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Complex Building Construction Projects: Reducing Rework through Facilitation of Craftspeople's Motivation in United Arab Emirates

By

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Declaration

I hereby declare that this thesis has not been submitted or published in whole or partially to any other university for the award of a degree. It is submitted to this university under the condition that anyone who consults it is understood to recognise that it is copyright bounded and needs to fully give acknowledgement whenever any portion of this thesis is being used.

Signature

Abdelrahim Al Zanati

Dedication

This research study has been dedicated to my loved ones: my wife, children, family and friends.

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Abstract

Most construction projects are dominated by schedule and cost overruns. Rework is a major cause, with craftspeople's behaviour vital to its occurrence. In response to this issue, this study explores reducing rework through facilitation of craftspeople's motivation. Notably, in the United Arab Emirates (UAE) construction context, quality management (QM) within the contractor's work domain are hindered by lack of commitment and motivation by top management, which in turn hinders the quality mind-set of craftspeople. Likewise rework reduction models (RRM), which analyse the causes of rework at project level, have not been implemented effectively. Lack of motivation stems from resistance to change, shortage of expertise and lack of standardisation at the construction site. Many motivation theories lack empirical evidence to understand craftspeople's motivation over the construction lifecycle. For this reason, self-determination theory (SDT) was conceptualised as a human motivation theory that will give insight in this area.

Using a qualitative exploratory case study, factors influencing craftspeople's motivation within the UAE's local attributes of work environment, culture and management style were explored across three cases. The researcher collected data using semi-structured interviews and documentary sources. Data analysis was done via thematic analysis. Using cross-case synthesis, the researcher identified common themes responsible for craftspeople's motivation which influences a project's level of rework. The researcher adopted a systems thinking approach to deal with the dynamic nature of those themes so as to understand the causes and effects of elements interacting with one another within the building construction system. The causal loop diagram (CLD) depicts the craftspeople's perceptions and experiences of their motivation in relation to the issue of rework. The resulting driving factors of those themes formed from the feedback mechanism were diverse work experience, quality and number of supervision, on-time payment, communication difficulty, on-site training, work acceleration, long working hours, and contracting by worker.

Synthesis of theoretical concepts through CLD outcomes facilitated understanding and interpretation of craftspeople's motivation influencing the project's level of rework. This was validated using documentary analysis of the relevant project's information on the cause of rework.

The findings revealed the regulation of craftspeople's motivation, in relation to rework, as identified, introjected or external, according to self-determination theory. Identified regulation promotes autonomous motivation, which facilitates positive outcomes on project performance, whereas introjected and external regulation promotes a controlled motivation which impacts project performance negatively. The study showed that the motivation types were mediated by how well the basic psychological needs for competence, autonomy and relatedness had been satisfied. For this reason, a motivational rework reduction model was developed using the theory (SDT) initially designed by (Deci and Ryan 2000). It is expected that utilisation of this model by practitioners and site managers would reduce the project's level of rework by facilitating craftspeople's motivation in building construction projects.

Chapter 1.0: Introduction

This chapter provides an overview of the study. It begins with the background of the study, highlighting the role of craftspeople's motivation, particularly that of migrant workers, and its association with the occurrence of rework in building construction projects. The study's significance in the United Arab Emirates (UAE) building construction context is explained in terms of its economic importance. There follows a statement of the problem as it affects the UAE construction industry. The research gap in the literature with respect to UAE construction is outlined, together with the resulting research questions and sub-questions. A final section provides an overview by presenting the structure of the thesis.

1.1 Background

The construction industry has been one of the most vibrant sectors, and its economic importance is significant worldwide, across both developed and developing countries. According to the Office of National Statistics (ONS 2018), the construction sector contributes almost 90 billion pounds to the UK economy in value added, equivalent to about 10% of total UK employment and 6.5% of annual Gross Domestic Product (GDP). Similarly, the Bank for International Settlements [BIS] (2018) noted that the UAE construction and building sector contributes 8.4% of GDP. Moreover, it is reported that the UAE construction and building sector accounts for 22.1% of their workforce (BIS 2018). In developing nations such as Nigeria, construction projects account for nothing less than 16% GDP (Bilau et al. 2015). On average, at a global level, construction records roughly 11-13% of global GDP, which is forecast to grow to as much as 15% by 2020, whereas a formal sector workforce accounts for 5-10% in most countries (Schilling 2015). Thus construction is to be seen not merely as a significant component of the global economy, but as one of the largest employers worldwide (Bosch and Philips 2003; Martin 2009).

Despite the enormous contribution of the construction industry to the economy of many nations, the construction sector is challenged by schedule delay and cost overrun in its design and implementation phases (Kennedy et al. 2011; Davies and Mackenzie 2012; Johnson and Babu 2018; Ramabhadran 2018). Time and cost overrun are frequently and unceasingly faced in construction projects irrespective of size, nature and complexity (Faridi and El-Sayegh 2006; Ren

et al. 2008). These are major factors when reporting project performance (Li et al. 2011; Aftab et al. 2012). Among several reports on causes of time and cost overruns in construction projects, it has been documented that rework is a substantial cause of time and cost overruns in construction projects (Construction Industry Development Authority [CIDA] 1993; Love et al. 2011; Li et al. 2011; Ajayi and Oyeyipo 2015; Enshassi et al. 2017).

The UAE construction industry is not an exception with regard to time and cost overruns (Johnson and Babu 2018). The building sector is particularly noted for complexity, due to its fragmented, high-risk and multiparty business nature (Alarcon and Mesa 2012). Despite its complex nature, Architecture, Engineering, Consulting, Operations, and Maintenance [AECOM] (2018) noted that construction contract awards for 2018 in the Gulf Cooperation Council (GCC) states (i.e. Saudi Arabia, Bahrain, Oman, Qatar, Kuwait, and the United Arab Emirates) would be dominated by building projects, followed by energy and infrastructure projects. The building project awards were anticipated to be worth USD 79.1 billion, 53 percent of overall construction awards in 2018 and 10 percent higher than awards in 2017 (Venture Onsite 2019) This illustrates the region's importance in relation to rework in construction projects (Love and Smith 2019). The UAE has been noted to possess the highest number of building construction projects (Ali and Beheiry 2015; Bhatti et al. 2018). Since the impact of rework is substantial with respect to time and cost overruns, there is a call to investigate this in the UAE (Ramabhadran 2018).

A couple of studies that examined rework identified factors such as poor productivity, insufficient early planning, delayed completion, and lack of skilled resources and motivation (Ramabhadran 2018) as its main causes. Jarkas (2015a) noted that local practices, industry culture and contextual agreements have significant influence on the incidence of rework; nevertheless, he observed that motivation played a major role in its occurrence. Barg et al. (2014) suggested that worker motivation is necessary for optimal performance in the construction industry. Love et al. (2016a) recognised that reducing rework demands greater attention to changing behaviour, particularly the motivation of team members.

Generally, in the Arab states popularly referred to as the GCC local population sizes are small (Hamza 2015). Expansive development plans, financed through oil wealth, have attracted a rapid

influx of migrant workers to meet the labour demand. As a result, the UAE construction industry is known for its varied culture and diverse traditional backgrounds. A sponsorship system emerged following this influx, and has played a central role in rapid economic development in the GCC states, particularly the UAE.

The UAE labour market is made up of 110 nationalities. Its characteristics include the sponsorship system, hot weather conditions, limited living facilities for workers, and prolonged family separation (Ailabouni et al. 2009; Hamza 2015). Such factors impact on the motivation of craftspeople working in building construction projects. Ailabouni et al. (2009) noted that the sponsorship system involves an employee restriction to change jobs; and cancellation of the workmen category visa invites a six month ban from employment in the UAE. In addition, craftspeople are subject to various combinatory factors such as different management styles, language barriers, cultures, customs and late payment of salaries, which affect their work quality performance (Ailabouni et al. 2009).

UAE building construction projects are expected to increase in the coming years, especially in the two major cities, Dubai and Abu Dhabi, which dominate the UAE construction market (Flanders 2016) together with events such as Dubai World Expo 2020. Reducing the impact of rework through facilitating craftspeople's motivation within the UAE's local attributes, such as work environment, culture and management style, will impact positively on time and cost overruns, thereby improving the economy.

1.2 Significance of the Research

This study investigates the problem of rework in building construction projects from the perspective of craftspeople's motivation. Studies have revealed that challenges encountered with projects are caused not by deficiencies in methodology or poorly constructed schedule methods, but rather by the people involved in the project (Wong 2007; Steyn 2009; Orando 2013). Motivation of people is central to performance (Taylor 2015), but little has been done to investigate craftspeople's motivation in relation to the occurrence of rework in building construction projects.

Craftspeople in the construction sector are said to account for nothing less than 40% of direct capital cost in large construction projects (Kazaz et al. 2008), and they contribute significantly towards determining the outcome of construction projects (Hickson and Ellis 2014; Bilau et al. 2015). The Human Resources and Skills Development Resources Canada [HRSDC] (2009) define craftspeople as workers skilled in building. Working mostly on construction sites, they engage in site preparation, cleanup, concrete and masonry work, steel, wood and pre-cast erecting projects. They handle materials and equipment, and perform demolition, excavation and compaction activities. They are responsible for their labour team, site security and final work quality. In 2013, out of a total world migrant population of 9.2 million people, UAE migrants accounted for 7.8 million, making them the fifth-largest international migrant stock in the world. The UAE had approximately 80% of migrant residents, who made up a staggering 90% of the workforce (Human Rights Watch [HRW] 2015; Sonmez et al. 2011). On arrival, migrant craftspeople found themselves in debt to employers with wages too low (between US $175 and $220 a month) to manage re-payments (HRW 2012). Craftspeople were exposed to long hours of work (up to 12 hours per day with one day's holiday per week), during times of extreme heat, with very few breaks (HRW 2009).

In a previous study, Ren et al. (2008) noted that Dubai construction projects faced unique challenges due to diverse cultures, complex demands concerning style and quality, workforce shortage, and involvement of world-wide teams; this made the causes of delay and cost overrun different from other countries. The growing cost of rework (Love and Li 2000b; Love and Smith 2019), and unique peculiarities of the UAE construction environment, indicate a need to explore the influence of craftspeople's motivation with respect to rework. Building construction projects in the UAE construction industry were chosen for this investigation. The ability to improve project performance in a multi-cultural and multi-national environment such as the UAE will mean that a positive breakthrough has been achieved.

1.3 Statement of Problem

The UAE's construction market is booming. This is particularly true of building construction projects, which had the highest value of construction contract awards in 2018 with USD 37.3 billion across the GCC region (AECOM 2018). Projects in the UAE are known to be large and complex, requiring a lot of coordination and synchronisation between various special trades and services (Ramabhadran 2018).

The building sector is generally recognised as complex, due to its fragmented, high-risk and multiparty business nature (Alarcon and Mesa 2012). The complex nature of projects requires additional effort and thinking beyond the normal greenfield sites (Mouchi et al. 2011). While there are various definitions of complexity (Custovic 2015; Pich et al. 2002; Remington et al. 2009; Vidal and Marle 2008; Ward and Chapman 2003), complexity in this study is define as a project demonstrating a number of characteristics to a degree or level that is difficult to predict the project outcomes as a result of the changing behaviours. Complex building projects involve interactions among individuals, organisations and agencies from diverse national backgrounds and cultural contexts. Their cultural problems are well-known, and include misunderstandings, increased transaction costs, friction between project participants and coordination and communication difficulties (Zhang and Liang 2008). Brockmann and Kahkonen (2014) noted that definitions of complexity represent two ends of a continuum: one which is highly abstract and flexible, and the other which is concrete and more rigid. Seeing complexity not only from a technical perspective - which has been represented as concrete and rigid - is a rather new topic (Antoniadis et al. 2012). A flexible and abstract position allows the incorporation of nontechnical perspectives such as social and cultural complexity. Complexity will be viewed from this perspective in relation to the phenomenon under investigation.

As viewed in this study, complexity is associated within the main contractors and the numbers of subcontracted craftspeople that the main contractor's manager has to deal with, to ensure their motivation aligns with the objectives and goals of the project. Multicultural factors are involved, together with numbers of non-conformance reports (NCRs) resulting from the associated mistakes, omission and errors, all of which impact on project performance. Construction projects are generally associated with large numbers and diverse workers.

