	61	0.316	-0.553	0.614
IKEA_25_31	0.312	0.261	1.194	61	0.237	-0.240	0.731
IKEA_26_34	-0.067	0.285	-0.234	61	0.816	-0.211	0.835

[a]Levene's test is significant (p < .05), suggesting a violation of the equal variance assumption

Table W1. Independent Sample T-Test for IKEA items (KWT vs UK).

	KWT		UK				
Variable	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
IKEA_16_13	2.00	1.25	2.57	0.94	-2.02	.048	0.51

Note. N = 63. Degrees of Freedom for the *t*-statistic = 61. *d* represents Cohen's *d*.

Table W2. Two-Tailed Independent Sample T-Test for IKEA_16 by Group.

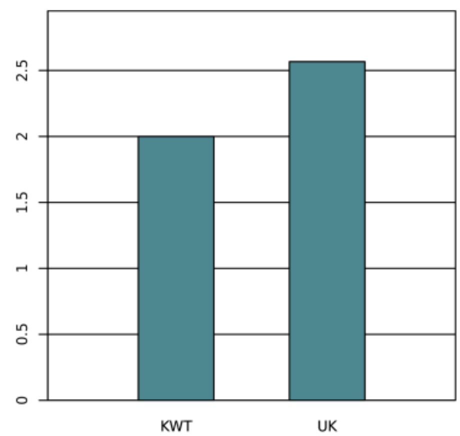


Figure W1. Mean of IKEA_16 by Group.

Variables	Group	N	Mean	SD	SE
IKEA_11_1	KWT	33	3.48	1.176	0.205
	UK	30	3.47	0.860	0.157
IKEA_12_4	KWT	33	3.24	1.146	0.200
	UK	30	3.17	0.874	0.160
IKEA_13_7	KWT	33	2.97	1.159	0.202
	UK	30	2.87	1.074	0.196
IKEA_14_10	KWT	33	3.15	1.093	0.190
	UK	30	3.00	0.910	0.166
IKEA_16_13	KWT	33	2.00	1.250	0.218
	UK	30	2.57	0.935	0.171
IKEA_17_16	KWT	33	2.18	1.185	0.206
	UK	30	2.47	1.008	0.184
IKEA_19_19	KWT	33	4.00	0.968	0.169
	UK	30	4.03	0.718	0.131
IKEA_20_22	KWT	33	2.76	1.226	0.213
	UK	30	2.70	1.055	0.193
IKEA_21_25	KWT	33	2.70	1.212	0.211
	UK	30	2.67	1.093	0.200
IKEA_24_28	KWT	33	3.55	1.034	0.180
	UK	30	3.30	0.877	0.160
IKEA_25_31	KWT	33	3.55	1.148	0.200
	UK	30	3.23	0.898	0.164
IKEA_26_34	KWT	33	3.00	1.173	0.204
	UK	30	3.07	1.081	0.197

Table W3. Descriptive – IKEA Items by Group.

IG Construct:

Variables	Mean Difference	Std. Error Difference	t	df	*p*	Confidence Interval Lower	Upper
IG_11_2	0.406	0.233	1.743	61	0.086	-0.060	0.872
IG_12_5	0.279	0.246	1.133	61	0.262	-0.213	0.771
IG_13_8	0.376	0.154	2.433	61	**0.018**	0.067	0.685
IG_14_11	0.088	0.204	0.431	61	0.668	-0.320	0.495
IG_16_14	0.712	0.195	3.657	61	**0.001**[a]	0.323	1.102
IG_17_17	0.515	0.178	2.900	61	**0.005**	0.160	0.870
IG_19_20	0.336	0.292	1.150	61	0.254	-0.248	0.921
IG_20_23	0.579	0.168	3.439	61	**0.001**	0.242	0.915
IG_21_26	0.776	0.167	4.634	61	**0.000**	0.441	1.110
IG_24_29	0.470	0.223	2.103	61	**0.040**	0.023	0.916
IG_25_32	0.421	0.234	1.800	61	0.077	-0.047	0.889
IG_26_35	0.176	0.158	1.112	61	0.270	-0.140	0.492

[a]Levene's test is significant ($p < .05$), suggesting a violation of the equal variance assumption

Table W4. Independent Sample T-Test for IG items (KWT vs UK).

	KWT		UK				
Variable	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
IG_13_8	4.58	0.61	4.20	0.61	2.43	.018	0.61

Note. N = 63. Degrees of Freedom for the *t*-statistic = 61. *d* represents Cohen's *d*.

Table W5. Two-Tailed Independent Sample T-Test for IG_13 by Group.

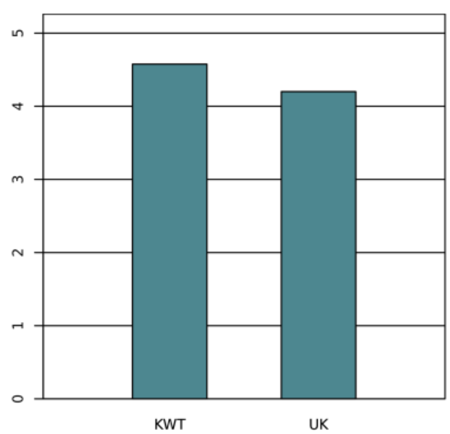


Figure W2. Mean of IG_13 by Group.

	KWT		UK				
Variable	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
IG_16_14	4.55	0.56	3.83	0.95	3.66	< .001	0.91

Note. N = 63. Degrees of Freedom for the *t*-statistic = 61. *d* represents Cohen's *d*.

Table W6. Two-Tailed Independent Sample T-Test for IG_16 by Group.

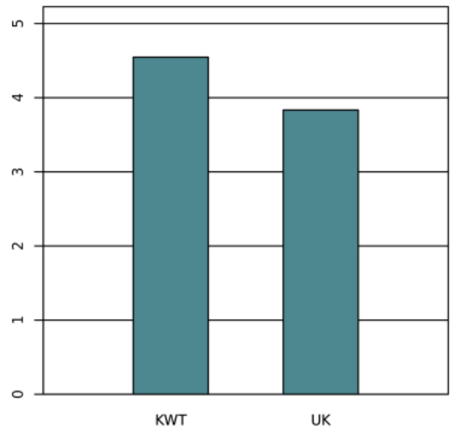


Figure W3. Mean of IG_16 by Group.

	KWT		UK				
Variable	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
IG_17_17	4.52	0.67	4.00	0.74	2.90	.005	0.73

Note. N = 63. Degrees of Freedom for the *t*-statistic = 61. *d* represents Cohen's *d*.

Table W7. Two-Tailed Independent Sample T-Test for IG_17 by Group.

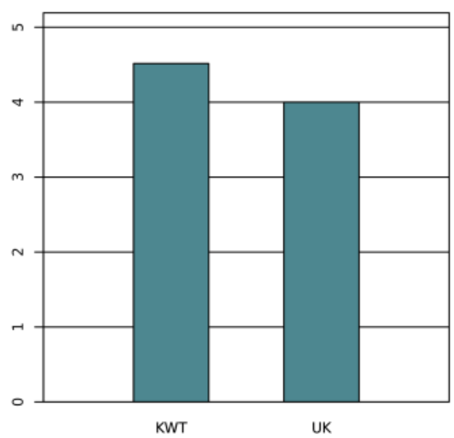


Figure W4. Mean of IG_17 by Group.

	KWT		UK				
Variable	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
IG_20_23	4.55	0.67	3.97	0.67	3.44	.001	0.87

Note. N = 63. Degrees of Freedom for the *t*-statistic = 61. *d* represents Cohen's *d*.

Table W8. Two-Tailed Independent Sample T-Test for IG_20 by Group.

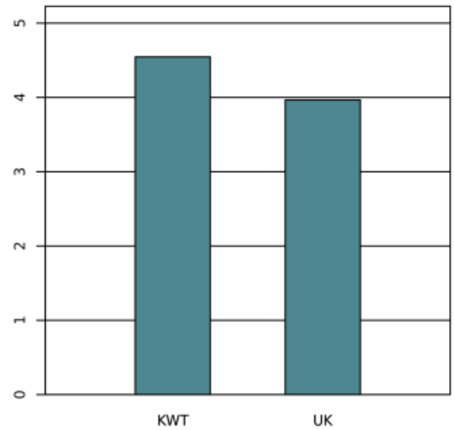


Figure W5. Mean of IG_20 by Group.

	KWT		UK				
Variable	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
IG_21_26	4.58	0.61	3.80	0.71	4.63	< .001	1.16

Note. N = 63. Degrees of Freedom for the *t*-statistic = 61. *d* represents Cohen's *d.*

Table W9. Two-Tailed Independent Sample T-Test for IG_21 by Group.

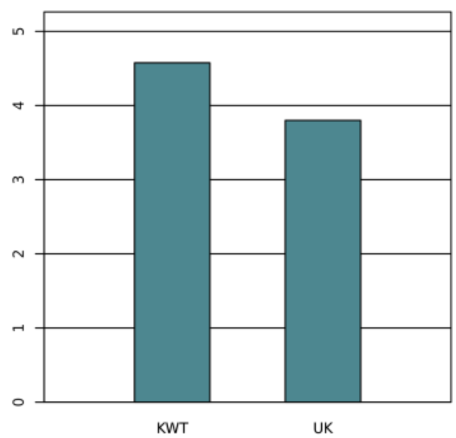


Figure W6. Mean of IG_21 by Group.

	KWT		UK				
Variable	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
IG_24_29	3.64	0.96	3.17	0.79	2.10	.040	0.53

Note. N = 63. Degrees of Freedom for the *t*-statistic = 61. *d* represents Cohen's *d.*

Table W10. Two-Tailed Independent Sample T-Test for IG_24 by Group.

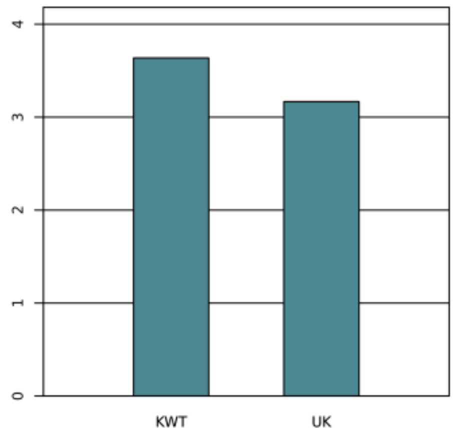


Figure W7. Mean of IG_24 by Group.

Variables	Group	N	Mean	SD	SE
IG_11_2	KWT	33	3.27	1.069	0.186
	UK	30	2.87	0.730	0.133
IG_12_5	KWT	33	3.55	1.063	0.185
	UK	30	3.27	0.868	0.159
IG_13_8	KWT	33	4.58	0.614	0.107
	UK	30	4.20	0.610	0.111
IG_14_11	KWT	33	3.79	0.893	0.155
	UK	30	3.70	0.702	0.128
IG_16_14	KWT	33	4.55	0.564	0.098
	UK	30	3.83	0.950	0.173
IG_17_17	KWT	33	4.52	0.667	0.116
	UK	30	4.00	0.743	0.136
IG_19_20	KWT	33	2.97	1.380	0.240
	UK	30	2.63	0.850	0.155
IG_20_23	KWT	33	4.55	0.666	0.116
	UK	30	3.97	0.669	0.122
IG_21_26	KWT	33	4.58	0.614	0.107
	UK	30	3.80	0.714	0.130
IG_24_29	KWT	33	3.64	0.962	0.168
	UK	30	3.17	0.791	0.145
IG_25_32	KWT	33	3.79	1.023	0.178
	UK	30	3.37	0.809	0.148
IG_26_35	KWT	33	4.24	0.663	0.115
	UK	30	4.07	0.583	0.106

Table W11. Descriptive – IG Items by Group.