Common to the Gulf countries, the UAE has over 110 nationalities, and significant numbers of them are involved in the construction industry. Thus, an implicit complexity in the form of social and cultural diversity emerges from the number and variety of actors communicating and working with each other. Their experience and sense-making processes vary significantly by virtue of their diversity. The construction site is a working place for humans and a place for cooperation and social interaction, which because of its temporary character, forms a highly transient human system. This aspect is often hidden by the fact that staff at the production facility, the construction site, are not hired and reimbursed by the place where they work. Their loyalty is divided between their own firm and the job at hand, often with the firm as the one with the highest priority. Traditional project management often overlooks this aspect and does not perceive the gangs on the sites as their own employees in the virtual firm which is formed by the project (Hannah and Gidado 2008). Just as nothing will happen without an engineer's effort to translate a great idea into some accurately calculated design, so too nothing will happen without the hard work of construction craftspeople to physically transform the design from paper to physical reality (Woo and Soetanto 2010). To achieve this, there is a great need to apply energy, direction, and persistence, all of which have been referred to as motivation (Deci and Ryan 2000). Thus craftspeople's motivation plays a vital role.

The importance of craftspeople in the UAE construction industry cannot be over-emphasised. They are a significant unit of human resources needed on construction project delivery (Kazaz and Ulubeyli 2007). Generally, the main contractors serve as management, handling up to 60% of construction activities through their manpower, and they employ sub-contractors through a contractual agreement to cover 40% of other construction works. The main contractor bears full responsibility for all activities executed on the construction site. Large numbers of construction workers are involved in the completion of projects. Some of the subcontractors carry out specialised tasks, such as electrical work, steel erection, painting and plumbing. Practically, a subcontractor who has a contractual relationship with the main contractor can supply workers, materials, equipment, tools, and designs (Arditi and Chotibhongs 2005; Eom et al. 2008). Mbachu (2008) recognises three categories of subcontractor. The first category consists of trade subcontractors, who are qualified in specific trades such as paintwork, brickwork, etc. The second category includes specialist subcontractors, who provide services such as electrical work,

plumbing, insulation etc. The third category is called labour-only subcontractors; these are skilled craftspeople (Polat and Damci 2014). The needs of the construction project generally determine the nature of the subcontractors employed. Nevertheless, the main contractor bears full responsibility for the works carried out by their subcontractors (Ulubeyli et al. 2010; Biruk et al. 2017; Ghoneim 2018).

The main contractor is responsible for managing challenging situations in the construction environment. They manage the interrelationships of the whole supply chain, which makes the project process very complex. Dealing with huge numbers of workers in the supply chain, and also the associated diversity of cultures, is usually a challenging experience for the contractor. Ruuska et al. (2009) recognised that large complex projects present unique challenges due to the following: 1) a complex project involves a dynamic network of organisations which manage the project's resources and the capabilities and knowledge of participating actors; and 2) a complex project involves the interaction of multi-dimensional views of parties, and their often conflicting objectives and expectations. Such challenges are not easily dealt with, resulting in lack of performance, and in some cases, project failure.

Cultural diversity, work environment and management style play an important part in construction projects in the UAE, due to the mix of nationalities. Culture presents a number of challenges in managing customs, lifestyles, demographics, educational levels, norms and values, different ways of thinking, communication, different decision-making processes, different backgrounds, predominant national or tribal characteristics, different languages and different attitudes toward social responsibility (Akanni et al. 2015; Luckmann and Farber 2016; Yusof and Iranmanesh 2017). Through interaction with the processes of cooperation and coordination, the political, institutional and social culture together affects management style and the speed of processes undertaken (Luckmann and Farber 2016; Naoum et al. 2015). Cultural factors need to be handled with the utmost care in order to overcome the challenges of time and cost overruns when completing projects (Akanni et al. 2015). Cultural diversity and management style presents a challenge in the UAE, especially when the project manager is more likely a foreigner than a UAE national.

According to Afolabi et al. (2016), craftspeople's position in the construction industry is central to achieving a high quality construction outcome. This is because construction activities and operations in the developing countries are still relatively low tech and labour intensive, unlike in developed economies such as the UK, USA and Germany, where operations on construction sites are highly mechanised (Bilau et al. 2015). To address issues confronting the UAE construction industry, there are quality management (QM) and rework reduction models (RRM) applications. However, their implementation in the UAE construction industry has faced challenges in relation to motivation, management commitment, empowerment and culture (Mehran 2016).

The main cause lies in human resources: rework increases with low operator ability, particularly at craftspeople's level. The UAE's migrant workforce is increasing tremendously, with many seeking to escape the poverty in their home countries. Buckley et al. (2016) noted that roughly 80% of the UAE's total population consisted of migrants, both high and low skilled. Evidence points to the fact that worker motivation is integral to the problem of rework (Josephson and Hammarlund 1999; Jarkas 2015b; Love et al. 2016b). This calls for an exploration of factors influencing craftspeople's motivation in relation to the rework phenomenon. However, variables and local attributes influencing rework differ from country to country. Local practices such as work environment, culture, and management style have a significant impact (Lim and Ling 2012; Barg et al. 2014; Jarkas 2015a; Brook and Spillane 2016; Oyewobi et al. 2016), and will be considered in this investigation.

1.4 Research Questions

As described earlier, there is a need to look into craftspeople's motivation to enhance their performance in the UAE construction industry, in the context of local practices such as work environment, culture, and management style in which they operate. The following research questions emerged:

1. Why would the understanding of craftspeople's motivation help to address the occurrence of rework in building construction projects?

Sub-Questions

a. What are the factors influencing craftspeople's motivation?
b. What kind of motivational driving factors affect the level of rework?
c. Why is it important to understand the types of craftspeople's motivation?
d. What is the impact of rework on project performance?

2. How can the facilitation of craftspeople's motivation enhance project performance?

1.5 Limitations

In the course of this study, building construction projects were found to be the most frequently awarded contracts, and to possess the highest economic value to the UAE economy. As a result, the study is limited to building construction projects in the UAE. The outcome cannot be generalised to the entire construction sector, as certain features of other construction projects, such as infrastructure, and special projects like energy, were not included in the selected cases. Moreover, methods of procurement in the UAE construction industry are essentially different. Thus it was expected that the outcome of the study's exploration with regard to the phenomenon under investigation would be limited to building construction projects in the UAE context.

A case study approach was adopted because of the depth of information needed to explore craftspeople's motivation in relation to the project's level of rework, but it is limited on the grounds of non-representativeness and lack of statistical generalisability. Nevertheless, an analytical generalisation is possible (Yin 2003b). Furthermore, the exploration centred on the construction stage, and dealt with contractors and subcontractors only. These considerations limit the possibility of generalisation across the civil construction industry to include projects such as infrastructure and energy construction.

Given the plethora of rework definitions in the literature, rework was considered through the lens of non-conformance (e.g. Abdul-Rahman 1993; CIDA 1995; Baiche et al. 2006), errors (e.g. Farrington 1987), quality deviation (e.g. Farrington 1987) and defects (Atkinson 2002). Terms

such as change orders requested by the client were excluded. This limiting area has been recommended in Chapter Seven as an area for future research.

1.6 Thesis Structure

This section presents an overview of the research topic. It looks at the background of the study, explains its significance, defines the problem statement, and the emerging research questions for the study. The research questions emerge as a result of the gap in the literature, presents the study's limitations, and concludes with the thesis structure.

Chapter Two provides a literature review of construction projects, and explores the importance and complexity of building construction projects. The UAE construction context, rework concept, challenges associated with achieving quality, and craftspeople's motivation in construction projects are all discussed.

Chapter Three introduces the theoretical framework, highlighting the types of motivation (i.e. intrinsic and extrinsic) and explaining their nature as it affects human behaviour. Self-determination theory (SDT) is used to explain human motivation, using two theoretical tools of SDT: basic psychological needs theory (BPNT) and organismic integration theory (OIT) as the basis of understanding.

Chapter Four defines the methodological approach adopted for the study, including an appropriate method chosen for answering the research questions. The data collection and analysis is discussed, using thematic analysis, causal loop diagram and documentary analysis as the data analysis approach.

Chapter Five presents the findings of the thematic analysis, using the theoretical framework to explain its relationship with craftspeople's motivation and its influence on the project's level of rework. The cross-case analysis is evaluated on the basis of local practices, with the causal loop diagram serving as an analytical tool to understand dynamic relations between craftspeople and factors affecting their motivation. The overall findings serve as the basis for development of a motivational model in this study.

Chapter Six discusses the findings which serve as the basis for answering the main research questions posed in this study.

Finally, Chapter Seven offers the concluding part of the study, and provides recommendations and areas for future research.

Chapter 2.0: Literature Review

This section provides a review of existing knowledge related to the topic. It starts with definitions of project as used in the construction industry, followed by the importance of construction projects and their various classifications. Complexity is explored, together with its constructs and its implications for construction management. The UAE's construction industry is reviewed in terms of its benefits, labour market, and implications. The concept of rework, with its definitions, categories, effects, impacts, and influencing factors, is explained. There follows an examination of quality and its associations in the construction industry, with a focus on the concept of quality management and its implications in the UAE. Motivation, and its definition in relation to the construction environment and factors influencing it, is explored. Lastly, there is a review of challenges in implementing quality, which is essential to improving rework outcomes. Thus the research questions were developed to understand how craftspeople's motivation impacts on rework.

2.1 Projects in the Construction Industry

There have been many different definitions of project. Turner and Muller (2003, p. 7) defined a project as " a temporary organization to which resources are assigned to undertake a unique, novel and transient endeavour managing the inherent uncertainty and need for integration in order to deliver beneficial objectives of change."On the other hand, Cardinal and Marle (2006, p. 227) noted that a project is "a transformation process, from an initial to an expected final situation, evolving in an often complex and changing environment".

Despite these differences in definition, project is seen as "a temporary endeavour undertaken to create a unique product, service, or result" (PMI 2013, p. 179); which reinforced that it is not a routine operation that has occurred in the past and will persist into the future without a definite end time. Although potentially full of risky and difficult activities, projects in the construction industry serves as an effective driver of economies (Ehsan et al. 2010; Ghahramanzadeh 2013; Hanna et al. 2013; Hwang et al. 2014 2017; Iqbal et al. 2015; Liu et al. 2016; Sambasivan et al. 2017).

2.1.1 Importance of Construction Projects

Construction projects are a major contributor to the economy of any nation, and add a significant percentage to the GDP of many countries. Globally, the construction sector impacts positively on the economy. It has recorded a revenue of 11% to 13% of GDP worldwide (Architecture, Engineering, Consulting, Operations [AECOM] 2017). In the developed world, for example, 11.3% of GDP was generated annually in the Canadian construction industry (Al-Emad and Nagapan 2015). In the UK economy, construction generates 6.5% of GDP annually (Office of National Statistics 2018). In an emerging economy like Qatar, the construction industry generates 9.8% of GDP annually (Al-Kharashi and Skitmore 2009) and in the United Arab Emirates the construction industry shares 11.1% of GDP annually (Dubai Chamber of Commerce [DCCI] 2018). In developing countries like Nigeria, construction accounts for 16% of GDP (Bilau et al. 2015).

2.1.2 Classifications of Construction Projects

The classification of construction projects is essential to addressing the challenges they face. Project classification schemes allow scholars and experts to analyse projects by grouping them according to similar characteristics. Due to the unique aspects of construction projects, it is difficult to classify the wide range of possible projects (Blayse and Manley 2004; Young et al. 2011). Nonetheless, several authors within the construction management field have developed modalities to make this happen. Table 2.1 illustrates an example of this.

Table 2. 1 Large Projects and their Associated Cost Overruns

Large Projects	**Location**	**Sector**	**Cost overrun %**	**Source**
Baku-Tbilisi-Ceyhan (BTC) Pipeline	Azerbaijan, Georgia, Turkey	Energy	85	(Sovacool and Cooper 2013)
Famanville 3 Nuclear Power Plant	France	Energy	81	(Locatelli and Mancini 2013)
London Olympic	UK	Construction	101	(Flyvbjerg and Stewart 2012)
Opera house Sydney	Australia	Construction	1600	(Flyvbjerg et al. 2003)
Channel tunnel	UK and France	Transport	80	(Flyvbjerg et al. 2003)

According to Construction Industry Institute [CII] (2014), classification of similar projects can enhance project effectiveness through consistent management of project portfolios. Venture Onsite (2019) reported three classes of construction project: building, infrastructure and energy. Buckley et al. (2016) explained that in many locales, construction markets tend to be divided into three broad sub-sectors: civil construction (e.g., roads and highways, water treatment plants, bridges etc.), industrial construction (e.g., oil and gas platforms, mining infrastructure) and residential and commercial construction (e.g., single-family dwellings, office buildings, condominium developments). According to the Office for National Statistics (2018), the construction industry is categorised into three broad areas:

- Construction of buildings includes residential, commercial, mixed use, airports, sport facilities, hotels and recreational facilities, healthcare, education facilities and industrial projects.
- Civil engineering includes roads, bridges, railways, ports, wastewater and sewerage.
- Specialised construction activities includes oil and gas, and power and water.

A construction project may involve any number of parties, but it usually entails the client (employer), contractor and consultant. Categories within a construction project may, in turn, include various specialists such as project managers/site managers, quantity surveyors, architects, engineers and craftspeople. Any of these may be involved at different phases of the project depending on the nature, type of procurement system and type of contract that has been adopted (Peckiene et al. 2013; Nasirzadeh et al. 2016). Researchers have recently begun to perceive the importance of craftspeople in construction projects, given that construction is a labour intensive as well as craft-based activity and the behaviour of people has a direct impact on the performance of construction projects (Lill 2008; Love and Smith 2019). People's behaviour also affects the three main parties defined in the construction sector. Nevertheless, large numbers of craftspeople are employed by the contractors (Lill 2008). The three main parties in the construction sector are as follows:

- Client: A legally responsible person who signs the construction contract and assigns its activities to contractors in accordance with the contract documents. Clients invest in and fund construction projects. The client's object is to have the project delivered on time, within budget, and fit for purpose.
- Contractor: A legally responsible person who, by signing the construction contract, takes on several responsibilities in the fulfilment of construction activities. Contractors undertake the work of constructing a building or any other type of construction. In addition, the contractor's objective under the contract is to make a profit.
- Consultant: A legally responsible person introduced to the contractor by the client in order to supervise the execution of the work with whatever authority is granted in the contract.

Consultants are hired to use their professional skills and experience to protect the client's interests. They advise the client on most aspects of the project, including design, budget and contracts. They must also manage their own risks and protect themselves from disputes or lawsuits due to defective advice or work (Ghahramanzadeh 2013; Nasirzadeh et al. 2016). Despite the fact that contractors are the legal individuals that sign contracts, a considerable percentage of construction activities are carried out by subcontractors (Yoke-Lian et al. 2012). Contractors have used subcontracting to allow for specialisation (Okunlola 2015). Subcontracting is beneficial to the contractors Construction Industry Development Board [CIBD] (2013), but its benefits, such as obtaining higher quality, improving cash flow, contractor development, sustainable business growth, and good environmental management, have been circumvented by the fact that contractors exploit subcontractors mainly to shift liability risks, resulting in reliance on complete contracts rather than cooperative relationships (Eriksson 2007).

Although there are three main parties in the construction sector, contractors normally face greater complexity than the client, since they employ the resources of a large scale engineering project directly. This will be enlarged on in the next section. Generally, construction projects will not operate without an existing construction procurement system. Safa et al. (2017) define a construction procurement system as the management of the entire project; it is thus associated with the delivery of the project. Different procurement systems vary in the way they allocate responsibilities, the order in which they sequence the activities, the organisational approach they

adopt, and the processes that they use in order to deliver the project. For this reason, the procurement system varies from one project to another, and clients may use different procurement systems for different aspects of the project. Morledge and Smith (2013) argue that a construction project's procurement system is mainly concerned with how people interact with each other and with their environment. That is, it takes into account the project's human aspect as well as its social, cultural and ethical aspects. Much depends, then, on how a project's responsibilities and risks are allocated to various parties through various procurement systems and how these various parties then cooperate. The range of procurement systems employed in the construction industry are classified into four main types: traditional, design and build, management contracting and construction management **(**Shrestha et al. 2012**).** These are discussed below.

• Traditional: These have three phases: design, bid and build. The client initiates the project, the consultant designs it and the contractor bids to carry out the actual construction.

• Design and build: In this type of procurement system, the contractor carries out both the design and the construction phases.

• Management contracting: In this system, the work is carried out by a group of subcontractors chosen through competitive bidding who are under contract to the main contractor (known as the management contractor).

• Construction management: Here, the project's planning, design and construction phases are carried out in an integrated fashion with the client, consultant and contractor working in unison (Al Mousli and El-Sayegh 2016; De Araujo et al. 2017; Naoum and Egbu 2015; Oladinrin et al. 2013; Pal et al., 2017; Yusof et al. 2016).

An important part of any construction procurement system is the process for selecting the best type of contract given the particular project and its size and objectives. The UAE largely adopts traditional, and design and build, forms of procurement. The UK and other developed nations employ additional procurement methods such as construction management and management contracting (Taylor Wessing 2016). The characteristics of each construction project will influence

the type of approach that is taken and how the project is managed. Sometimes there are many interdependent activities, each with its own time, cost, quality specifications and risks (Ali et al. 2015; Arditi et al. 2017; De Bakker, Boonstra and Wortman 2010; Elfaki et al. 2014; Gunhan and Arditi 2007; Meng 2012; Serrador and Turner 2015). As such, this study focus on investigating and identify the driving factors affecting craftspeople's motivation which impact on the level of rework and explore how facilitating their motivation in building construction projects can enhance better project performance. This requires improvement in quality, which will be investigated. However, complexity in construction projects is an overwhelming challenge in the construction industry.

2.2 Complexity in Construction Projects

Interaction of players within the construction field brings about complex interdependence, so that a decision made on one part of the project triggers events that may be unpredictable in other parts of it (Williams 2002). The result is that most construction projects face schedule delay and cost overrun in their design and construction phase (Thomas and Mengel 2008; Kennedy et al. 2011; Davies and Mackenzie 2012). The quality of construction products is usually at the receiving end, (Hopkin et al. 2014), resulting in rework.

The term "complex" is defined as "made up of many interconnecting parts", and complexity is defined as "the state or quality of being intricate or complex" (Wood and Gidado 2008). In line with Luhmannian systems theory, it is necessary to create systems in order to reduce complexity to a manageable degree. Construction projects are one type of system (Brockmann and Kahkonen 2014), but there is a need to draw system borders on the construction projects (e.g. building, civil or specialised projects such as energy). Bertelsen (2003) noted that construction is a complex system. He explains that the general view of the construction process is that it is an ordered, linear phenomenon, which can be organised, planned and managed top down. The frequent failures to complete construction projects on time and on schedule suggests the process may not be as predictable as it seems.

A closer examination reveals that construction is indeed a nonlinear, complex and dynamic phenomenon, which often exists on the edge of chaos (Wood and Gidado 2008). Sargut and McGrath (2011) identified complex systems in terms of multiplicity, interdependence and diversity, in which their outcomes are difficult to foresee. Complex systems display a variety of behaviour, including self-organisation, emerging properties and non-linear behaviour, and are often counter-intuitive (Bakhshi and Ireland 2016). As such, opportunities for external or top-down control are very limited (Helbing 2013). Given that numerous interactions are undertaken and project components do not follow simple causal relationships, complexity can be viewed as "the inability to predict the behaviour of a system due to large numbers of constituent parts within the system and dense relationships among them" (Sheard and Adviser-Mostashari 2012, p.11).

2.2.1 Construct dimensions of Complexity

Complexity is a term often used when discussing construction projects (Wood and Gidado 2008), although it is difficult to define, as there is no generally agreed definition among researchers (Ireland 2013; Brockmann and Kahkonen 2014; Bakhshi and Ireland 2016; San Cristobal et al. 2018). Time and cost overruns are frequently and unceasingly faced in construction projects irrespective of size, nature and complexity (Faridi and El-Sayegh 2006; Ren et al. 2008). It is believed that every project contains a degree of complexity (Bakhshi and Ireland 2016), and it is important to state clearly the type of complexity being dealt with (Wood and Gidado 2008).

Baccarini (1996) proposed a definition of project complexity as "consisting of many varied interrelated parts and can be operationalized in terms of differentiation and interdependency". Baccarrini explains the dimensions of complexity as comprising organisation, technology, environment, information, decision-making and systems. Based on interviews to gauge what experts in the building industry considered project complexity to be, a number of interrelated components emerged (Gidado 1996). Bosch-Rekveldt et al. (2011) conducted an online survey using the TOE framework (technical, organisational, and environmental) to determine the position of respondents about the nature of the complexity of the organisation in engineering projects. They concluded that project managers were more concerned with organisational complexity than with technical or environmental complexities. Vidal and Marle (2008) argued that approximately 70%

of the complexity factors of a project are organisational. This outcome is similar to that of Baccarini (1996), which showed that organisational complexity is influenced by differentiation and operative interdependencies.

Girmscheid and Brockmann (2008) introduced task, social and cultural complexity based on Wilke (2000). Task complexity combines technological and parts of organisational complexity, especially planning and organising. It excludes leadership which is part of social complexity. There can be little doubt that the number and diversity of stakeholders in a project, along with the strength of their impact (interests and power) (Chinyio and Olomolaiye 2010) increases complexity; this is termed "social complexity". The same holds true for the influence of culture on construction projects (Tijhuis and Fellows 2012; Kahkonen 2008). In all cultural studies the point is to show how much the stakeholders' cultural diversity influences project outcome. The more cultures meet in a project, the more complex it becomes since it requires coordination of an increasing number of different cognitive maps (Brockmann 2009); this is termed "cultural complexity" (Brockmann and Kahkonen 2014). The UAE construction environment presents a number of components similar to those described above. It comprises many nationalities from different backgrounds, with varying cultural diversities, who interrelate on the construction projects for a common goal.

2.2.2 Implications of Complexity

Construction projects are essentially multifaceted. Because of the challenges encountered during implementation, they can become complex (Maylor et al. 2008). According to Ochieng and Hughes (2013), it has become crucial that senior managers develop plans and standards with the purpose of managing complexity in the most efficient way throughout a project's life cycle. Researchers have documented time and cost overruns as the main issue for construction project performance (Johnson and Babu 2018), and reports have shown that many are caused by rework (Hwang et al. 2009; Love et al. 2011; Li et al. 2011). Due to the many sources and dimensions involved in complexity, it may be difficult to define which of its factors are the major contributors to rework.

Azim et al. (2010) identified direct links between project complexity and people. Alwi et al. (2001) noted that causes of rework related to people could be responsible for up to 60% of rework costs.

Liu (1999) states that complex construction projects are driven largely by human perceptual phenomena. Complexity in construction, in relation to human beings, rests on the fact they do not behave in a regimented or mechanistic manner; this creates a number of difficulties that are not apparent to project managers (Aina 2014). Social and cultural complexity can impact on people's motivation. Motivation of people is a complex phenomenon, because people can hold contrasting or opposing motives at the same time (Taylor 2015). In the construction industry, craftspeople occupy a sensitive position and are responsible for construction project delivery (Bilau et al. 2015; Abiodun and Segbenu 2017). Where skilled craftspeople are involved in construction projects, poor quality is generally eliminated as a concern (Medugu et al. 2011). Management of capital equipment/technology in construction operations may be complex, but it is fairly consistent and predictable. In contrast, human behaviour (Aina 2014), tends not to be predictable. It has been argued that the place of craftspeople in the construction industry is central, because a large percentage of quality hinges on their skill (Afolabi et al. 2016). In view of this, it is proposed that human perception has an influence on rework, and this impacts on project performance.