LIKE Construct:

Variables	Mean Difference	Std. Error Difference	t	df	*p*	Confidence Interval Lower	Confidence Interval Upper
LIKE_11_3	0.536	0.200	2.682	61	**0.009**[a]	0.136	0.936
LIKE_12_6	0.370	0.229	1.616	61	0.111	-0.088	0.827
LIKE_13_9	0.352	0.188	1.874	61	0.066	-0.023	0.726
LIKE_14_12	0.261	0.190	1.370	61	0.176	-0.120	0.641
LIKE_16_15	0.315	0.195	1.618	61	0.111	-0.074	0.705
LIKE_17_18	0.373	0.231	1.612	61	0.112	-0.090	0.835
LIKE_19_21	0.136	0.253	0.540	61	0.591	-0.369	0.641
LIKE_20_24	0.667	0.250	2.665	61	**0.010**	0.166	1.167
LIKE_21_27	0.900	0.260	3.464	61	**0.001**	0.380	1.420
LIKE_24_30	0.533	0.227	2.348	61	**0.022**	0.079	0.988
LIKE_25_33	0.109	0.257	0.424	61	0.673	-0.406	0.624
LIKE_26_36	0.070	0.195	0.358	61	0.722	-0.320	0.459

[a]Levene's test is significant ($p < .05$), suggesting a violation of the equal variance assumption

Table W12. Independent Sample T-Test for LIKE items (KWT vs UK).

	KWT		UK				
Variable	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
LIKE_11_3	3.97	0.64	3.43	0.94	2.68	.009	0.67

Note. N = 63. Degrees of Freedom for the *t*-statistic = 61. *d* represents Cohen's *d*.

Table W10 13. Two-Tailed Independent Sample T-Test for LIKE_11 by Group.

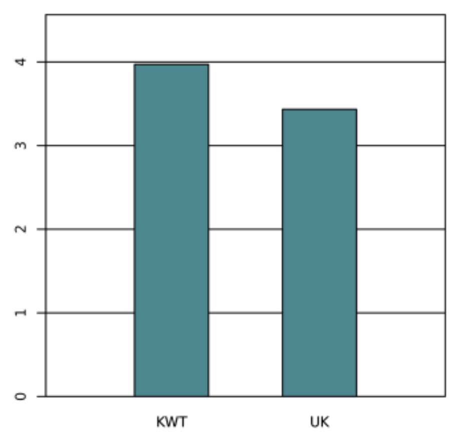


Figure W8. Mean of LIKE_11 by Group.

	KWT		UK				
Variable	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
LIKE_20_24	4.33	0.96	3.67	1.03	2.66	.010	0.67

Note. N = 63. Degrees of Freedom for the *t*-statistic = 61. *d* represents Cohen's *d*.

Table W14. Two-Tailed Independent Sample T-Test for LIKE_20 by Group.

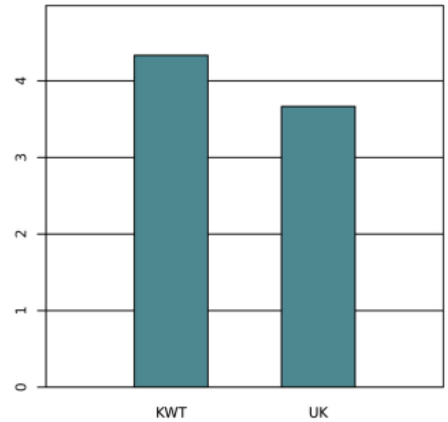


Figure W9. Mean of LIKE_20 by Group.

	KWT		UK				
Variable	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
LIKE_21_27	4.33	0.96	3.43	1.10	3.46	< .001	0.87

Note. N = 63. Degrees of Freedom for the *t*-statistic = 61. *d* represents Cohen's *d*.

Table W15. Two-Tailed Independent Sample T-Test for LIKE_21 by Group.

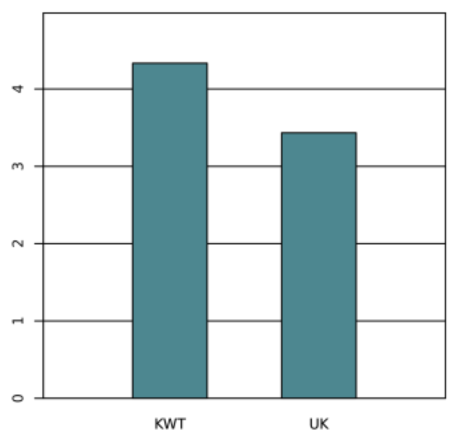


Figure W10. Mean of LIKE_21 by Group.

	KWT		UK				
Variable	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
LIKE_24_30	4.00	0.87	3.47	0.94	2.35	.022	0.59

Note. N = 63. Degrees of Freedom for the *t*-statistic = 61. *d* represents Cohen's *d*.

Table W16. Two-Tailed Independent Sample T-Test for LIKE_24 by Group.

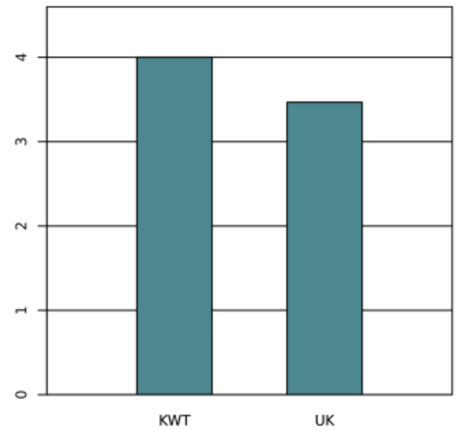


Figure W11. Mean of LIKE_24 by Group.

Variables	Group	N	Mean	SD	SE
LIKE_11_3	KWT	33	3.97	0.637	0.111
	UK	30	3.43	0.935	0.171
LIKE_12_6	KWT	33	3.97	0.951	0.166
	UK	30	3.60	0.855	0.156
LIKE_13_9	KWT	33	4.48	0.795	0.138
	UK	30	4.13	0.681	0.124
LIKE_14_12	KWT	33	4.06	0.704	0.123
	UK	30	3.80	0.805	0.147
LIKE_16_15	KWT	33	4.18	0.727	0.127
	UK	30	3.87	0.819	0.150
LIKE_17_18	KWT	33	4.27	0.977	0.170
	UK	30	3.90	0.845	0.154
LIKE_19_21	KWT	33	3.64	1.025	0.178
	UK	30	3.50	0.974	0.178
LIKE_20_24	KWT	33	4.33	0.957	0.167
	UK	30	3.67	1.028	0.188
LIKE_21_27	KWT	33	4.33	0.957	0.167
	UK	30	3.43	1.104	0.202
LIKE_24_30	KWT	33	4.00	0.866	0.151
	UK	30	3.47	0.937	0.171
LIKE_25_33	KWT	33	3.91	1.100	0.192
	UK	30	3.80	0.925	0.169
LIKE_26_36	KWT	33	4.30	0.847	0.147
	UK	30	4.23	0.679	0.124

Table W17. Descriptive – LIKE Items by Group.

II Construct:

Variables	Mean Difference	Std. Error Difference	t	df	*p*	Confidence Interval Lower	Upper
II_11	0.21212	0.17146	1.237	61	0.221	-0.131	0.555
II_12	0.17727	0.17756	0.998	61	0.322	-0.178	0.532
II_13	0.23939	0.15991	1.497	61	0.140	-0.080	0.559
II_14	0.11970	0.17556	0.682	61	0.498	-0.231	0.471
II_16	0.07273	0.17044	0.427	61	0.671	-0.268	0.414
II_17	0.11515	0.15358	0.750	61	0.456	-0.192	0.422
II_19	0.15152	0.16598	0.913	61	0.365	-0.180	0.483
II_20	0.31818	0.15957	1.994	61	0.051	-0.001	0.637
II_21	0.40303	0.17244	2.337	61	**0.023**	0.058	0.748
II_24	0.35758	0.15522	2.304	61	**0.025**	0.047	0.668
II_25	0.36667	0.16824	2.179	61	**0.033**[a]	0.030	0.703
II_26	0.05455	0.15450	0.353	61	0.725	-0.254	0.363

[a]Levene's test is significant ($p < .05$), suggesting a violation of the equal variance assumption

Table W18. Independent Sample T-Test for II items (KWT vs UK).

Variables	Group	N	Mean	SD	SE
II_11	KWT	33	3.3788	0.80069	0.13938
	UK	30	3.1667	0.51417	0.09387
II_12	KWT	33	3.3939	0.88174	0.15349
	UK	30	3.2167	0.42918	0.07836
II_13	KWT	33	3.7727	0.68569	0.11936
	UK	30	3.5333	0.57135	0.10431
II_14	KWT	33	3.4697	0.75972	0.13225
	UK	30	3.3500	0.61798	0.11283
II_16	KWT	33	3.2727	0.68569	0.11936
	UK	30	3.2000	0.66436	0.12130
II_17	KWT	33	3.3485	0.59273	0.10318
	UK	30	3.2333	0.62606	0.11430
II_19	KWT	33	3.4848	0.75503	0.13143
	UK	30	3.3333	0.53067	0.09689
II_20	KWT	33	3.6515	0.67875	0.11816
	UK	30	3.3333	0.57735	0.10541
II_21	KWT	33	3.6364	0.67630	0.11773
	UK	30	3.2333	0.69149	0.12625
II_24	KWT	33	3.5909	0.65496	0.11401
	UK	30	3.2333	0.56832	0.10376
II_25	KWT	33	3.6667	0.75691	0.13176
	UK	30	3.3000	0.55086	0.10057
II_26	KWT	33	3.6212	0.63775	0.11102
	UK	30	3.5667	0.58329	0.10649

Table W19. Descriptive – II Items by Group.

ALL Construct:

Variables	Mean Difference	Std. Error Difference	T	Df	*P*	Confidence Interval Lower	Upper
ALL_11	0.47121	0.15520	3.036	61	**0.004**	0.161	0.782
ALL_12	0.32424	0.20663	1.569	61	0.122	-0.089	0.737
ALL_13	0.36364	0.13755	2.644	61	**0.010**	0.089	0.639
ALL_14	0.17424	0.16918	1.030	61	0.307	-0.164	0.513
ALL_16	0.51364	0.16693	3.077	61	**0.003**	0.180	0.847
ALL_17	0.44394	0.18286	2.428	61	**0.018**	0.078	0.810
ALL_19	0.23636	0.22339	1.058	61	0.294	-0.210	0.683
ALL_20	0.62273	0.18867	3.301	61	**0.002**	0.245	1.000
ALL_21	0.83788	0.17990	4.657	61	**0.000**	0.478	1.198
ALL_24	0.50152	0.18314	2.738	61	**0.008**	0.135	0.868
ALL_25	0.26515	0.20627	1.285	61	0.203	-0.147	0.678
ALL_26	0.12273	0.14844	0.827	61	0.412	-0.174	0.420

[a]Levene's test is significant ($p < .05$), suggesting a violation of the equal variance assumption

Table W20. Independent Sample T-Test for ALL items (KWT vs UK).

Variables	Group	N	Mean	SD	SE
ALL_11	KWT	33	3.6212	0.61276	0.10667
	UK	30	3.1500	0.61798	0.11283
ALL_12	KWT	33	3.7576	0.92805	0.16155
	UK	30	3.4333	0.67891	0.12395
ALL_13	KWT	33	4.5303	0.59869	0.10422
	UK	30	4.1667	0.47946	0.08754
ALL_14	KWT	33	3.9242	0.69733	0.12139
	UK	30	3.7500	0.63991	0.11683
ALL_16	KWT	33	4.3636	0.56282	0.09797
	UK	30	3.8500	0.75601	0.13803
ALL_17	KWT	33	4.3939	0.75785	0.13192
	UK	30	3.9500	0.68670	0.12537
ALL_19	KWT	33	3.3030	1.03787	0.18067
	UK	30	3.0667	0.67891	0.12395
ALL_20	KWT	33	4.4394	0.74747	0.13012
	UK	30	3.8167	0.74837	0.13663
ALL_21	KWT	33	4.4545	0.67735	0.11791
	UK	30	3.6167	0.75067	0.13705
ALL_24	KWT	33	3.8182	0.79861	0.13902
	UK	30	3.3167	0.63631	0.11617
ALL_25	KWT	33	3.8485	0.92267	0.16062
	UK	30	3.5833	0.68334	0.12476
ALL_26	KWT	33	4.2727	0.68569	0.11936
	UK	30	4.1500	0.45769	0.08356

Table W21. Descriptive – ALL Items by Group.