It would be unreasonable to suggest that all projects experience rework at the same level (Love and Smith 2019). Naturally, the levels of rework that occur in projects will vary significantly, as do cost and consequences (Love et al. 2018). In the study by Aljassmi and Han (2014), it was noted that rework cost resulting from defects in construction projects ranged from 2% to 6% of total contract value. Mills et al. (2009) claimed that rework in residential construction cost 4% of the contract value. This associated cost has been linked to the complex nature of the construction environment (Aljassmi and Han 2014). According to Alarcon and Mesa (2012), the building sector is a fragmented, complex, high-risk, and multiparty business. Due to the diverse nature of tasks associated with all the building systems, many types of craftspeople from many different trades are required in a building construction project. The large amount of craftspeople creates complexity which the contractors have to deal with for the clients (Brockmann and Christian 2007). For instance, they have to handle the activities of the subcontractors, and take responsibility for the overall activitiy of the project, despite an external imposition of time, cost and quality constraints. Since construction is a labour intensive as well as crafts-based activity, the behaviour of people has a direct impact on the performance of construction projects (Lill 2008). However, complexity management can be improved if the nature of complexity is identified and unnecessary

complexity decreased (Pennanen and Koskela 2005). An abstract approach (such as social and cultural complexity) to complexity will deal with nontechnical perspectives. To ensure quality, understanding the organisational context of factors influencing craftspeople's motivation within multiple system goals - for example, local practices such as work environment, culture and management style - is important if the project's level of rework is to be determined and subsequently reduced.

2.3 Construction in the UAE Context

The construction industry is one of the most important sectors of the UAE economy, making a significant contribution to development. It has experienced unprecedented growth in construction activities over the past four decades (El-Mallakh 2014; El-Sayegh 2014; Deloitte 2016). Its wider significance for the economy can be attributed to its products and services, which generate substantial economic benefits, including the buildings in which other businesses operate (UK Construction 2013). Projects in the UAE are large and complex, requiring a lot of coordination and synchronisation between various special trades and services (Ramabhadran 2018). Projects in the construction industry play a significant role in the structure of the UAE's economy, including healthcare, tourism, sport, education and hospitality (El-Mallakh 2014).

2.3.1 Economical Benefits of UAE Construction Projects

The UAE is the second largest economy among the GCC countries (after Saudi Arabia) (Deloitte 2016), and has the second largest value of construction output in the world as of 2015 (AECOM 2016). In 2015, the construction sector output represented about $8.4 trillion worldwide – comparable to China's GDP - and this number is expected to expand by 85 percent to $15.5 trillion in 2030, with China, India, and the United States accounting for up to 57 percent of this growth. Today 52 percent of construction activity is already in emerging markets (Andrieu et al. 2016). International events such as the upcoming World Expo Dubai 2020 which is expected to attract 25 million visitors and World Cup 2022 are also boosting the construction sector in the United Arab Emirates (UAE) and in Qatar specifically, with new development of hotels, residential, healthcare and transport infrastructure, and retail centres. As of May 2016, the pipeline of construction projects in the pre-execution stage in the GCC countries amounted to more than US$2 trillion,

with the UAE capturing around 34.84% of the total value of these projects (Deloitte 2016). This reflects decades of unprecedented construction boom in the GCC countries, including the UAE (Deloitte 2016). Moreover, the statistics published by Global Market Information Databases [GMID] (2015) demonstrate that over the period 2009 to 2015, the UAE's construction sector contributed about 11.1% to the country's GDP (Al Hasani 2018). This illustrates the importance of the UAE for economic development in the Middle East (Hasani et al. 2017).

Significantly, the construction sector is among the major indicators of economic development, which has improved over the last two years by approximately 7% (from 32% to 39%), according to Pinsent Masons' GCC Construction Survey (Venture Onsite 2019). Nevertheless, construction projects often experience cost and schedule overruns, and rework is a significant factor which contributes directly to these (Hwang et al. 2009, Ramabhadran 2018). The construction sector employs between 5-10% of the formal sector workforce in most countries, and should not be viewed merely as a significant component of the global economy, but as one of the largest employers worldwide (Bosch and Philips 2003; Martin 2009). In the UAE construction sector, nearly all workers are foreigners, and are usually categorised as migrant workers (Buckley et al. 2016). Most construction migrants tend to be concentrated in the emirates of Dubai, Abu Dhabi, Sharjah, and Ajman. Recently in the UAE, higher paid migrants in construction have been from Australia, Lebanon, Canada, India, the UK, Jordan, Syria and Egypt, while some low paid workers have been primarily from India, Pakistan, Bangladesh, Nepal, Sri Lanka, and the Philippines, though increasingly from Vietnam, China and other parts of South and East Asia (Buckley et al. 2016).

The UAE construction industry, being largely labour intensive and composed of culturally diverse teams, presents a social–cultural complex within the construction environment. Project complexity resulting from social and cultural complexity affects craftspeople's motivation, but can be greatly impacted by local practices such as work environment, culture, and management style (Lim and Ling 2012; Barg et al. 2014; Brook and Spillane 2016; Oyewobi et al. 2016). Jarkas (2015a) noted that local practices, industry culture and contextual agreements can definitely influence the incidence of rework. For instance, some studies identified problems in UAE construction projects as being associated largely with the main contractors and subcontractors' activities. Ujene et al.

(2011) recognised subcontractors as impacting the quality of projects in the Nigerian construction industry. Human factors are the driving force behind project success, because people generate the motivation and energy needed to execute projects successfully (Wong 2007). Thus it is generally accepted that construction workers can be motivated (Cox et al. 2006) to address certain construction project performance challenges such as rework. Despite the construction sector's contributions to the economy, its low performance is a world-wide phenomenon, since its projects are distinctive and dynamic in nature, constantly dealing with uncertainties and temporary teams from multi-lingual and multi-cultural backgrounds (Johnson and Babu 2018). Nevertheless, its economic importance has continued to drive construction activities all over the world. The UAE construction industry is the concern of this thesis.

2.3.2 UAE Labour Market and its Challenges

AECOM (2018) noted that construction contract awards for 2018 would be dominated by building projects, followed by energy and infrastructure projects. Building project awards were anticipated to be worth USD 79.1 billion, 53 percent of overall construction awards in 2018 and 10 percent higher than awards in 2017. It was further noted that the UAE would lead the building construction contract awards in 2018 with USD 37.3 billion. According to Faridi and El-Sayegh (2006), 'Dubai's key role in the recent expansion of construction activity in the Gulf is obvious: of the $50 billion estimated Gulf-wide building spends, 60% of that, about $30 billion, is in the UAE alone; and the majority of that is in Dubai'.

Construction labourers are naturally attracted by the extensive construction activities in the UAE. The increase in construction activities has resulted in the UAE being the favourite destination for many construction labourers ever since the birth of this country (Khan 2014). The UAE as a whole has been structurally reliant on large amounts of low-paid and non-citizen labour since the mid-20th century, and because construction work tends to be considered a low-status, difficult and low-paid occupation by most emiratis, the UAE's urbanisation agenda has required massive importation of migrant construction workers at the top and bottom of the occupational ladder (Buckley et al. 2016). The outcome of this agenda has not been without challenges in the industry, mostly in relation to rework that is influenced by human factors. Andersen et al. (2016) noted that

while human behaviour differs from individual to individual and from situation to situation, it remains possible to find an underlying coherence.

The UAE construction industry, being labour intensive and culturally diverse, represents a sociocultural complex within the construction environment. The project complexity resulting from social and cultural complexity affects the craftspeople's motivation, but can be greatly impacted by local practices such as work environment, culture, and management style (Lim and Ling 2012; Barg et al. 2014; Brook and Spillane 2016; Oyewobi et al. 2016). Jarkas (2015a) noted that local practices, industry culture and contextual agreements can definitely influence the incidence of rework. For instance, some studies identified problems in UAE construction projects as being associated largely with the main contractors and subcontractors. Human factors are the driving force behind project success, because people generate the motivation and energy needed to execute projects successfully (Wong 2007). Thus it is generally accepted that construction workers can be motivated (Cox et al. 2006) to address construction project performance challenges such as rework. Despite the construction sector's contribution to the economy, its low performance is a world-wide phenomenon, since its projects are distinctive and dynamic in nature, constantly dealing with uncertainties and temporary teams from multi-lingual and multi-cultural backgrounds (Johnson and Babu 2018), resulting in rework.

2.3.3 Rework Implications in the Construction Projects

According to Habibi et al. (2019), rework resulting from deviations in construction performance has become a universal phenomenon in the construction industry, mainly in developing countries, up to the point that more than half of the construction projects in the UAE postponed their substantial completion date. Major construction parties asserted that the main cause of delay in construction projects is rework (Heravi and Mohammadian 2017). Construction industry performance has always remained a matter of concern, and the UAE has not been an exception to this (Johnson and Babu 2018). Ramabhadran (2018) observed that the percentage cost of rework is substantial and needs to be investigated in UAE projects. Although causes of time and cost overruns associated with rework are common, they may vary according to the changing culture and practices followed within the country (Dolage and Rathnamali 2013).

Jin et al. (2013) observed that the construction industry is a business that largely centres on management of people. As such, more attention needs to be given to their motivation. Motivation is central to performance (Taylor 2015), which makes motivation an integral factor in rework occurrence in construction projects. Poor technical performance by a contractor is often linked to deficiencies in forecasting and management experience, which leads to rework throughout the construction phase of the project, escalating project cost (Frimponga et al. 2003; Shanmugapriya and Subramanian 2013; Sunjka and Jacob 2013).

2.4 Concept of Rework in Construction

The 1970s was the decade when ground-breaking research conducted by Pugh Roberts Associates, led by Cooper, developed what was known as the rework cycle (Cooper 1993) as shown in Figure 2.1. The model explains how rework occurs in projects by recognising that completed project tasks may be flawed, resulting in the need to undertake rework (Rahmandad and Hu 2010). Rework itself can be flawed, requiring further rework. This happens in a recursive cycle, extending the project's duration and workload far beyond what was originally planned. In the absence of a rework cycle, project completion is a function of the amount of work and scope to be accomplished, the available resources and their productivity (Rahmandad and Hu 2010). The model helps managers view a project as a flow, executed by people working at variable productivity, performing work that may need subsequent rework; the need may go undetected for some time (Adapted from Cooper and Lee 2009).

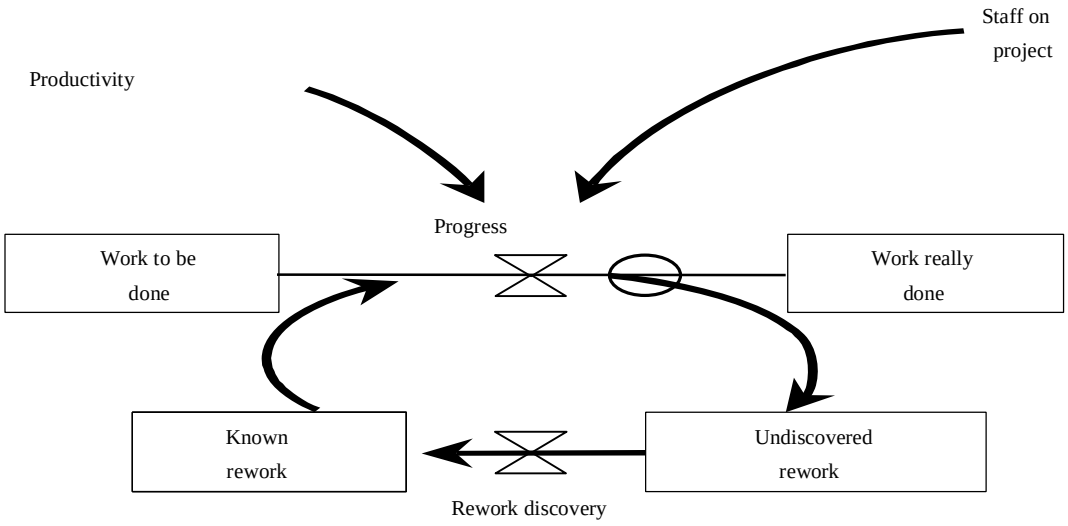


Figure 2. 1 The Rework Cycle of Projects

2.4.1 Definitions of Rework

Rework in the construction industry has different connotations and interpretations in the literature. Some refer to rework as "quality deviation" (Burati et al. 1992), "nonconformance" (Abdul-Rahman 1995), "defects" (Josephson and Hammarlund 1999), and "quality failures" (Barber et al. 2000). It may be argued that rework caused by clients as a result of scope changes and change orders should not be classified as rework (Fayek et al. 2003; Zhang et al. 2012). These types of corrective action are performed at the request of the owner (Zhang et al. 2012). As a result, rework can be basically looked at from the contractor's perspective, especially when it involves completed activity that does not meet the required specifications. The inappropriate differentiation between terms such as quality failures, defects, and errors can lead to inaccurate and incomplete measurements for rework and possibly inappropriate strategies for reducing rework occurrence (Mills et al. 2009; Aljassmi and Han 2013; Ajayi and Oyeyipo 2015; Love and Smith 2019). The construction industry lacks a common operational definition that can be used to establish a baseline for purposes of benchmarking and understanding the nature of the problem of rework (Love and Smith 2019). For this reasons, it is of main concern to focus on craftspeople's motivation which produces human error that lead to quality failure, non-conformance, quality deviations, and defects. Helmreich (2000) noted that error occur due to physiological and psychological limitations

of humans. Furthermore, Love and Smith (2019) argued that errors are systematically connected to aspects of people's tools, tasks and their environment. Thus, to ensure quality, people must negotiate with multiple system goals such as economic pressures that a contractor needs to manage, selection of subcontractors, the method and sequence of construction. As a result, addressing rework at the construction site is viewed from the perspective of facilitating craftspeople's motivation since their lack of motivation have a very high rates of cognitive and behavioural errors (Wallace et al. 2002). This has been observed in practice for subcontract trades where is a high degree of task repetition, such as the placing and fixing of reinforcement (Sing et al. 2014). Therefore, rework is typically a product of human error, which can arise due to actions, judgment and decision-making (Reason 1990; Reason 2008).

According to Oyewobi et al. (2011) rework is the process in which an element of building work fails to meet customer's needs and specifications, or when completed work does not conform to contract documentation. McDonald (2013) identified rework as "work measures that have to be completed more than once". Previously, Love and Edwards (2004a) defined rework as "the unnecessary effort of re-doing a process or activity that was incorrectly implemented the first time'. Rogge et al. (2001) referred to rework as a result of field work, and thus defined rework as "activities in the field that have to be done more than once in the field or activities which remove work previously installed as part of the project". The Construction Industry Institute [CII 2001] (2001) defines field rework as activities that have to be done more than once or activities that remove work previously installed as part of a project. More recently, Enshassi et al. (2017) considered rework essential when any building activity fails to meet the customer's requirement, or when completed work does not conform to contract documentation (citing Oyewobi et al. 2011). There is a plethora of rework definitions. However, what remains relevant is the definition given by Love (2002) who referred to rework as 'unnecessary effort of re-doing a process or activity that was incorrectly implemented the first time'. Giving consideration to this definition, which has been adopted as the study definition, provides an avenue to address rework via craftspeople's motivation by striving to identify and understand the factors influencing their motivation leading to a project's level of rework. Love and Smith (2019) recognised that the scope of rework is affected by the definition adopted for a given study.

2.4.2 Rework Categories

Rework can occur in the form of errors, omissions, defects, damage, and change orders throughout the design and construction interface process (Love 2002). Although three of these - errors, omissions and change orders - have been widely studied, especially in relation to quality deviation (Farrington 1987), others are used interchangeably when discussing rework in the construction sector.

2.4.2.1 Errors

People are fallible and are in general prone to making errors (Love et al. 2019). Error is defined as any item or activity in a system which if performed incorrectly results in a deviation from its intended purpose (Farrington 1987; Love et al. 1998b). Another definition states that errors are unintended deviations from correct and acceptable practices and lead to project cost and schedule overruns, which are both unnecessary and avoidable (McDonald 2013). The occurrence of error in any activity aggravates rework, especially when made during the design process, and continues downstream in the procurement process and construction phase (Love et al. 1998). The extent of rework required in such cases will depend on how long the error remained unnoticed (Simpeh 2012). According to Love et al. (2005) errors result from a complex range of interactions, which implies that isolating a singular variable to detect its occurrence can be unachievable. Understanding its typical nature and underlying dynamics can ensure the reduction and containment of error in projects (Love et al. 2008). Construction errors are the result of incorrect construction methods and procedures and are human-related (Simpeh 2012). Origins of error include the following: aspects overlooked; lack of or bad communication; poor coordination and integration; lack of skills and training. When error goes undetected, there is greater likelihood of rework which significantly impacts cost and schedule (Simpeh 2012).

2.4.2.2 Omission

An early study of omission defined it as any part of a system, including design, construction, and fabrication, that has been left out resulting in a deviation (Farrington 1987). Omission is a form of error which arises when the mental process of action control is subjected to strain or distraction (Reason 2002). According to Love et al. (2009), work practices implemented by organisations can aggravate similar errors, regardless of the skills and experience of the people involved in a project.

For instance, their own investigation of the anatomy of omission errors in construction and resource engineering projects revealed that design fees contributed to omission and design-related rework, because fees were based on the concept brief such that scope of error detection would be low. Insufficient resources were also a contributing factor to omission error (Love et al. (2002). Specifically, Simpeh (2012) noted that contractors and subcontractors are prone to omission errors, as quality, safety and environmental management system constraints are usually not upheld, and accordingly, tasks or processes may need to be reworked.

2.4.2.3 Defects

Defects are also identified at a later stage in the procurement process and may subsequently lead to rework (Love and Edwards 2004a). Realistically, prior to the issue of the certificate of practical completion, defects will be typically identified and will require rectification; a process often referred to as snagging items (Sommerville et al. 2004; Sommerville 2007; Taggart et al. 2014). Such defects are the physical manifestation of an error or omission (Knocke 1992) and listed for rectification before the certificate of practical completion is issued. Essentially, a defect is a "failing or shortcoming in the function, performance, statutory or user requirements of a building, and might manifest itself within the structure, fabric, services or other facilities of the affected building" (Watt 1999). Defects have been classified as minor or major, according to Porteous (1992), who explained that minor defects are those that "arise from poor workmanship or defective materials used in the erection or construction of a building, but do not render the building unsafe, inhabitable or unusable for the purposes for which the building was designed or intended" (p.46). A major defect, the exact opposite a minor one, is where the building becomes unsafe, inhabitable or unusable (Love and Smith 2019). Nevertheless, it is recognised that rework takes its name from defects noticed due to non-conformance to specification or deviation in quality (Oyewobi et al. 2011).

2.4.2.4 Damage

Palaneswaran (2006) noted that damage is a rework related problem with subcontractors in construction projects. Apart from damage occurring from weather conditions or natural disasters, damage is usually caused by employees, which makes it largely a human-related problem. Damage is one of the major sources of rework (Mastenbroek 2010).

2.4.2.5 Changes

According to Farrington (1987), change is a directed action altering currently established requirements. Similarly, Burati et al. (1992) stated that a change is essentially a directed action that alters current established requirements. Changes can affect the scope and nature of the work, or its operational aspects (Abu Zaiter 2014). During a project many changes can occur. Some are intended, others unintended, and both can have positive and negative influences on the project (Mastenbroek 2010). Rework is not commonly considered to include missing scope of work changes and change orders brought about by end users/owners. These are not necessarily considered non-conformance. Rather, changes such as these stem from a desire to change due to budget constraints or other unrelated circumstances (McDonald 2013).

Research by Burati et al. (1992), Willis and Willis (1996) and Love and Li (2000a) has demonstrated that rework can arise from design and construction changes, even though standards or requirements may have been achieved (Love and Smith 2019). Thus the term quality deviation was coined and used by (Farrington 1987; Davis et al. 1989; Burati et al. 1992) to encapsulate rework. Deviation in desired quality or specific client requirements in a construction project is referred to as nonconformance (Cheung et al. 2004). Whenever there is a deviation in quality, a non-conformance report (NCR) is issued (Maheswari et al. 2016). The NCRs are triggered anytime during the project's execution, under various dimensions such as quality, safety, contracts, etc. These non-conformances result in rectification, repair or rework leading to time and/or cost overrun of the current activity and dependent activities (Maheswari et al. 2016).

2.4.3 Effects of Rework

It is critically important for project managers to balance the competing demands of quality, scope, time and cost in construction projects. According to Ali and Beheiry (2015), in spite of the fact that several players interact within the construction field, the major concern for most contractors is to balance the project's constraints: scope, time and cost. From a contractor's viewpoint, projects are successfully completed when accomplished according to the client's required scope and quality within a defined time and cost. This task is not simple, due to the complexity surrounding construction environments, and the many parties that need to collaborate and interact (Ali and Beheiry 2015). Nevertheless, project managers can be effectively supported to keep track of events

related to rework, and apply effective management to reduce its impact on project performance (Hwang and Zhao 2014).

According to Enhassi et al. (2017), rework can arise both directly and indirectly. Its direct impact with respect to project performance involves additional materials for rework and subsequent wastage handling, or additional labour for rework and related extensions of supervision manpower. Its indirect impact has been reported to include end-user dissatisfaction, inter-organisational conflicts, fatigue, stress, de-motivation, work inactivity, absenteeism, loss of future work, poor morale, reduced profit, and damage to professional image (Love and Edward 2004b). Maheswari et al. (2016) reported that rework due to NCR had a negative effect on a project, in both quantitative and qualitative terms. The negative influence of rework can be understood in terms of either delay or cost. Studies have shown that rework due to NCR has a strong correlation with project time and cost overruns (Burati et al. 1992; Josephson and Hammarlund 1999; Oyewobi et al. 2011). The effect of rework as it relates to delay and cost overruns has had a wide reach. Rhodes (2015) identified that projects in Saudi Arabia were delayed 70%, while in Abu Dhabi, the UAE capital, 90% were delayed. The proportion of delay is higher in the UAE than in other Middle Eastern countries (Bhatti et al. 2018). Similarly, the average building construction time overrun in Ghana goes beyond 40% of the estimated schedule, up to the point that public and private construction build had approximately 176% and 77% time overrun, respectively (Habibi et al. 2019).

It is recognised that the average magnitude of cost and time overruns depends on various project characteristics comprising project location, project type, industry, and time of construction (Habibi et al. 2018; Safapour and Kermanshachi 2019), but a reduction in rework can significantly improve overall project performance (Love et al. 2000; Oyewobi et al. 2011). Interestingly, some studies have suggested that project characteristics (e.g. procurement methods, project types, and contract value) do not influence cost and schedule performance (e.g. Ireland 1985; Naoum 1994; Walker 1995; Love et al. 2017; Love and Smith 2019).

2.4.4 Impact of Rework

Earlier studies such as Burati et al. (1992), Abdul-Rahman (1997) and Josephson and Hammurlund (1999) reported that rework costs varied between 3% and 15% of a project's contract value (Oyewobi et al. 2011). Barber et al. (2000) suggested that rework costs could be as high as 23% of contract value. Aminudin (2006) stated that up to 30% of construction is rework; labour is used at only 40% to 60% of potential efficiency, and at least 10% of materials are wasted. Quite a lot of studies have reported the impact of rework in building and engineering projects (Love 2002; Love et al. 2004; Love et al. 2009).

Measuring the non-conformance cost of projects, Enshassi et al. (2017) reported 10% and 20% of project cost. Cnuddle (1991) reported 3.15% cost of contract value of residential apartment blocks, while Love et al. (1998) documented 2.40% of contract value in an industrial warehouse. Furthermore, 2.01% to 3.21% in high-rise buildings was demonstrated by Alwi et al. (1999), and 2.3% to 9.3% of contract value was reported for seven building projects (Josephson et al. 2002). In a benchmarking program conducted by CII Capital, using approximately 360 projects, CII developed a formula to calculate a metric known as Total Field Rework Factor (TFRF), which is expressed as Total Direct Cost of Field Rework over the Total Construction Phase Cost, as shown below:

Formula for Total Field Rework (CII, 2005):

$$\text{TFRF} = \frac{\textbf{Total direct cost of field rework}}{\textbf{Total construction phase cost}}$$

Similarly, Canadian Owners Association of Alberta [COAA] (2001) calculated the rework cost and gave the percentage of field rework as follows:

$$CFRI = \frac{\textbf{Total direct pluse indirect cost of rework performed in the field}}{\textbf{Toatl field construction phase cost}}$$

$$CFRI = \frac{D_r \times I_f}{D_t + I + P + O} D_r$$

Where:

CFRI = Construction Field Rework Index

D_r = Total direct field cost of rework

$D_r = \sum_1^n 1_{ri} + e_{ri} + m_{ri} + s_{ri} + v_{ri}$

1_{ri} = *Direct field labour and supervision cost of rework*

e_{ri} = *Direct equipment's cost of rework*

m_{ri} = *Material cost of rework*

s_{ri} = *Subcontract cost of rework*

v_{ri} = *Vendor and suppliers cost of rework*

i = Rework event

n = Number of rework events

$D_r = \frac{D_t + I}{D_t}$ = *field indirect mark-up factors`*

D_t = *Direct field construction phase cost*

I = Indirect field construction phase cost

P = Profit fees ($)

O= Overhead fees ($)

Delay is defined as the situation where contractors and project owner jointly or severally contribute to non-completion of the project within its planned or agreed contract period (Aibinu and Jagboro 2002). It is known as an act that extends the time of an event beyond its intended duration (Stumpf 2000). Said (2009) indicates that rework presents itself in the form of stoppage and delay which impacts on project schedule. He presents the time implications of rework as follows:

Percentage of rework delay = (Total rework delay/Total Project delay) *100% …… (i)

Percentage of rework time = (Total rework time/Total Project duration) * 100% …… (ii)

Where equation (i) & (ii) represent the calculation of rework delay and duration respectively.