Appendix X: ESQ – Descriptive Statistic for Dependent Variables

Descriptive statistic results for the studied variables corresponding to the KWT and UK groups; graphical representation of the mean is also presented:

Variables	**Mean Difference**	**Std. Error Difference**	**T**	**df**	***P***	***CI*** *Lower*	*Upper*
Like_IKEA_Furniture	-0.097	0.165	-0.587	61	0.559	-0.427	0.233
I_like_IKEA_IG	1.012	0.193	5.248	61	**0.000**	0.627	1.398
I_prefer_no_additional_design	-1.679	0.299	-5.616	61	**0.000**[a]	-2.277	-1.081

[a]Levene's test is significant ($p < .05$), suggesting a violation of the equal variance assumption

Table X1. Independent Sample T-Test for study variables (KWT vs UK).

Variables	**Group**	**N**	**Mean**	**SD**	**SE**
Like_IKEA_Furniture	KWT	33	4.30	0.585	0.102
	UK	30	4.40	0.724	0.132
I_like_IKEA_IG	KWT	33	4.55	0.617	0.107
	UK	30	3.53	0.900	0.164
I_prefer_no_additional_design	KWT	33	2.45	1.481	0.258
	UK	30	4.13	0.730	0.133

Table X2. Descriptive – Dependent Variables by Group.

Appendix Y: ESQ – Regression Analysis for Variables

Regression analysis for the studied variables corresponding to demographics; estimated marginal means and post-hoc analysis results for the studied variables corresponding to the KWT and UK groups are presented:

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Like_IKEA_Furniture	5.539[a]	9	0.615	1.570	0.149
	I_like_IKEA_IG	21.196[b]	9	2.355	4.086	0.001
	I_prefer_no_additional_design	63.034[c]	9	7.004	5.548	0.000
Intercept	Like_IKEA_Furniture	10.647	1	10.647	27.157	0.000
	I_like_IKEA_IG	19.671	1	19.671	34.125	0.000
	I_prefer_no_additional_design	8.447	1	8.447	6.692	0.012
Gender	Like_IKEA_Furniture	1.799	1	1.799	4.537	**0.038**
	I_like_IKEA_IG	0.016	1	0.016	0.027	0.869
	I_prefer_no_additional_design	4.365	1	4.365	3.458	0.069
Age	Like_IKEA_Furniture	1.572	1	1.572	4.009	0.050
	I_like_IKEA_IG	0.744	1	0.744	1.290	0.261
	I_prefer_no_additional_design	0.206	1	0.206	0.163	0.688
Province	Like_IKEA_Furniture	0.013	1	0.013	0.033	0.857
	I_like_IKEA_IG	1.079	1	1.079	1.872	0.177
	I_prefer_no_additional_design	0.082	1	0.082	0.065	0.800
Ethnicity	Like_IKEA_Furniture	0.450	1	0.450	1.148	0.289
	I_like_IKEA_IG	0.110	1	0.110	0.190	0.665
	I_prefer_no_additional_design	3.080	1	3.080	2.440	0.124
Religion	Like_IKEA_Furniture	0.101	1	0.101	0.259	0.613
	I_like_IKEA_IG	2.578	1	2.578	4.472	**0.039**
	I_prefer_no_additional_design	0.246	1	0.246	0.195	0.660
Education	Like_IKEA_Furniture	0.034	1	0.034	0.086	0.770
	I_like_IKEA_IG	0.324	1	0.324	0.562	0.457
	I_prefer_no_additional_design	0.420	1	0.420	0.332	0.567
Occupation	Like_IKEA_Furniture	0.439	1	0.439	1.121	0.295
	I_like_IKEA_IG	0.301	1	0.301	0.521	0.473
	I_prefer_no_additional_design	3.696	1	3.696	2.928	0.093
Organization	Like_IKEA_Furniture	0.384	1	0.384	0.978	0.327
	I_like_IKEA_IG	0.307	1	0.307	0.533	0.468
	I_prefer_no_additional_design	1.266	1	1.266	1.003	0.321
Group	Like_IKEA_Furniture	0.057	1	0.057	0.146	0.704
	I_like_IKEA_IG	0.003	1	0.003	0.005	0.945
	I_prefer_no_additional_design	5.631	1	5.631	4.461	**0.039**
Error	Like_IKEA_Furniture	20.779	53	0.392		
	I_like_IKEA_IG	30.551	53	0.576		
	I_prefer_no_additional_design	66.903	53	1.262		

Total	Like_IKEA_Furniture	1218.000	63
	I_like_IKEA_IG	1092.000	63
	I_prefer_no_additional_design	797.000	63
Corrected Total	Like_IKEA_Furniture	26.317	62
	I_like_IKEA_IG	51.746	62
	I_prefer_no_additional_design	129.937	62

a. R Squared = .210 (Adjusted R Squared = .076)
b. R Squared = .410 (Adjusted R Squared = .309)
c. R Squared = .485 (Adjusted R Squared = .398)

Table Y1. Multivariant ANOVA – Variables to Demographics.

						95% Confidence Interval	
Dependent Variable		**B**	**Std. Error**	**t**	**Sig.**	**Lower Bound**	**Upper Bound**
Like_IKEA_Furniture	Intercept	3.838	0.897	4.280	0.000	2.039	5.636
	Gender	0.383	0.180	2.130	**0.038**	0.022	0.743
	Age	-0.278	0.139	-2.002	0.050	-0.556	0.000
	Province	-0.013	0.073	-0.181	0.857	-0.159	0.133
	Ethnicity	-0.300	0.280	-1.071	0.289	-0.863	0.262
	Religion	0.221	0.435	0.509	0.613	-0.651	1.093
	Education	-0.023	0.079	-0.293	0.770	-0.181	0.135
	Occupation	0.161	0.152	1.059	0.295	-0.144	0.467
	Organization	0.114	0.116	0.989	0.327	-0.117	0.346
	[Group=1.00]	0.156	0.407	0.382	0.704	-0.660	0.972
	[Group=2.00]	0[a]					
I_like_IKEA_IG	Intercept	5.305	1.087	4.880	0.000	3.124	7.485
	Gender	-0.036	0.218	-0.165	0.869	-0.473	0.401
	Age	0.191	0.168	1.136	0.261	-0.146	0.528
	Province	0.121	0.088	1.368	0.177	-0.056	0.297
	Ethnicity	0.148	0.340	0.436	0.665	-0.534	0.830
	Religion	-1.115	0.527	-2.115	**0.039**	-2.173	-0.057
	Education	-0.072	0.096	-0.750	0.457	-0.263	0.120
	Occupation	-0.134	0.185	-0.722	0.473	-0.504	0.237
	Organization	0.102	0.140	0.730	0.468	-0.179	0.383
	[Group=1.00]	0.034	0.493	0.070	0.945	-0.955	1.024
	[Group=2.00]	0[a]					
I_prefer_no_additional_design	Intercept	4.258	1.609	2.647	0.011	1.032	7.485
	Gender	-0.599	0.322	-1.860	0.069	-1.246	0.047
	Age	-0.100	0.249	-0.403	0.688	-0.599	0.399
	Province	0.033	0.130	0.255	0.800	-0.228	0.295
	Ethnicity	0.786	0.503	1.562	0.124	-0.223	1.795
	Religion	-0.345	0.780	-0.442	0.660	-1.910	1.220
	Education	-0.082	0.141	-0.577	0.567	-0.365	0.202
	Occupation	0.468	0.274	1.711	0.093	-0.081	1.017

Organization	-0.208	0.207	-1.002	0.321	-0.624	0.208
[Group=1.00]	-1.542	0.730	-2.112	**0.039**	-3.006	-0.078
[Group=2.00]	0[a]					

a. This parameter is set to zero because it is redundant.

Table Y2. Regression Equation Parameter Estimates – Demographics to Variables.

			95% Confidence Interval	
Dependent Variable	**Mean**	**Std. Error**	**Lower Bound**	**Upper Bound**
Like_IKEA_Furniture	4.346[a]	0.079	4.186	4.505
I_like_IKEA_IG	4.063[a]	0.096	3.869	4.256
I_prefer_no_additional_design	3.291[a]	0.143	3.005	3.577

a. Covariates appearing in the model are evaluated at the following values: Gender = 1.57, Age = 1.92, Province = 2.03, Ethnicity = 1.46, Religion = 1.52, Education = 3.70, Occupation = 2.10, Organisation = 2.08.

Table Y3. Estimated Marginal Means – Dependent Variables.

				95% Interval	
Dependent Variable		**Mean**	**Std. Error**	**Lower Bound**	**Upper Bound**
Like_IKEA_Furniture	KWT	4.423[a]	0.209	4.004	4.843
	UK	4.268[a]	0.227	3.812	4.723
I_like_IKEA_IG	KWT	4.080[a]	0.254	3.571	4.589
	UK	4.045[a]	0.276	3.493	4.598
I_prefer_no_additional_design	KWT	2.520[a]	0.375	1.767	3.273
	UK	4.062[a]	0.408	3.244	4.880

a. Covariates appearing in the model are evaluated at the following values: Gender = 1.57, Age = 1.92, Province = 2.03, Ethnicity = 1.46, Religion = 1.52, Education = 3.70, Occupation = 2.10, Organisation = 2.08.

Table Y4. Group Estimates– Dependent Variables.

						95% Confidence Interval for Difference[b]	
Dependent Variable			**Mean Difference (I-J)**	**Std. Error**	**Sig.[b]**	**Lower Bound**	**Upper Bound**
Like_IKEA_Furniture	KWT	UK	0.156	0.407	0.704	-0.660	0.972
	UK	KWT	-0.156	0.407	0.704	-0.972	0.660
I_like_IKEA_IG	KWT	UK	0.034	0.493	0.945	-0.955	1.024
	UK	KWT	-0.034	0.493	0.945	-1.024	0.955
I_prefer_no_additional_design	KWT	UK	-1.542*	0.730	**0.039**	-3.006	-0.078
	UK	KWT	1.542*	0.730	**0.039**	0.078	3.006

Based on estimated marginal means
*. The mean difference is significant at the
b. Adjustment for multiple comparisons: Bonferroni.

Table Y5. Post-hoc Analysis.

Appendix Z: Top PDs in Relation to Demographics

Demographic data is investigated in connection to each of the top IKEA-IG PDs (using Linear Model ANOVA) within each of IKEA, IG and LIKE constructs from the MSQ and the ESQs; mean standard deviation results are based on a Likert scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree:

Main Study:

	Gender			
	Male (N=162)	**Female (N=217)**	**Total (N=379)**	**p value**
IKEA_13_37				0.768[1]
Mean (SD)	3.2 (1.2)	3.2 (1.2)	3.2 (1.2)	
IKEA_17_49				0.239[1]
Mean (SD)	3.0 (1.3)	2.9 (1.3)	2.9 (1.3)	
IKEA_20_58				0.992[1]
Mean (SD)	3.0 (1.3)	3.1 (1.3)	3.1 (1.3)	
IKEA_26_76				0.307[1]
Mean (SD)	3.3 (1.2)	3.2 (1.2)	3.2 (1.2)	
LIKE_13_39				0.632[1]
Mean (SD)	3.7 (1.0)	3.7 (1.1)	3.7 (1.0)	
LIKE_17_51				0.876[1]
Mean (SD)	3.6 (1.2)	3.6 (1.2)	3.6 (1.2)	
LIKE_20_60				0.381[1]
Mean (SD)	3.7 (1.1)	3.6 (1.2)	3.7 (1.2)	
LIKE_26_78				0.786[1]
Mean (SD)	3.5 (1.1)	3.6 (1.1)	3.6 (1.1)	
IG_13_38				0.042[1]
Mean (SD)	3.5 (1.1)	3.7 (1.1)	3.6 (1.1)	
IG_17_50				0.003[1]
Mean (SD)	3.6 (1.1)	4.0 (1.0)	3.8 (1.1)	
IG_20_59				0.953[1]
Mean (SD)	4.0 (0.9)	4.0 (1.0)	4.0 (1.0)	
IG_26_77				0.005[1]
Mean (SD)	3.5 (1.1)	3.8 (1.0)	3.6 (1.1)	

Table Z1. MSQ – Top PDs and Gender Demographic.