Love et al. (2018) noted that the level of rework that occurs in projects will vary significantly, as does its cost and consequences. Practically, rework costs are tracked from the point where rework is identified to that time when rework is completed and the activity has returned to the condition or state it was in originally (Oyewobi et al. 2011). The duration of cost tracking includes the length of the standby/relocation time once rework is identified, the time required to carry out the rework, and the time required to gear up to carry on with the original scope of the activity (Fayek et al. 2003). The sequence of events that constitute rework are shown in Figure 2.2.

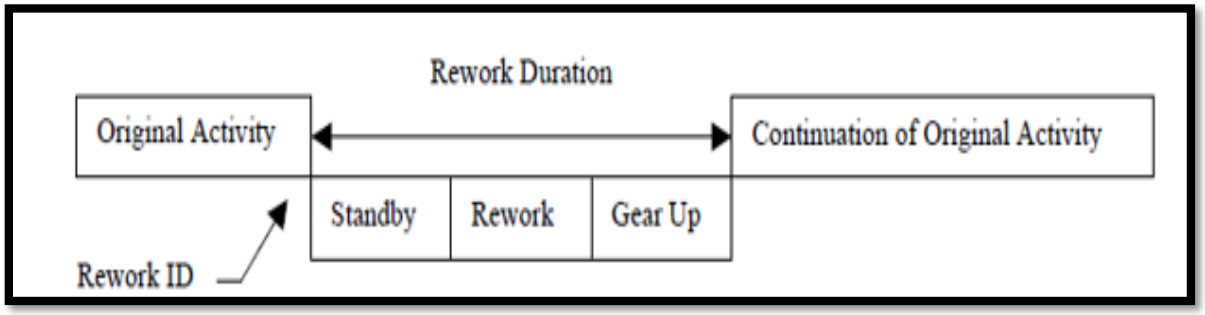


Figure 2. 2 Components of Rework (Adapted from Fayek et al. 2003)

In a case study on a residential-commercial tower in Saudi Arabia, Wasfy (2010) categorised construction activities, and for each activity found the average frequency of rework, average percent of increase in cost, and average percent of delay. The results of this study are given in Table 2.2.

Table 2. 2 Frequency, cost and delay of rework in construction activities (Wasfy 2010)

Work Category	**Average frequency of Rework**	**Average percentage of increase in cost**	**Average percentage of delay**
Block works	3.00	30%	72%
Aluminum and glass works	2.33	7%	77%
Plaster works	2.00	17%	60%
Reinforced concrete works	1.67%	7%	12%
Flooring and wall cladding works	1.67%	22%	47%
Plumbing works	1.33	4%	29%
Electrical works	1.25	4%	21%
Air conditioning works	1.00	2%	12%
False ceiling works	0.67	2%	15%

Fire protection and firefighting works	0.50	2%	10%
Wooden works	0.33	2%	10%
Elevator works	0.25	2%	15%

As indicated in the table above, block works had the highest frequency of rework among the construction activities, and elevator works resulted in the lowest frequency. Increase in cost showed that block works had the first rank due to the frequency of rework, but had second rank in delay caused by rework, after aluminium and glass works.

Similarly, Oyewobi et al. (2011) conducted a study on 25 selected institutional building projects in Nigeria, and found elemental cost, total variation cost and total rework cost of each of the elements, as represented in Table 2.3.

Table 2. 3 Elements of building and their contribution to rework (Oyewobi et al. 2011)

	Additional			**Variation**		**% of Rework Cost**	**% of Rework Cost**	**Cost**
Elements	**Initial Cost**	**Works Cost**	**Rework Cost**	**Cost**	**Final Cost**	**In Variation Cost**	**In final Cost**	**Overrun**
Substructure	240.38	11.77	6.8	18.57	258.95	36.62	2.63	18.57
Frames and upper floors	172.38	10.64	7.36	18	190.38	40.89	3.87	18
Roof and covering	165.86	6.98	2.05	9.03	174.89	22.70	1.17	9.03
Wall	118.97	3.23	3.53	6.76	125.73	52.22	2.81	6.76
Doors and windows	75.56	8.67	4.03	12.7	88.26	31.73	4.57	12.7
Furniture and fittings	20.2	3.46	3.49	6.95	27.15	50.22	12.85	6.95
Mechanical installation	45.11	1.99	5.38	7.37	52.48	73.00	10.25	7.37
Electrical installation	69.21	1.46	0.85	2.31	71.52	36.80	1.19	2.31
Finishing	183.16	25.84	8.65	34.49	217.65	25.08	3.97	34.49
Painting	59.41	1.71	1.98	3.69	63.1	53.66	3.14	3.69
External works	38.45	0.06	1.18	1.24	39.69	95.16	2.97	1.24

Another study carried out by Meshksarr (2012) showed major rework items to include: 1-collapsing excavation walls, 2 – over excavation, and 3 – formwork materials falling from top storey causing damage to them. Typically, research efforts have focused on determining direct rework costs at the expense of indirect costs which remain relatively unknown (Josephson 2000). However, several studies have looked into its significance (Love 2000; Love 2002; CII 2005; Palaneeswaran 2006; Oyewobi et al. 2011; Meshksarr 2012).

The study by Palaneeswaran (2006) argued that the direct impact of rework on a project consists of additional time to carry out the rework, additional cost to rectify the occurrence, more materials for rework, and consequential increase in labour cost and manpower supervision. On the other hand, indirect costs of rework usually materialise from delays, disruption, claims and litigation (Love and Smith 2019). Oyewobi et al. (2011) subscribed to varying rework costs under different procurement methods. Nevertheless, studies such as Love (2002), McDonald (2013), Love et al. (2017) and Love and Smith (2019) hold that this has no influence on rework. Given the ambiguity surrounding rework costs, it was suggested that the reported figures should be treated with caution. In fact, there is a danger that they have become an unverifiable factoid as no context or caveats are provided when they are cited (Love and Smith 2019).

2.4.5 Factors Influencing Rework

Love and Edwards (2004b) noted that project characteristics such as size and complexity, organisational management features such as management style, and project management practices such as environment/culture, play an important part in the occurrence of rework. An early study by Love et al. (1999) noted that organisational and project management practices are interrelated, and that motivation of project team members is an important factor influencing rework (cited by Love and Edwards 2004b). Several studies have identified the causes of rework in construction (e.g. Robinson-Fayek et al. 2004; Fayek, et al. 2004; COAA 2006; Aljassmi and Han 2013; Hwang et al. 2014; Taggart et al. 2014; Jingmond and Agren 2015), but many such studies identified singular causal factors and have not acknowledged the interdependency and complex relationships that lead to the occurrence of rework in construction (e.g. Aiyetan 2013; Kakitahi et al. 2013; Ye et al. 2015; Yap et al. 2017).

Repeated singular rework causal factors identified include poor communication, workmanship and quality management. However, these factors lack clarity (Love and Smith 2019). Motivation of craftspeople is an intangible, a hypothetical construct that is used to explain human behaviour (Barg et al. 2014). But there are several factors influencing human behaviour e.g. communication, coordination, quality of supervision, and training (Deci and Ryan 2000; Barg et al. 2014; Enshassi 2014; Ye 2014; Bilau et al. 2015; Cardoso et al. 2015 ; Brooks and Spillane 2016). These can be significantly influenced by the work environment, culture and management style. Studies have found that organisational and managerial decisions and actions are underlying mechanisms that provide uncommittable parts of an explanation for the occurrence of rework and its negative impact on project costs (Barber et al. 2000; Robinson-Fayek et al. 2004; Taggart et al. 2014; Love and Smith 2019).

In Middle Eastern countries such as the UAE, where the cost of labour is relatively cheap, pressure to accomplish work in the construction industry results in pushing more people to get the job completed quickly (Ailabouni et al. 2009). Projects in the region are often populated by inexperienced workers, and this continues to impact on the quality of the projects. Abdel-Wahab et al. (2008 cited by Ailabouni et al. 2009) admitted that effective utilisation of skills rather than mere increase in supply of skills is essential for construction improvement, and will enhance quality standards. In a popular study Godlewski et al. (2012) noted that hiring more workers means bringing in people less experienced than those already on the project, especially in a labour-constrained environment, thus increasing rework. Although training for development of capability is key to sustainability (Osei 2000; Dantong et al. 2011), however, training of construction craftspeople is not very common in developing countries, and even when done, it is not adequate (Uwakweh 2000 cited by Enshassi 2014).

Building on past studies, Jarkas (2015b) showed that better management of people is very important to the success of a project (citing Mansfield and Odeh 1989), and that people are essentially the cause of rework (citing Love et al. 1997). The presence of socio-cultural complexity, especially as it relates to the UAE construction context, can be multi-dimensional, which can influence the craftspeople's motivation to perform work optimally. The complexity of a project system from the perspective of craftspeople's motivation in relation to the incidence of

rework is an area that has received limited attention within the literature. Projects will naturally vary in complexity (e.g. social and cultural) due to their degree of differentiation and interdependency, but how their integration is managed is the key to their successful quality delivery (Girmscheid and Brockmann 2008).

2.5 Quality and its Associates

The absence of a quality focus in design organisations has meant that the concept of service quality has not been given any serious recognition (Richardson 1996; Stasiowski and Burstein 1994; Tilley and McFallen 2000). As a result, contractors and their subcontractors act as "quality buffers" as they are left to identify quality deviations in contract documentation (Love and Edwards 2004a). Rework takes its name from deviation in the quality or specification (Oyewobi and Ogunsemi 2010). Nevertheless, it is difficult to define quality in the construction industry, since quality means many things to different people (Ahmed and Yusuff 2016). According to Smallwood and Rwelamila (1996), quality means conformance to requirement (citing Crosby 1984), "meeting expectations of the customer" (Chase 1998; McKim and Kiani 1995), "reduced rework or defects" (Atkinson 1998; Love et al. 1999; Pheng and Wee 2001), "repeat business" (Sommerville 1994; Sypsomos 1997), "conformance to ISO 9000 criteria" (Bubshait and Al-Atiq 1999) and "completion on-time and within budget" (Courtice and Herrero 1991; Gransberg 1999; Kiwus and Williams 2001). Also, Fédération Internationale des Ingénieurs-Conseils [FIDIC] (2001) defines quality as all the key attributes of professional services including skill, experience, innovation, integrity, sustainability, and best business practice. Obviously, it is difficult to find a precise definition of quality in the construction industry. Nevertheless, for the purpose of this study, the following definition by Sweis et al. (2014) is adopted: "conformance to predetermined standards". In essence, it is purported to reduce rework, which means a reduction in redoing an activity that has already been done (Love 2002).

2.5.1 Quality in Construction Projects

Certainly, construction projects demand a very high scale of quality (Abdelsalam and Gad 2009; Heravitorbati 2011). A number of studies on quality have shown that contractors play a major role in ensuring construction projects are completed within time and targeted cost (Hoonakker et al.

2010; Aje 2012; Sweis al. 2014). Evaluating quality from the perspective of craftspeople, it is believed that humans will determine the results of all quality activities. As such, humans are considered both the controlled targets and controlling motivation of other quality activities (Cheng 2004). The concept of human control includes the overall quality of the organisation and the individual's knowledge, ability, physical condition, psychological state, quality consciousness, behaviour, organisational discipline, and professional ethics (Abdel Khalek et al. 2016). Sommerville et al. (2004) suggested that lack of care and poor attitude towards quality on behalf of the contractor lead to snagging problems (i.e. defects, quality deviation, rework). Nevertheless, Afolabi et al. (2016) argued that craftspeople's position in the construction industry is central, as a large percentage of quality in a construction project hinges on the skill of craftspeople and artisans.

2.5.2 Quality Management (QM) Concept

Quality management (QM) in the construction industry is different from that in manufacturing or other service industries, because in the construction industry it encompasses not only the quality of products, but also the total management approach to meeting a defined purpose provided by clients (Rumane 2011). The Association of Project Management [APM] (2012) defines QM as a discipline for ensuring that output, benefits and the processes which they are delivered, meet stakeholder requirements and are fit for purpose. It serves as the basis for understanding quality from two approaches (Total Quality Management (TQM) and Quality Management System (QMS)). The International Academy of the American Society for Quality defines TQM as "The management approach of an organization centered on quality, based on the participation of all of its members and aiming at long-term success through customer satisfaction and benefits to all members of the organization and to society" (Harrington et al. 2012, p.2). Thorpe and Sumner (2004, p.3) describe QMS in companies as "a formal statement of an organization's business policy, management responsibilities, processes and their controls, that reflects the most effective and efficient ways to meet (or exceed) the expectations of those it serves, whilst achieving its own prime business objectives".

It is generally considered that TQM is a higher level concept of strategic achievement than that provided by QMS, but several scholarly articles have argued that the two concepts (i.e. QMS and

TQM) are at about the same level (Wong and Fung 1999; Low and Teo 2004; Ahmed et al. 2005; Farooqui and Ahmed 2009; Shibani et al. 2010). Nevertheless, Thorpe and Sumner (2004) recommended that construction firms eager to benefit from TQM approach should start by establishing a QMS concept as their first step on what has been noted by Grossman and Helpman (1989) among others as a "quality ladder". This is illustrated in Figure 2.3.

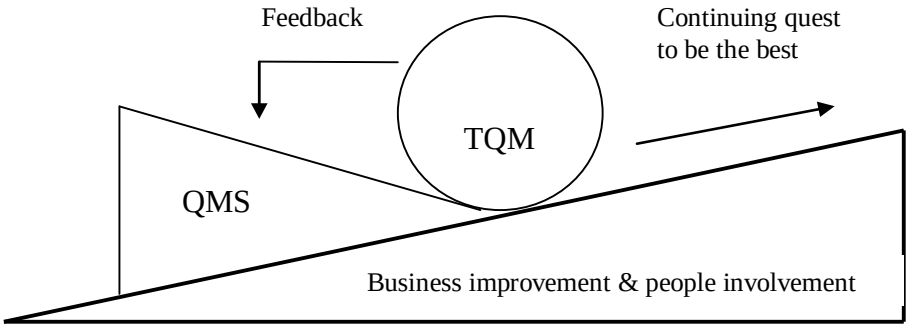


Figure 2. 3 Illustration of Relationship of QMS and TQM (Thorpe and Sumner 2004)

2.5.3 Benefits of Quality Management (QM)

A number of studies on quality have shown that contractors play a major role in ensuring construction projects are completed within time and targeted cost (Hoonakker et al. 2010; Aje 2012; Sweis et al. 2014). According to Love and Edwards (2004b), prior to implementation of TQM in Barclay Construction Ltd (Australia), rework costs were 5% of contract value. The implementation of TQM reduced rework costs to 1% (citing Lomas 1996). Similarly, Construction Industry Development Authority [CIDA] (1995) reported that with a formal QMS in place, rework cost could be as low as 0.72%. Cusack (1992) noted that projects without a quality system in place typically experienced a 10% cost increase because of rework. Egan (1998) emphasised that the client's requirements must be fully addressed through a quality management system in an efficient and effective manner. However, Haupt and Whiteman (2004) argued that the benefits of QMS would be minimal unless the principles were transferred to site operations (Marasini and Quinnell 2010).

QMS are applied in the construction industry in different ways. Some adopt Investors in People (IIP), International Organistion for Standardisation (ISO9000), European Foundation for Quality Management (EFQM), custom designed systems and/or third party certifications (Griffith and Watson 2004). Irrespective of the system used, quality should be managed in ways which are clearly identified, well documented, and efficiently planned, implemented and controlled (Fryer et al. 2004). According to the Office of Government Commerce (OGC) Projects in Controlled Environments [PRINCE2], (2009), and Mallawaarachchi and Senaratne (2015), implementation of quality management entails a variety of concepts such as quality planning (identification of quality standards), quality assurance (evaluation of overall project performance), and quality control (monitoring of specific project results). These terms are explained by Ashokkumar (2014) as follows:

- Quality Planning (QP): identifying quality standards relevant to the project and determining how to satisfy quality standards.
- Quality Assurance (QA): planned and systematic activities implemented within quality systems and demonstrated, as needed, to provide adequate confidence that an entity will fulfil requirements for quality.
- Quality Control (QC): monitoring specific project results to determine if they comply with relevant quality standards, and identifying ways to eliminate causes of unsatisfactory performance.

These key elements are relevant parts of the quality systems of all the supply chain participants on which a project depends (Barrett 2000). The quest for quality in construction projects has continued to see studies such as these (Love and Edwards 2004a; Sweis 2009; Al-Sabek 2015; Ahmed and Yusuf 2016; Brooks and Spillane 2016). In the light of these studies, various benefits of quality have continued to emerge, including: customer satisfaction, improved schedule performance, improved relationships, cost savings, nurture and support of worker motivation, and reduced rework (McIntyre and Kirschenmen 2000; Hoonakker et al. 2010; Brooks and Spillane 2016). There have been challenges, and these are described in the UAE construction context as follows.

2.5.3.1 Quality Management (QM) Implementation in UAE Construction

Al-Sabek (2015) reported that TQM has become a vital requirement for clients in the UAE. Contractors who understand it fully and are able to implement it have a considerable competitive advantage. The TQM concept and approach are well-understood and widely practiced in Europe, North America and Japan and the growing economies of East Asia in the building and construction industry (Honnakker et al. 2010). Nevertheless, the developing countries failed in quality program implementation due to lack of understanding of QM (Wong and Fung 1999). This has led to difficulties experienced in implementing TQM successfully (Krygier 1993). Moreover, TQM implementation in many parts of the world, such as the USA, Hong Kong, South Africa and Australia, may not be comparable, since they all have different laws and working environments (Al-Sabek 2015). The difficulties experienced may not be due to the TQM concept itself; rather, problems could stem from cultural factors. The UAE construction labour market is highly multi-cultural, and thus, is a good example of the challenges faced in the implementation of TQM and/or QMS.

It is not easy to achieve TQM in the building and construction industry, due to its transient nature, its lack of standardisation, and the many professions, occupations and organisations involved in the process (Honnakker et al. 2010). Nevertheless, QM has increasingly been adopted by construction companies as an initiative to solve quality problems and meet the needs of the final customer (Kanji and Wong 1998). Despite this effort, some construction companies have seen it as neither effective nor workable (Brooks and Spillane 2016). The problem stems largely from perceiving quality as a standardised methodology (Brooks and Spillane 2016).

According to the study by Al-Zamany et al. (2002) people need to know and understand the internal and external processes that may be affected when improvement in any process is required. Yusof and Aspinwall (2000) noted that failure of understanding by top management of the requirements and implementation process of the TQM programme is a major challenge. It is clear that top management need to have a good understanding of the purpose of TQM, how its requirements are implemented, ways to measure its business impact and areas in which benefits may lie. It has been recognised that main barriers to quality implementation in the construction industry are management commitment, culture and motivation (Dick et al. 2008; Sampaio et al.

2012; Fonseca 2015; Brooks and Spillane 2016). Motivation as it relates to rework occurrence in achieving TQM in the UAE construction industry is essential in this context.

2.5.3.2 Influence of TQM on Project Performance in UAE construction

The influence of TQM on project performance is enormous, since it is practically proven to be a successful approach to improving quality performance (Talib et al. 2013; Zehir et al. 2012). TQM originated in the manufacturing industry, and has been noteworthy for performance improvement. However, its influence in the construction sector is beset with challenges, due to the perspectives with which it is viewed in the course of a construction project. Performance measurements vary across project participants (Alzahrani and Emsley 2013). One challenge TQM faces is varying dimensions: leaders tend to define the set of criteria that best suits their organisations. As a result, agreement on a set of common practices defining the wide range of TQM frameworks is problematic (Prajogo and McDermott 2005; Psomas et al. 2014). Despite this challenge, studies conducted in the construction industry have shown that TQM has a positive impact on project performance (Kuo and Kuo 2010; Ali and Rahmat 2010; Din et al. 2011; Mir and Pinnington 2014; Leong et al. 2014). Within the UAE construction context, the challenge to implementation of QMS and TQM within the contractor's work domain is aggravated by lack of top management commitment, standardisation and motivation (Chileshe and Hayat 2010). This has significant influence on the implementation of quality at the construction site, and hinders improvement for those at the heart of construction operations (i.e. craftspeople). Love and Heng (2000) argued that a cultural and behavioural shift in the mind-set of all participants in the construction process, especially top or senior management, is necessary if the construction industry is to improve its performance (Haupt 2002).

2.5.3.3 Quality via Rework Reduction Model

A reduction in field rework is widely regarded as an effective way to improve construction performance in terms of quality, safety, time, and cost overruns (Zhang 2009). Steps taken to reduce rework are generally based on analysis of its causes (Simpeh 2012). Several rework reduction models have been developed to address rework by improving quality levels in the construction industry. These include the Field Rework Index (FRI) (Rogge et al. 2001), alternate procurement model (Love et al. 2004), Project Rework Reduction Tool (PRRT) (COAA 2006),

and Building Information Modeling (BIM) (Succar et al. 2012). Nevertheless, the UAE construction industry still faces challenges to its efforts to curtail rework occurrence.

The Field Rework Index (FRI) was developed to provide an early warning sign of the amount of rework in a project, but to date there is little correlation on its ability to accurately predict the amount of rework. Similarly, PRRT was initiated as a comprehensive tool to rate performance against known and significant rework-causing factors at any point in the project time line, but there has been no indication of its successful use in the industry. The BIM was intended to encourage and enable project teams to develop projects with better quality, and identify potential issues earlier in the process of development; nevertheless, it has faced limitations such as lack of standardisation, awareness, and resistance to change in the UAE construction industry (Mehran 2016).

As explained above, the application of QM within the construction industry starts with the commitment of top management. However, it is suggested that its proper implementation has to be extended to site operations (Haupt and Whiteman 2004), particularly those at the centre of operations (Afolabi et al. 2016). The mere existence of quality documentation, such as the quality plans, procedures and work instructions available within the respective organisations, does not in itself deliver rework-free products. There is a need to apply energy, direction and persistence, which are typically referred to as motivation (Deci and Ryan 2000) to make the final product a reality which provides customer satisfaction. On the other hand, the RRM approach focuses on field rework, so its application is at project level. Much of its implementation is achieved through site operations, and the motivation to carry out its functions is essential to ensure customer satisfaction.

2.6 Motivation in Construction Projects

An excessive amount of abortive time occurs as a combined result of the nature and environment of construction work (Ibironke et al. 2011). The construction industry is a laborious and hazardous environment, but plays an important role in the development of a country's economy. This calls for energetic and enthusiastic people (Thwala and Monese 2012; Horta et al. 2013). Nevertheless, construction workers can hold contrasting or opposing motives at the same time (Houle 1961 cited by Taylor 2015, p.36-42). Thus, understanding the motivation of the labour force is of paramount

importance because the quality of human performance in the workplace depends largely upon motivation (Kazaz et al. 2008; Khaled and Remon 2013). While organisation tends to enhance performance, it influences the behaviour of the worker (Sonnentag and Frese 2002). This in turn is dependent on the right attitude and right behaviour which propel an individual to perform (Block and Pickl 2014). This is referred to as motivation. According to Campbell et al. (1993), motivation is a determinant of job performance, and it refers to the processes that account for an individual's intensity, direction and persistence of effort toward attaining a goal (Robbins et al. 2010). Parkin et al. (2009) agrees that with an increase in motivation, a higher performance can be achieved. Thus motivation is an important aspect of project performance.