	Age					
	Less than 29 (N=155)	**30 - 39 (N=112)**	**40 - 49 (N=76)**	**≥ 50 (N=36)**	**Total (N=379)**	**p value**
IKEA_13_37						0.263[1]
Mean (SD)	3.1 (1.2)	3.4 (1.1)	3.1 (1.3)	3.2 (0.9)	3.2 (1.2)	
IKEA_17_49						0.673[1]
Mean (SD)	2.9 (1.3)	3.0 (1.4)	2.8 (1.3)	2.8 (1.1)	2.9 (1.3)	
IKEA_20_58						0.028[1]
Mean (SD)	3.2 (1.3)	3.1 (1.3)	2.9 (1.3)	2.6 (1.0)	3.1 (1.3)	
IKEA_26_76						0.173[1]
Mean (SD)	3.3 (1.2)	3.2 (1.2)	3.2 (1.3)	2.8 (0.8)	3.2 (1.2)	
LIKE_13_39						0.036[1]
Mean (SD)	3.6 (1.1)	3.6 (1.1)	3.9 (0.9)	4.1 (0.8)	3.7 (1.0)	
LIKE_17_51						0.021[1]
Mean (SD)	3.5 (1.2)	3.5 (1.3)	3.9 (1.1)	4.1 (1.0)	3.6 (1.2)	
LIKE_20_60						0.020[1]
Mean (SD)	3.7 (1.2)	3.4 (1.2)	3.8 (1.1)	4.1 (1.0)	3.7 (1.2)	
LIKE_26_78						0.038[1]
Mean (SD)	3.5 (1.2)	3.4 (1.2)	3.8 (0.9)	3.9 (0.9)	3.6 (1.1)	
IG_13_38						0.158[1]
Mean (SD)	3.5 (1.1)	3.6 (1.0)	3.6 (1.2)	4.0 (0.8)	3.6 (1.1)	
IG_17_50						0.130[1]
Mean (SD)	3.7 (1.1)	3.8 (1.0)	3.8 (1.2)	4.2 (0.7)	3.8 (1.1)	
IG_20_59						0.251[1]
Mean (SD)	4.0 (1.0)	4.0 (1.0)	4.2 (1.0)	4.2 (0.9)	4.0 (1.0)	
IG_26_77						0.075[1]
Mean (SD)	3.6 (1.1)	3.5 (1.1)	3.7 (1.0)	4.0 (0.9)	3.6 (1.1)	

Table Z2. MSQ – Top PDs and Age Demographic.

	Province							
	Capital (N=141)	**Hawalli (N=94)**	**Farwania (N=50)**	**Ahmadi (N=46)**	**Jahra (N=14)**	**Mubarak Al-Kabeer (N=34)**	**Total (N=379)**	**p value**
IKEA_13_37								0.031[1]
Mean (SD)	3.0 (1.1)	3.2 (1.1)	3.4 (1.2)	3.6 (1.2)	3.4 (1.3)	3.4 (1.1)	3.2 (1.2)	
IKEA_17_49								< 0.001[1]
Mean (SD)	2.5 (1.2)	3.2 (1.2)	3.2 (1.4)	3.3 (1.3)	2.8 (1.3)	2.9 (1.3)	2.9 (1.3)	
IKEA_20_58								< 0.001[1]
Mean (SD)	2.6 (1.2)	3.4 (1.2)	3.2 (1.5)	3.5 (1.3)	2.9 (1.3)	2.9 (1.4)	3.1 (1.3)	

IKEA_26_76								0.086[1]
Mean (SD)	3.0 (1.2)	3.4 (1.1)	3.3 (1.4)	3.5 (1.3)	3.3 (1.4)	3.2 (1.0)	3.2 (1.2)	
LIKE_13_39								0.561[1]
Mean (SD)	3.8 (0.9)	3.5 (1.1)	3.7 (1.0)	3.8 (1.1)	3.7 (1.3)	3.8 (1.0)	3.7 (1.0)	
LIKE_17_51								0.747[1]
Mean (SD)	3.6 (1.1)	3.7 (1.1)	3.6 (1.3)	3.8 (1.3)	3.4 (1.3)	3.7 (1.2)	3.6 (1.2)	
LIKE_20_60								0.710[1]
Mean (SD)	3.7 (1.1)	3.7 (1.1)	3.6 (1.3)	3.7 (1.3)	3.3 (1.4)	3.6 (1.1)	3.7 (1.2)	
LIKE_26_78								0.129[1]
Mean (SD)	3.7 (1.1)	3.5 (1.1)	3.4 (1.2)	3.8 (1.1)	3.0 (1.5)	3.5 (0.9)	3.6 (1.1)	
IG_13_38								0.011[1]
Mean (SD)	3.7 (1.0)	3.6 (1.0)	3.3 (1.3)	3.9 (0.9)	2.9 (1.3)	3.5 (1.0)	3.6 (1.1)	
IG_17_50								0.011[1]
Mean (SD)	4.0 (1.0)	3.7 (1.1)	3.5 (1.3)	4.1 (0.8)	3.5 (0.9)	3.7 (0.9)	3.8 (1.1)	
IG_20_59								0.003[1]
Mean (SD)	4.2 (0.9)	4.0 (1.0)	3.6 (1.2)	4.0 (0.9)	3.7 (1.3)	4.2 (0.7)	4.0 (1.0)	
IG_26_77								0.814[1]
Mean (SD)	3.7 (1.1)	3.7 (1.1)	3.5 (1.0)	3.7 (1.0)	3.7 (1.3)	3.5 (1.1)	3.6 (1.1)	

Table Z3. MSQ – Top PDs and Province Demographic.

	Ethnicity			
	Arabian (N=265)	**Non-Arabian (N=114)**	**Total (N=379)**	**p value**
IKEA_13_37				0.031[1]
Mean (SD)	3.1 (1.2)	3.4 (1.2)	3.2 (1.2)	
IKEA_17_49				< 0.001[1]
Mean (SD)	2.7 (1.2)	3.4 (1.3)	2.9 (1.3)	
IKEA_20_58				< 0.001[1]
Mean (SD)	2.8 (1.3)	3.6 (1.2)	3.1 (1.3)	
IKEA_26_76				0.002[1]
Mean (SD)	3.1 (1.2)	3.5 (1.2)	3.2 (1.2)	
LIKE_13_39				0.487[1]
Mean (SD)	3.7 (1.0)	3.6 (1.1)	3.7 (1.0)	
LIKE_17_51				0.298[1]
Mean (SD)	3.6 (1.2)	3.7 (1.2)	3.6 (1.2)	
LIKE_20_60				0.487[1]
Mean (SD)	3.7 (1.1)	3.7 (1.2)	3.7 (1.2)	
LIKE_26_78				0.394[1]
Mean (SD)	3.6 (1.1)	3.5 (1.2)	3.6 (1.1)	
IG_13_38				0.502[1]
Mean (SD)	3.6 (1.1)	3.5 (1.1)	3.6 (1.1)	
IG_17_50				0.049[1]
Mean (SD)	3.9 (1.0)	3.6 (1.1)	3.8 (1.1)	

IG_20_59				0.001[1]
Mean (SD)	4.1 (0.9)	3.8 (1.1)	4.0 (1.0)	
IG_26_77				0.464[1]
Mean (SD)	3.7 (1.1)	3.6 (1.0)	3.6 (1.1)	

Table Z4. MSQ – Top PDs and Province Demographic.

	Education						
	Below High School (N=9)	**High School (N=64)**	**Diploma (N=74)**	**Bachelor (N=176)**	**Higher Ed. (N=56)**	**Total (N=379)**	**p value**
IKEA_13_37							0.849[1]
Mean (SD)	3.1 (1.4)	3.1 (1.3)	3.3 (1.2)	3.2 (1.1)	3.2 (1.3)	3.2 (1.2)	
IKEA_17_49							0.031[1]
Mean (SD)	2.7 (1.7)	2.9 (1.4)	3.3 (1.4)	2.8 (1.2)	2.9 (1.3)	2.9 (1.3)	
IKEA_20_58							0.026[1]
Mean (SD)	2.9 (1.2)	3.4 (1.3)	3.1 (1.4)	2.8 (1.2)	3.3 (1.4)	3.1 (1.3)	
IKEA_26_76							0.123[1]
Mean (SD)	3.2 (1.4)	3.4 (1.3)	3.4 (1.2)	3.0 (1.2)	3.4 (1.2)	3.2 (1.2)	
LIKE_13_39							0.599[1]
Mean (SD)	3.7 (1.6)	3.5 (1.2)	3.6 (1.0)	3.8 (1.0)	3.8 (0.9)	3.7 (1.0)	
LIKE_17_51							0.887[1]
Mean (SD)	3.9 (1.3)	3.7 (1.2)	3.6 (1.2)	3.6 (1.2)	3.7 (1.1)	3.6 (1.2)	
LIKE_20_60							0.852[1]
Mean (SD)	3.8 (1.6)	3.8 (1.0)	3.6 (1.2)	3.6 (1.1)	3.6 (1.3)	3.7 (1.2)	
LIKE_26_78							0.452[1]
Mean (SD)	3.2 (1.4)	3.6 (1.3)	3.5 (1.1)	3.5 (1.1)	3.8 (1.1)	3.6 (1.1)	
IG_13_38							0.691[1]
Mean (SD)	3.1 (1.3)	3.6 (1.0)	3.6 (0.9)	3.6 (1.1)	3.6 (1.1)	3.6 (1.1)	
IG_17_50							0.871[1]
Mean (SD)	3.6 (1.4)	3.7 (1.2)	3.9 (0.9)	3.8 (1.1)	3.9 (1.0)	3.8 (1.1)	
IG_20_59							0.369[1]
Mean (SD)	3.4 (1.2)	4.0 (0.9)	4.0 (1.0)	4.1 (0.9)	4.0 (1.0)	4.0 (1.0)	
IG_26_77							0.812[1]
Mean (SD)	3.6 (0.5)	3.7 (1.1)	3.7 (1.0)	3.6 (1.1)	3.7 (1.1)	3.6 (1.1)	

Table Z5. MSQ – Top PDs and Education Demographic.

	Occupation					
	Student (N=103)	**Employ (N=213)**	**Retired (N=32)**	**Other (N=31)**	**Total (N=379)**	**p value**
IKEA_13_37						0.536[1]
Mean (SD)	3.1 (1.2)	3.2 (1.2)	3.3 (0.9)	3.5 (1.4)	3.2 (1.2)	
IKEA_17_49						0.406[1]
Mean (SD)	2.8 (1.3)	3.0 (1.3)	2.8 (1.0)	3.2 (1.4)	2.9 (1.3)	

IKEA_20_58						0.011[1]
Mean (SD)	3.3 (1.3)	2.9 (1.3)	2.7 (1.1)	3.5 (1.4)	3.1 (1.3)	
IKEA_26_76						0.491[1]
Mean (SD)	3.3 (1.3)	3.2 (1.2)	3.0 (1.1)	3.2 (1.4)	3.2 (1.2)	
LIKE_13_39						0.133[1]
Mean (SD)	3.6 (1.1)	3.6 (1.0)	4.0 (0.9)	3.9 (1.1)	3.7 (1.0)	
LIKE_17_51						0.386[1]
Mean (SD)	3.5 (1.2)	3.6 (1.2)	3.9 (1.0)	3.8 (1.2)	3.6 (1.2)	
LIKE_20_60						0.150[1]
Mean (SD)	3.8 (1.0)	3.6 (1.2)	4.0 (1.0)	3.5 (1.3)	3.7 (1.2)	
LIKE_26_78						0.555[1]
Mean (SD)	3.6 (1.2)	3.5 (1.2)	3.8 (1.0)	3.6 (1.0)	3.6 (1.1)	
IG_13_38						0.067[1]
Mean (SD)	3.5 (1.1)	3.5 (1.0)	4.0 (0.9)	3.8 (1.0)	3.6 (1.1)	
IG_17_50						0.208[1]
Mean (SD)	3.7 (1.1)	3.8 (1.1)	4.2 (0.8)	3.9 (0.8)	3.8 (1.1)	
IG_20_59						0.635[1]
Mean (SD)	4.0 (0.9)	4.0 (1.0)	4.2 (0.9)	3.9 (0.9)	4.0 (1.0)	
IG_26_77						0.270[1]
Mean (SD)	3.7 (1.0)	3.5 (1.1)	3.8 (1.0)	3.8 (0.9)	3.6 (1.1)	

Table Z6. MSQ – Top PDs and Occupation Demographic.

	Organisation					
	Public Sector (N=162)	**Private Sector (N=87)**	**Other (N=57)**	**Not Applicable (N=73)**	**Total (N=379)**	**p value**
IKEA_13_37						0.352[1]
Mean (SD)	3.2 (1.1)	3.2 (1.2)	3.4 (1.1)	3.0 (1.2)	3.2 (1.2)	
IKEA_17_49						< 0.001[1]
Mean (SD)	2.8 (1.2)	3.2 (1.3)	3.4 (1.4)	2.5 (1.3)	2.9 (1.3)	
IKEA_20_58						0.007[1]
Mean (SD)	2.8 (1.2)	3.1 (1.3)	3.5 (1.4)	3.2 (1.3)	3.1 (1.3)	
IKEA_26_76						0.476[1]
Mean (SD)	3.1 (1.1)	3.3 (1.2)	3.4 (1.3)	3.2 (1.3)	3.2 (1.2)	
LIKE_13_39						0.221[1]
Mean (SD)	3.8 (1.0)	3.5 (1.1)	3.8 (1.0)	3.6 (1.2)	3.7 (1.0)	
LIKE_17_51						0.584[1]
Mean (SD)	3.7 (1.2)	3.6 (1.2)	3.6 (1.2)	3.5 (1.2)	3.6 (1.2)	
LIKE_20_60						0.497[1]
Mean (SD)	3.8 (1.1)	3.6 (1.3)	3.6 (1.2)	3.7 (1.1)	3.7 (1.2)	
LIKE_26_78						0.513[1]
Mean (SD)	3.6 (1.1)	3.4 (1.1)	3.6 (1.2)	3.6 (1.2)	3.6 (1.1)	
IG_13_38						0.184[1]
Mean (SD)	3.7 (1.0)	3.4 (1.0)	3.5 (1.0)	3.6 (1.1)	3.6 (1.1)	

IG_17_50						0.462[1]
Mean (SD)	3.9 (1.1)	3.8 (1.1)	3.7 (0.9)	3.7 (1.2)	3.8 (1.1)	
IG_20_59						0.349[1]
Mean (SD)	4.1 (0.9)	4.0 (1.1)	3.9 (0.8)	4.0 (1.0)	4.0 (1.0)	
IG_26_77						0.704[1]
Mean (SD)	3.7 (1.1)	3.5 (1.1)	3.7 (0.9)	3.6 (1.1)	3.6 (1.1)	

Table Z7. MSQ – Top PDs and Organisation Demographic.

Evaluative Study:

	Group			
	KWT (N=33)	**UK (N=30)**	**Total (N=63)**	**p value**
IKEA_13_7				0.716[1]
Mean (SD)	3.0 (1.2)	2.9 (1.1)	2.9 (1.1)	
IKEA_17_16				0.311[1]
Mean (SD)	2.2 (1.2)	2.5 (1.0)	2.3 (1.1)	
IKEA_20_22				0.843[1]
Mean (SD)	2.8 (1.2)	2.7 (1.1)	2.7 (1.1)	
IKEA_26_34				0.816[1]
Mean (SD)	3.0 (1.2)	3.1 (1.1)	3.0 (1.1)	
LIKE_13_9				0.066[1]
Mean (SD)	4.5 (0.8)	4.1 (0.7)	4.3 (0.8)	
LIKE_17_18				0.112[1]
Mean (SD)	4.3 (1.0)	3.9 (0.8)	4.1 (0.9)	
LIKE_20_24				**0.010[1]**
Mean (SD)	4.3 (1.0)	3.7 (1.0)	4.0 (1.0)	
LIKE_26_36				0.722[1]
Mean (SD)	4.3 (0.8)	4.2 (0.7)	4.3 (0.8)	
IG_13_8				**0.018[1]**
Mean (SD)	4.6 (0.6)	4.2 (0.6)	4.4 (0.6)	
IG_17_17				**0.005[1]**
Mean (SD)	4.5 (0.7)	4.0 (0.7)	4.3 (0.7)	
IG_20_23				**0.001[1]**
Mean (SD)	4.5 (0.7)	4.0 (0.7)	4.3 (0.7)	
IG_26_35				0.270[1]
Mean (SD)	4.2 (0.7)	4.1 (0.6)	4.2 (0.6)	

Table Z8. ESQ – Top PDs and Group.

Appendix AA: Initial Table-Panel Experimental Designs

Initial design study model investigations exploring table-panel size, attachments and pattern design implementation. From illustrative and gesture model design explorations, a first-generation table-panel production stage took place using an industrial CNC machine to test PD outcomes on MDF in different wood thicknesses, engraving styles and size fitting for the IKEA LACK side table.

- Initial Table-Panel Experimental Model.
    - Foam-board table gesture using magnetic strip connections for table-panel sample attachments – single and double-panel implementation.

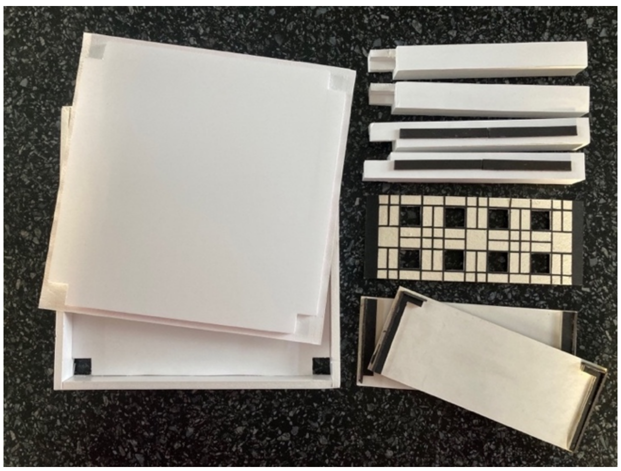


Table and Table-Panel Parts.

Magnet-strips on table-legs for table-panels to click onto.

One-Panel Attachment.

Two-Panel Attachment.

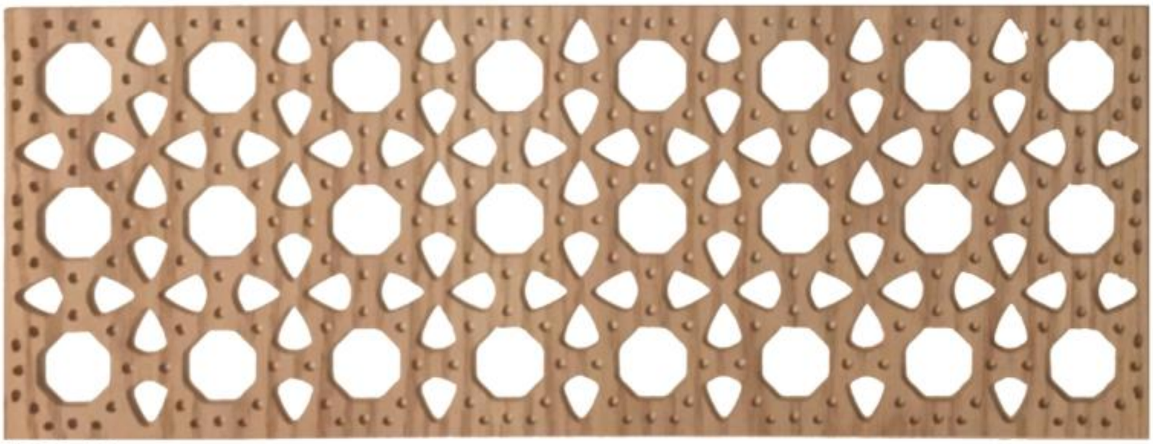
Table-Panel Demo.

- First Generation Table-Panel Production Stage.
    - CNC machine table-panel engraving exploration using straight-line and curved-line pattern designs; installed onto an IKEA LACK side table.
    - Wood Type: MDF board (available in 3mm, 5, 8, 11, and 18mm).

Original IKEA LACK side table.

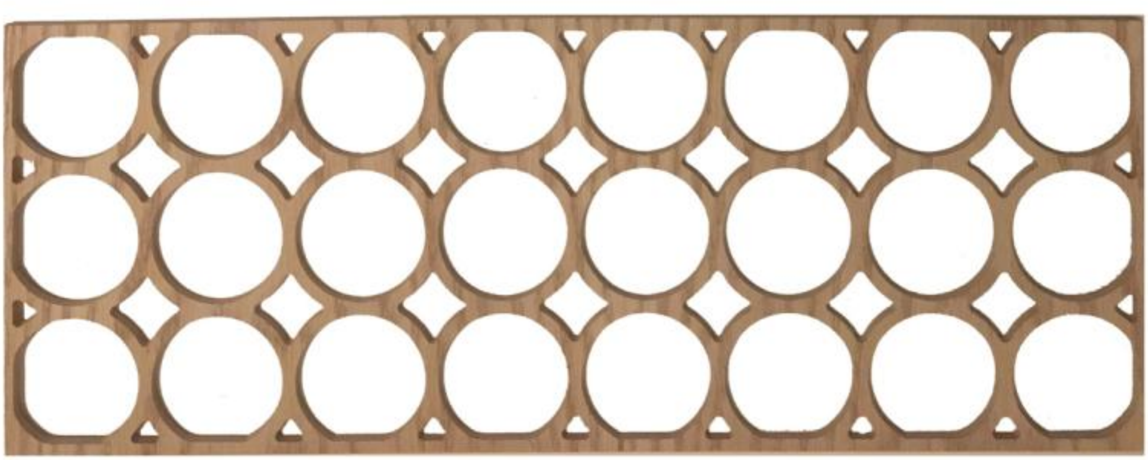
Appendix BB: IKEA-IG Style Table-Panel Prototypes

Table-panel prototype artifacts were assembled and displayed in IKEA stores; the table-panels were designed and installed to fit the IKEA LACK side table.

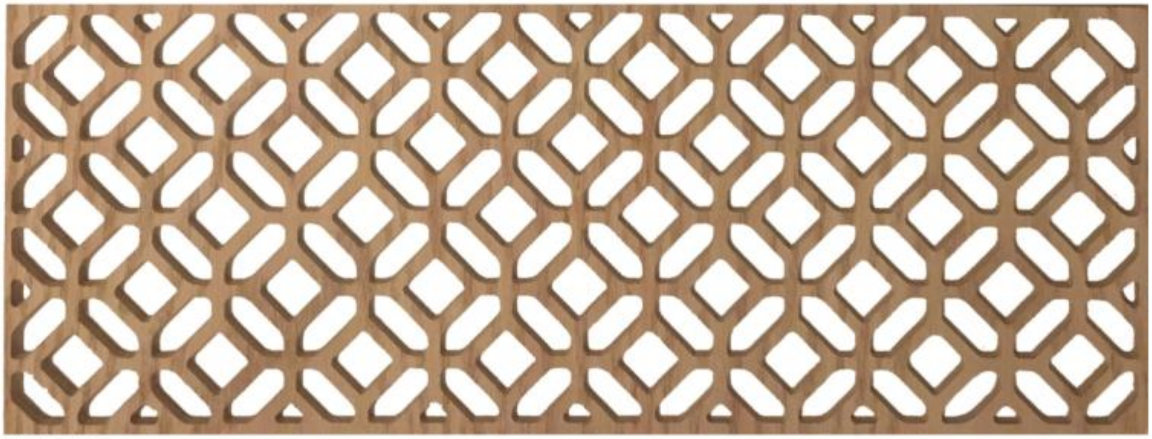


TP PD 16

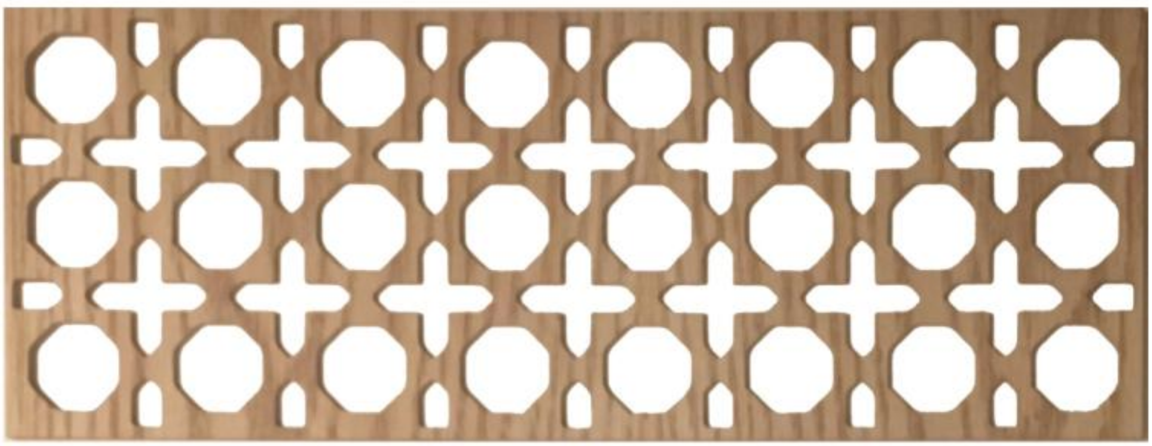
TP PD 12



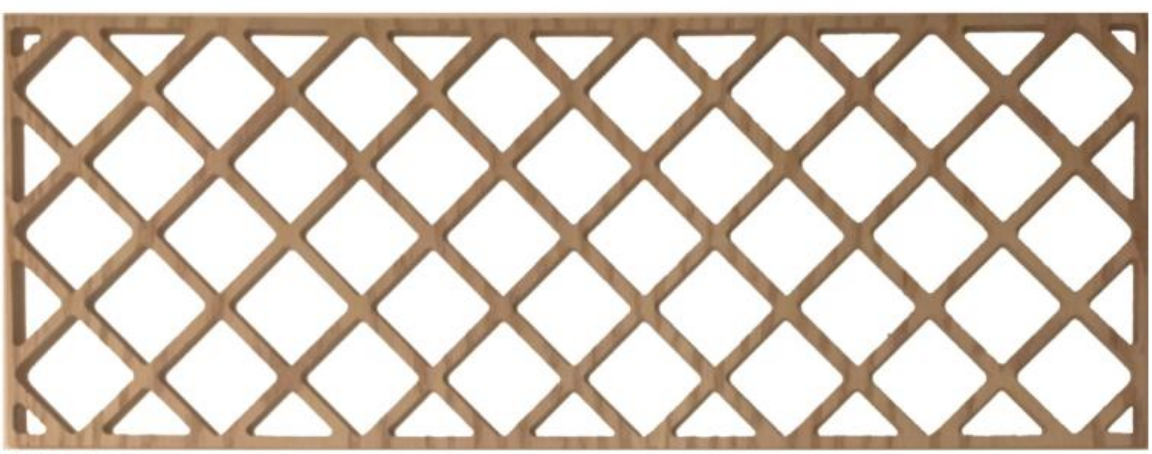
TP PD 11



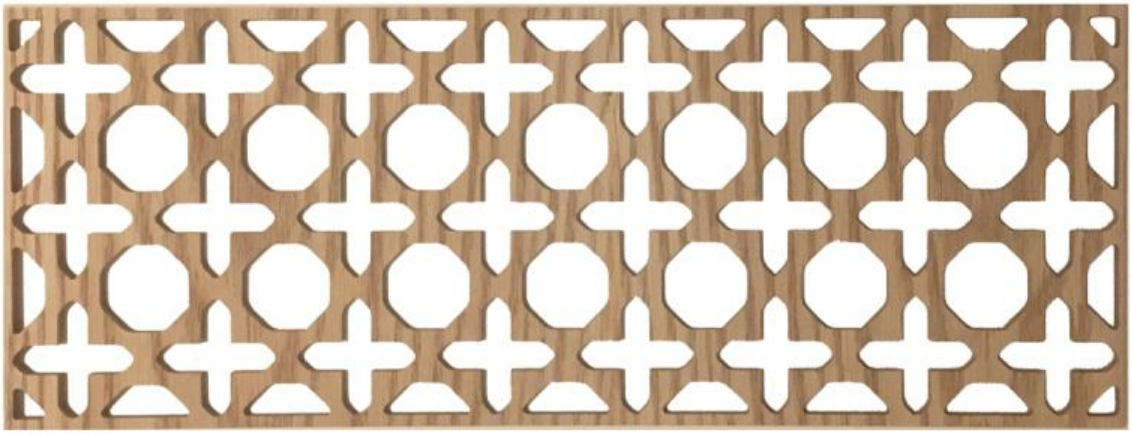
TP PD 26

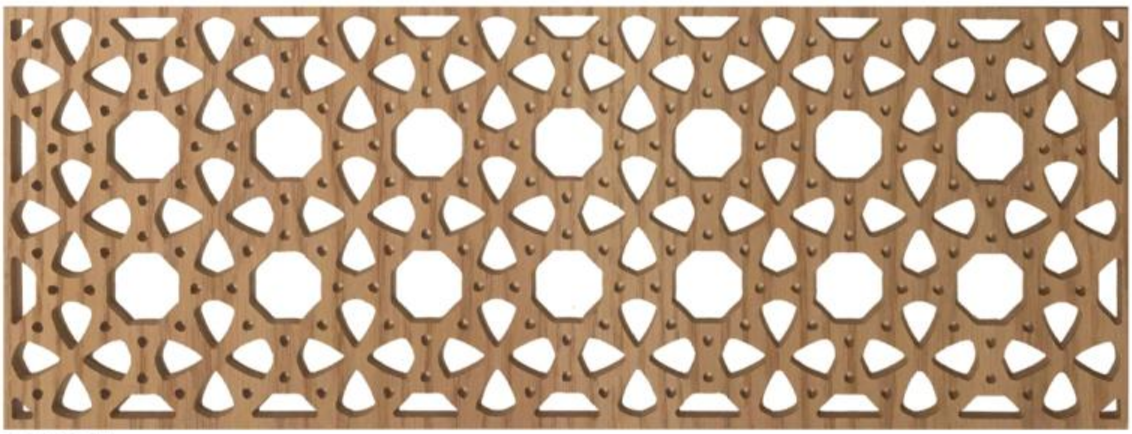


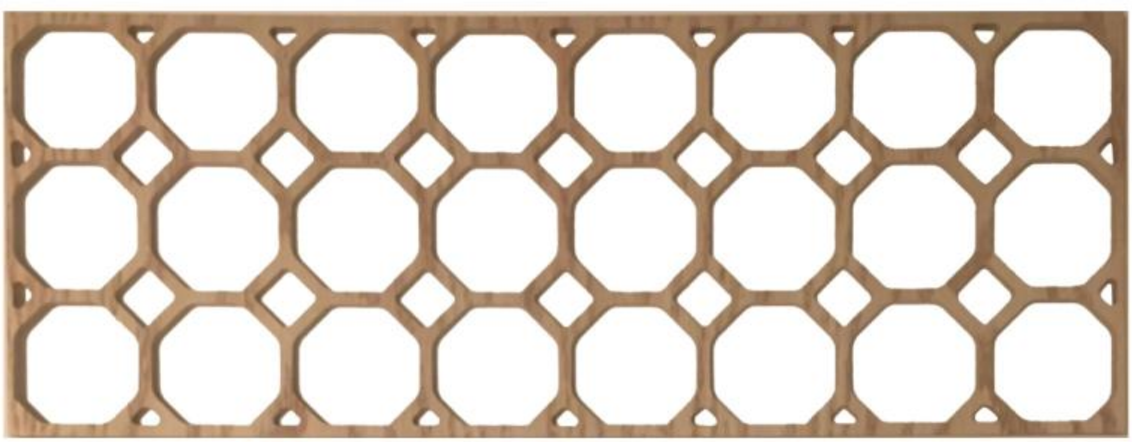
TP PD 20

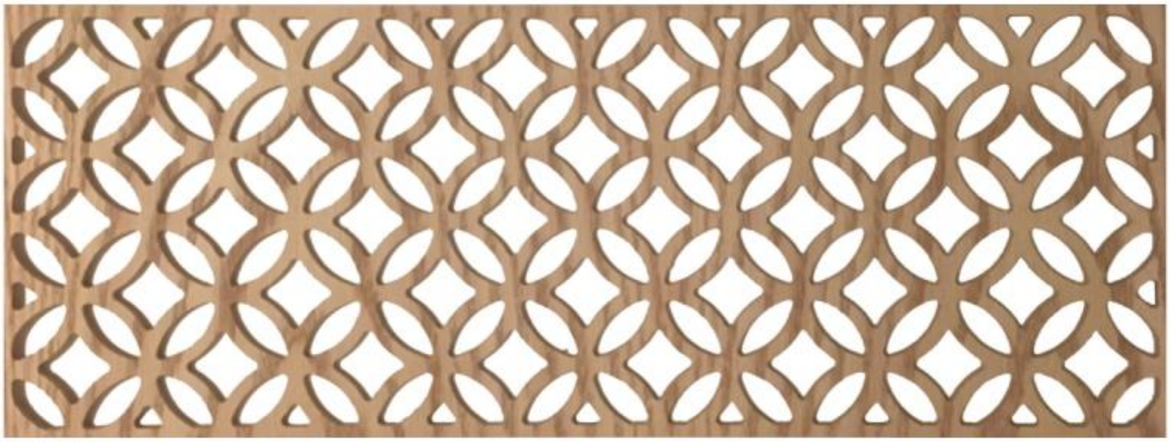


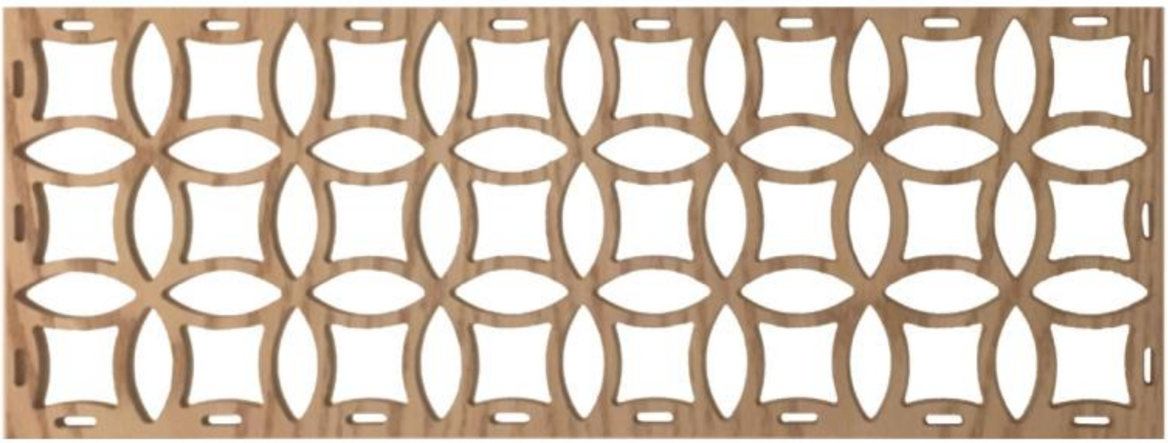
TP PD 19

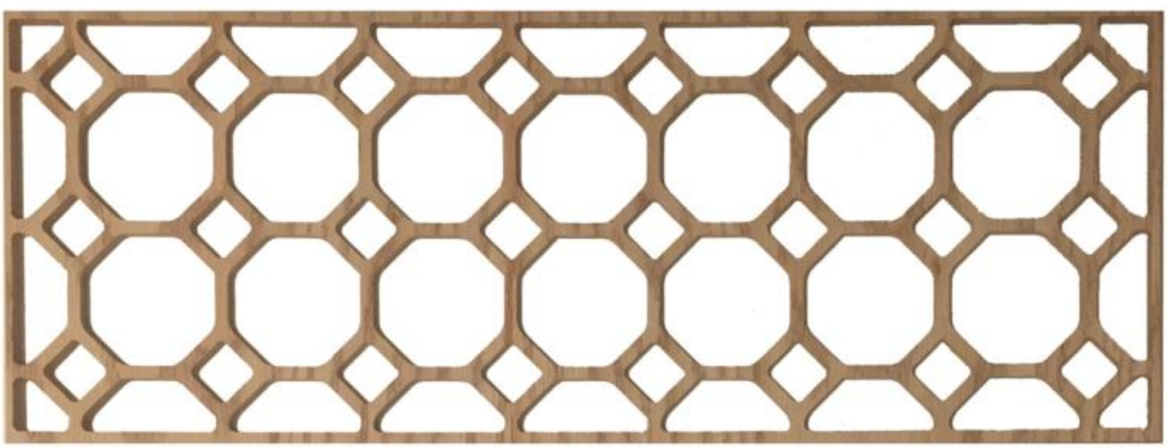

TP PD 21


TP PD 17


TP PD 24


TP PD 13


TP PD 14


TP PD 25

Appendix CC: Request for Project Approval from IKEA

These documents were presented to the IKEA store managers for permission to conduct the evaluative case study questionnaire inside the IKEA stores. The documents give a brief description of the research purpose and aim with an example of the proposal.

Bournemouth University

Faculty of Science & Technology

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Faculty of Science and Technology
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30th January 2020

To whom it may concern,

Re. Maria Alainati

I am writing (as her PhD Supervisor) to confirm that Maria Alainati is a PhD student in the Faculty of Science and Technology at Bournemouth University; and, that her PhD research involves a study of the IKEA style.

Yours faithfully,

Bob Eves

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To Whom It May Concern,

I am an interior design research student from Bournemouth University in the UK working on a design study involving IKEA. With its Worldwide success, IKEA's affordable to all flat-pack furniture supply is engaging with more cultural diversities as times progress.

Part of my study is to create designs complimenting IKEA's style (while adding cultural aspects), and to see if IKEA customers would engage in the design creations. This study entails a quick questionnaire to your customers towards their preference to the designs; the design creations pertain specifically to the IKEA LACK side-table. The questionnaire takes no more than 3 minutes to complete, asking the customers if they like the designs. The intended number of participants is 30 customers. This task should take no more than two hours of display time to complete.

I am aiming to conduct this project in both IKEA Kuwait and IKEA Southampton, UK, to compare result outcomes. I have already met with Alan Bowbanks, Local Marketing Manager of IKEA Southampton, and is looking forward to visiting IKEA Kuwait for conducting this questionnaire. Kindly, I am requesting if it is possible to conduct my project in the very near future as I am planning to travel to IKEA Kuwait soon. It would be my honor to meet the store manager, Mr. Al-Humaidhi and discuss further project detail if required, and for his permission.

Thank you and I look forward to meeting you and the team.
Kindest Regards,
Maryam Alainati
i7611340@bournemouth.ac.uk

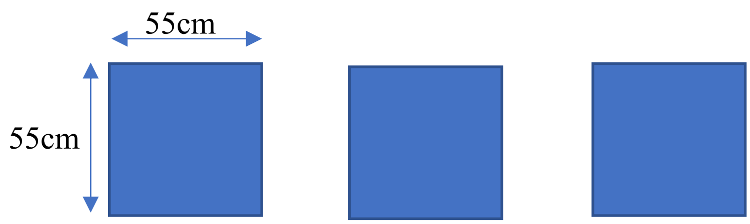
IKEA LACK side-table

Presentation Layout:

The study entails 12 table-panel prototype attachments designed specifically to fit the IKEA LACK table. To display all 12 panels, 3 LACK tables are used to present the artifacts and measure their style in a survey questionnaire to participants familiar to the IKEA style, therefore, IKEA customers.

Space requested to conduct the questionnaire:

- A maximum of 3 LACK side-table widths for table-panel attachment



IKEA LACK side-table dimensions:
55cm x 55cm

- 3 tables for display each holding 4 table-panels for the 12 designs to be tested, as well as an original LACK table with no prototype attachments.
    - Original IKEA LACK side-table –

    - Table-panel attachment examples –

لي من يهمه الامر،

أنا طالبة من جامعة بورنموث في المملكة المتحدة وباحثة في مجال التصميم الداخلي. أقوم بعمل دراسة تشتمل على أثاث ايكيا، حيث تم اختيار إيكيا بسبب النجاح الذي حققته في جميع أنحاء العالم. فالإضافة إلى بأسعارها معقولة لجميع لوازم الأثاث المسطحة تستمر إيكيا على مر السنين على العمل على زيادة التنوع الثقافي كذلك لديها.

جزء من دراستي هو تطوير تصاميم مقاربة لنوعية تصاميم ايكيا (بالإضافة إلى الجوانب الثقافية)، بهدف التوصل فيما إذا كان عملاء ايكيا سيشاركون في إبداعات تلك التصميم. فهذه الدراسة تنطوي على استبيان سريع لعملائك لمعرفة مدى تفضيلهم لتصاميم معينه تتعلق خاصة بشكل الطاولة الجانبية لـ .IKEA LACK علماً بأن هذا الاستبيان لا يستغرق أكثر من 3 دقائق لإكماله ، حيث يسأل العملاء عما إذا كانوا يحبون التصاميم أم لا. ويكتفى بعدد 30 من المشاركين ولا تستغرق هذه المهمة أكثر من ساعتين من وقت العرض.

أتطلع لتطبيق هذه الدراسة في كل من إيكيا فرع الكويت وإيكيا فرع ساوثهابتون في المملكة المتحدة بغرض مقارنة النتائج. ولحد الآن استطعت مقابلة Alan Bowbanks وهو مدير التسويق المحلي في وإيكيا فرع ساوثهابتون، كما أنني أتطلع إلى زيارة إيكيا فرع الكويت لإجراء هذا الاستبيان. وعليه أتطلع في المستقبل القريب بإجراء بحثي لديكم في إيكيا وبعد اخذ الإذن فإنه ليشرفني لقاء مدير المتجر السيد الحميضي لمناقشة تفاصيل الاستبيان إذا لزم الأمر.

شكراً لكم ، وأتطلع إلى لقائكم مع الفريق.
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مريم العييناتي
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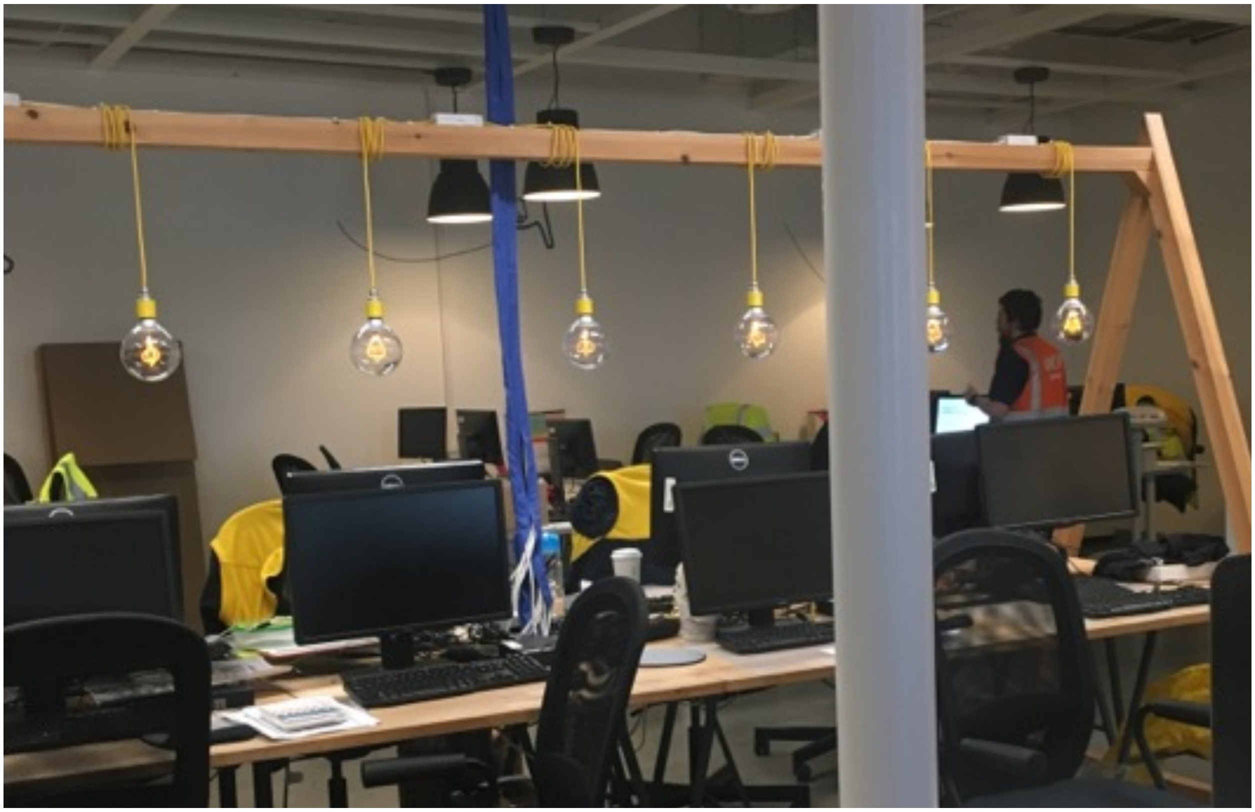
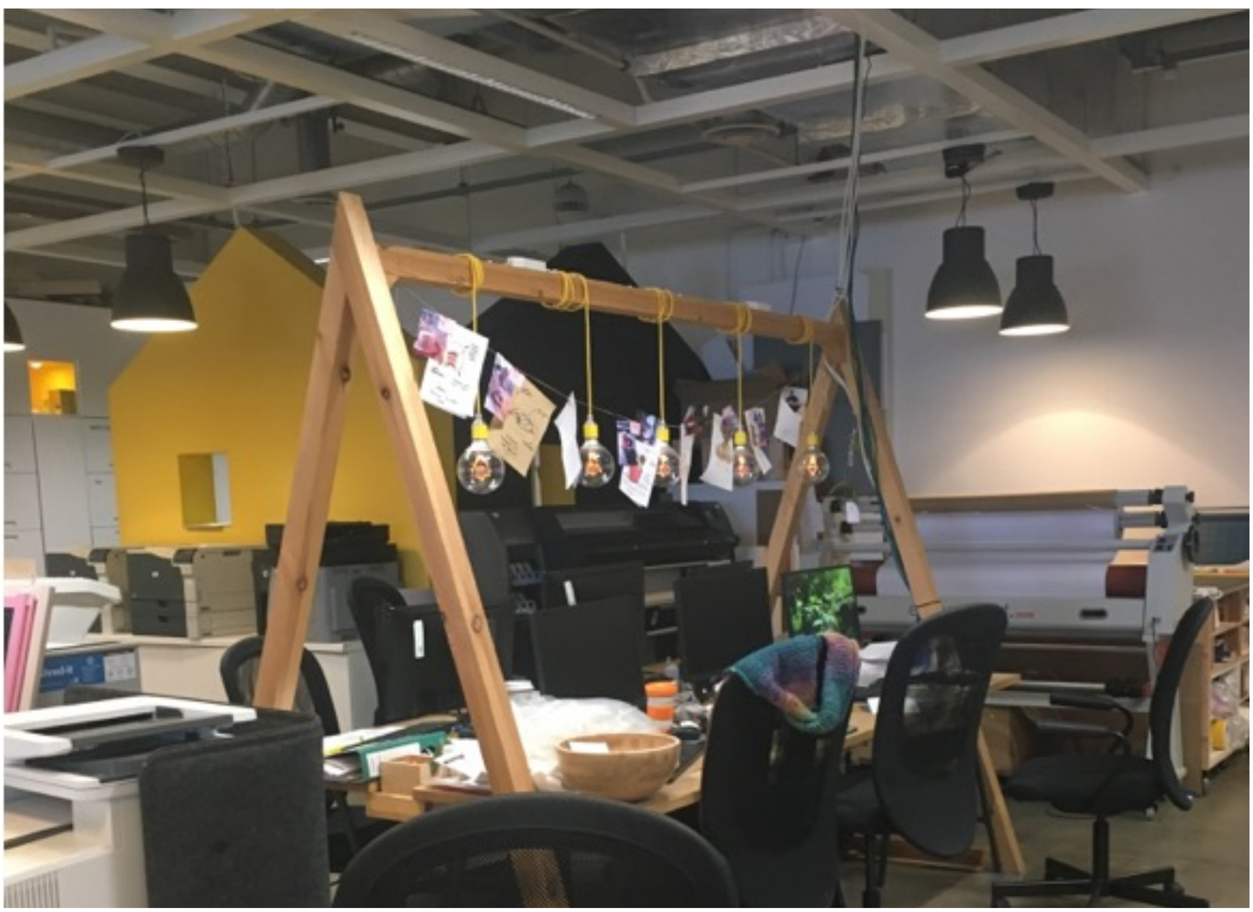
IKEA LACK طاولة جانبية

Appendix DD: Showcasing the IKEA-IG Table-Panels in IKEA

In gaining acceptance, approval, and access from both the IKEA Kuwait and IKEA Southampton stores, the IKEA-IG style table-panel prototypes were installed to fit the IKEA LACK side table and displayed for participant evaluation and preference.

- ‘The IKEA team’ workstations.





- ‘Creation Hub’ – Assemblage area for the IKEA-IG table-panel installations.

<u>IKEA Store – Kuwait, Middle-East:</u>

- One of the participants taking part in the survey.


Living room
SHOP
ONLINE

IKEA Store – Southampton, UK:


Side table
LACK
£6

Appendix EE: Shadow Casting IKEA-IG Table-Panels

The final IKEA-IG style PD outcomes from all three studies of this research are displayed; PD 13, 17, 20 and 26. These PDs are found to be the most preferred and representative of the cultural art of IG and the contemporary style of IKEA.

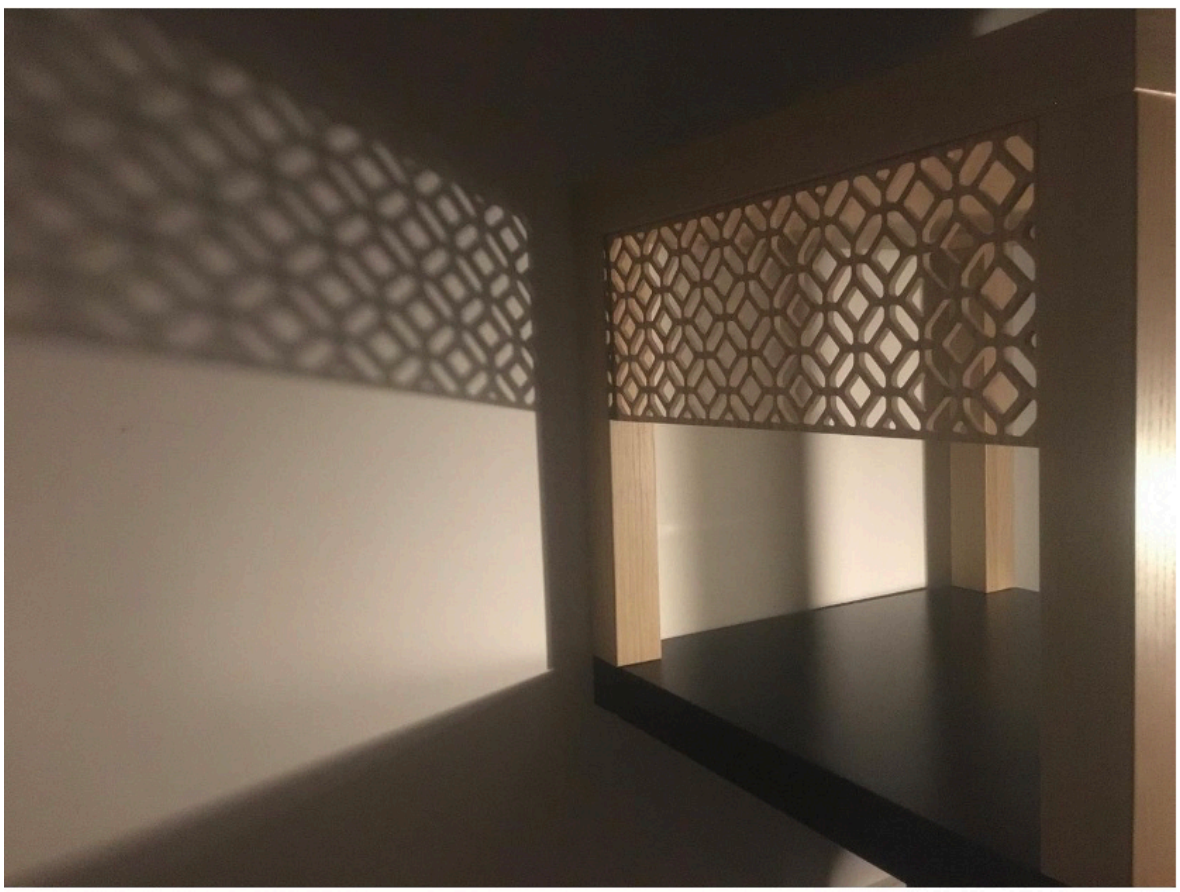

PD 13


PD 17


PD 20


PD 26





Appendix FF: IKEA-IG Table-Panels on IKEA's LACK Table

Images taken by the researcher of some table-panel installations onto the IKEA LACK side-table. Images demonstrate one and two panel applications, layering, PD arrangements and close-ups.

- IKEA-IG Style Table-Panel.

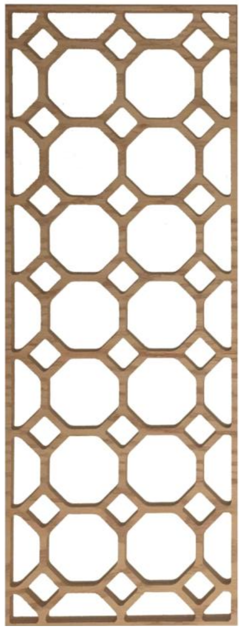
- One-Layer Panels

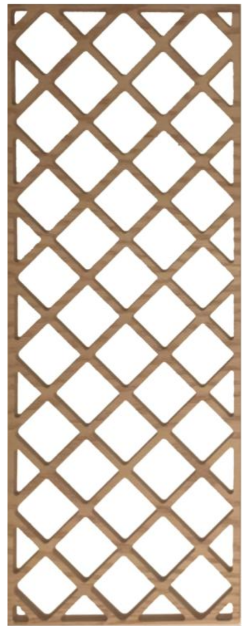
- Two-Layer Panels

- One-Panel Applications

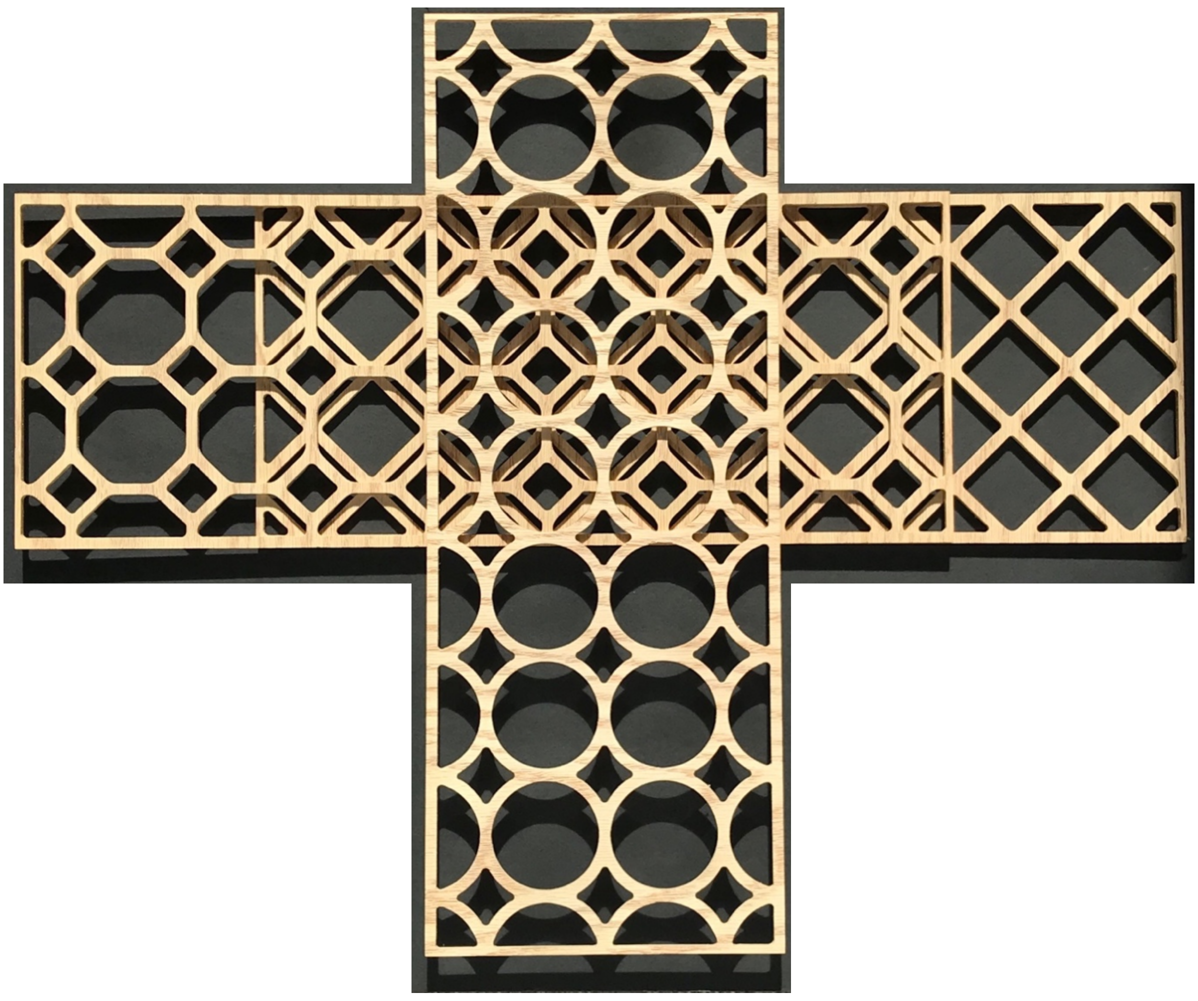
- Two-Panel Applications

- One and Two-Panel Applications


- Octagon


- Diamond


- Circle



- Panel-Layering PD Combination

- Different PD Table-Panel Attachments.