2.6.1 Definitions of Motivation

Motivation is the set of processes that determine the choices people make about their behaviour (Ibironke et al. 2011). According to Anthony (2011), motivation is the drive within a person that is responsible for the extent, course and diligence of efforts expended at work. Peklar and Bostjancic (2012) noted that motivation "is the steering of human activity towards a desired objective by means of motives generated internally in a person or in his or her environment, on the basis of his or her needs" (p.57). Bryan et al. (2011) describe motivation as the reason why people work. Elsewhere, motivation is seen as an intangible, a hypothetical construct that is used to explain human behaviour (Barg et al. 2014). However, remuneration is seen as the most important reason why an individual works in a job (Kazaz et al. 2008). Past research such as McKenzie and Harris (1984), Price (1992), Ogunlana and Chang (1998), and Yisa et al. (2000), also set out the claim that monetary compensation is most valuable to the construction workers. Despite this claim, this study adopts the definition of motivation as the need to apply energy, direction, and persistence (Deci and Ryan 2000) to an activity. This is because the construction industry is a labour intensive environment which requires significant effort to achieve the necessary tasks.

There is a growing concern for motivation, as a result of its importance in the real world. Overlooking its importance has great consequences, such as change in behaviour, which can result in work not been done properly, effectively or according to expected quality standards (i.e. TQM, QMS) (Ankil and Palliam 2012). Participation in an organisation has two important aspects: the

satisfaction of personal needs, and the attainment of something that is only possible in cooperation with others (Kim et al. 2015). Obviously, in a relatively low-tech labour intensive industry such as construction, workers are an invaluable asset (Thwala and Monese 2012). Nevertheless, their management is still the most difficult problem that has been encountered (Block and Pickl 2014).

2.6.2 Nature of Motivation

Previous studies have shown that construction projects, regardless of size, cost, stage or nature, require at least one individual to execute the tasks in order to make them happen (Woo and Soetanto 2010). Despite recent technological innovation in the construction industry, projects still remain a "human" enterprise (Love et al. 2008). Thus there is need to apply energy, direction, and persistence, all of which have been described as motivation (Deci and Ryan 2000). Motivation triggers the effort to perform a task (Raoufi and Fayek 2015). Nonetheless, it is the type of motivation possessed by the person concerned which could explain the work of behavioural science in relation to the occurrence of rework in construction projects.

2.6.3. Types of Motivation

According to Park and Rainey (2012) there are two basic types of motivation: intrinsic and extrinsic. These are differentiated by the reasons or goals that give rise to an action (Lam and Tang 2003; Malka and Chatman 2003; Legault 2016; Ryan and Deci 2017).

2.6.3.1 Intrinsic Motivation

According to Legault (2016) intrinsic motivation is denoted by the performance of an action out of interest or enjoyment. This type of motivation is based on doing something for the inherent satisfaction of the activity (Malka and Chatman 2003; Lam and Tang 2003; Park and Rainey 2012). It was noted by Deci and Ryan (2000) that no single phenomenon reflects the positive potential of human nature as much as intrinsic motivation. Thus, its inherent tendency seek out novelty and challenge, to extend and exercise one's capacities, to explore, and to learn (Deci and Ryan 2000). Although initial studies showed that individual who engaged freely in an activity (out of interest) and were subsequently offered an external reward such as money (Deci 1971) or points (Lepper et

al. 1973) for engaging in that activity, will experience a decline in intrinsic motivation toward the activity. These initial findings seem controversial because they challenge operant theories of behavioural reinforcement. Nevertheless, subsequent meta analysis affirmed that when extrinsic rewards are expected and tangible, they indeed undermine intrinsic motivation for an activity (Deci et al. 1999; Ryan and Deci 2000a; Promberger and Marteau 2013). The main reason for this undermining effect is because extrinsic rewards tend to shift the individual's reasons for performing the behaviour from internal (e.g., interest, fun) to external (e.g., to receive the reward), thus changing the source of the motivation and locus of causality for action (Legault 2016).

2.6.3.2 Extrinsic Motivation

Unlike intrinsic motivation which is considered the most optimal form of motivation and is associated with various benefits including enjoyment, persistence, and psychological well-being (Deci and Ryan 2008). Extrinsic motivators have been thought to be helpful to promote action for behaviours that are not intrinsically interesting (e.g., recycling, obeying traffic laws). Extrinsic motivation are referred to doing something because it leads to a distinguishable outcome and involves activities that are performed as a means to an end (Malka and Chatman 2003: Lam and Tang 2003; Park and Rainey 2012). An earlier study by Deci and Ryan (2000) argued that much of what people do is not, strictly speaking, intrinsically motivated, especially after the childhood stage, when freedom is increasingly curtailed by social pressures to do activities that are not interesting, and to assume a variety of new responsibilities (citing Ryan and La Guardia, in press). However, achieving extrinsic motivation has long been differentiated into various forms, each of which is recognisable in the workplace, and which range from externally regulated to introjected behaviour, and to integration (Deci et al. 2017). These various forms are expressed in a continuum: external regulation (e.g. an activity done to increase one's salary); introjected regulation (taking in a regulation but not fully accepting it as one's own); identified regulation (reflects a conscious valuing of a behavioural goal), and integrated regulation (brought into congruence with one's other values and needs) (Ryan and Deci 2000a). This distinction relies on the degree of "internalisation" of experiences, values, and attitudes into intrinsic aspects of oneself. If sufficiently "internalised", extrinsically motivated actions become self-determined (Ryan and Deci 2000b). Further discussions on the types of motivation is explained in Chapter Three.

Given the above explanation, certain factors influence motivation. Motivation is not the sole factor involved in changing behaviour. Without the abilities and supporting environment needed to succeed in and sustain change, behaviour modifications are prone to being unstable or incomplete, especially in a temporary organisation as found in the construction industry. Nevertheless, focusing on motivation is a critical first step on the journey to change, especially as it regards addressing the issue on rework in complex building construction projects.

2.6.4 Factors Influencing Motivation in Construction

Studies have shown that management practice is not generalisable across the culture, as it varies from one culture to another (e.g., Triandis 1994; House et al. 2004). Each employee has his or her particular collection of values, attitudes and beliefs which, as management researchers have found, serve as filters through which individuals observe and understand particular management situations. Such differences of viewpoint, grounded in cultural differences, are at work on construction projects. The UAE being a largely multi-cultural environment, certain factors have been considered to influence the craftspeople's motivation that impacts rework occurrence. Jarkas (2015a) suggest that local practices have significant influence on rework in the building construction industry. Although there are various local practices existing in the industry, this study considers the following three local attributes: work environment, culture, and management style, in relation to rework occurrence in the UAE construction industry.

2.6.4.1 Work Environment

The construction work environment is basically seen from two perspectives (Barg et al. 2014). Maloney (1986) discussed work environment in the form of content and context. Contextual factors involve supervision, material resources, compensation practices, and work environment. Content involves elements such as skills demanded, the challenging nature of the job, and the meaningfulness of work (Barg et al. 2014). Ahyari (2004) and Jarkas (2013) defines the working environment as one where employees perform tasks and work every day. It was found that one-third of construction workers derive growth from their profession, and this serves as a form of motivation. Nevertheless, the inability to enhance a worker's skills through effective feedback from supervisors is one of the major contributors to rework (Josephson and Hammarlund 1999;

Shinde and Kulkarmi 2016). Similarly, Smithers and Walker (2000 cited by Barg et al. 2014) conducted a study in Melbourne, Australia, and found that chaos, non-recognition for work completed, and lack of relationship between colleagues at the construction worksite, demotivates construction workers. Demotivation is central to poor workmanship, and thus rework (Jarkas 2015a).

A study examining the physiological demands on construction workers in relation to fulfilment found 20-40% of craftspeople routinely exceeding published guidelines for acceptable levels of physical performance when their motivation was high (Abdelhamid and Everett 2002). Hewage and Ruwanpura (2006) found that motivation of construction workers increased on the basis of the following factors: (a) incentive (bonus, rewards, and salary), (b) working team (relationship and mutual respect between coworkers and supervisors), (c) working conditions (freedom, physical surroundings, and opportunities to learn new things), (d) management and supervision (positive reinforcement and job security), (e) intrinsic motives (the chance to accomplish a meaningful activity, being heard, and building skills). Nepal et al (2006) recognised that schedule pressure makes workers lose motivation for the job, although moderate use of schedule pressure helps to maintain alertness and attention on the job. However, its excessive use brings about cutting corners, increases the amount of out-of-sequence work, increases the amount of rework and causes loss of motivation (Barg et al. 2014). Brooks and Spillane (2016) noted that a work environment with undue external control and regulation has been shown to shift the workers' perceived locus of causality, invariably making the worker less interested in the work itself, but focused on meeting the targets of the regulatory regime and avoiding subsequent penalties (citing Ryan and Connell 1989; Gagne and Deci 2005).

2.6.4.2 Culture

According to Oyewobi et al. (2016), culture is a reflection of beliefs, values, behaviour, attitudes and assumptions within an internal setting (citing Peteraf 1993; Aycan et al. 1999). Culture stands as an influencing element that impacts on the morale of construction workers, increasing their motivation and performance (Oyewobi et al. 2016). This can be seen in areas such as commitment, management decision-making style, and good team work (Coffey et al. 2011). Culture plays a critical role in motivating desired behaviour, as it helps foster the commitment necessary to direct

energy for a given cause (Deci and Ryan 2000). Ankrah et al (2009) noted that culture demands consideration because of the poor communication that characterises a multi-cultural environment. Its implication is not usually favourable to the organisation, due to the fact that it induces rework (Jarkas 2015a). According to Skitmore et al. (2004), managers' behaviour in relation to communication is guided to a large extent by their level of competence, suggesting that individuals' understanding of the communication process and its barriers varies according to their culture. Several researchers have studied the impact of cultural differences involving communication (Loosemore and Al Muslmani 1999 cited by Kivrak et al. 2009). Communication is viewed as paramount in cross-cultural management because of the difficulties in conveying meanings between parties from different cultures (Skitmore et al. 2004). It has been explained as the manner through which workers get support and training, leading to attainment of excellence in performance (Cheung et al. 2011; Lynch 2012 cited by Oyewobi et al. 2016).

King and DeMarie (2014) noted that culture should be the underlying "musical turn" of an organisation for better performance (cited by Taylor 2015, p.28-37). Coffey et al. (2011) showed that a significant relationship exists between culture and the quality of performance of contractors in Indonesian construction companies (Oyewobi et al. 2016). Brook and Spillane (2016) found substantial reports suggesting the effectiveness of implementing quality control through organisational culture (citing Dick et al. 2008; Sampaio et al. 2012; Fonseca 2015). However, Oyewobi et al. (2016) noted that relatively few studies identify culture as one of the factors responsible for poor project performance, as seen in developing countries where lack of training of craftspeople is responsible for poor project performance (Uwakweh 2000 cited by Oyewobi et al. 2016). Moreover, Josephson and Hammarlund (1999) noted that poor workers' training is a major contributor to rework.

2.6.4.3 Management Style

A growing concern for motivating construction workers requires manager/management to understand the appropriate motivational concepts (Barg et al. 2014). Pathack (2005) affirms that management style conditions the effectiveness and performance of organisations. It shapes the approach by which managers deal with the people at work and exercise authority over subordinates in an effort to reach organisational goals (Quang 2002; Hartzell 2006). The effectiveness of management style is experienced in areas such as work coordination, workers' co-operation with

one another, behaviour and level of workers commitment. An effective use of these attributes reduces the amount of rework occurrence. As noted by Hammarlund and Josephson (1991), poor coordination is a major contributor to construction rework. Ng and Price (2010) identified 18 site coordination problems and 16 essential causes of problems leading to poor site coordination in building projects from the literature review and advice from experienced industrial practitioners. Grouping the coordination problems produced three categorisations: staffing related causes; technical related causes; and management system related causes. It was concluded that main contractors should focus their efforts on management systems in relation to handling the subcontractors. Smithers and Walker (2000) noted that long hours and nonrecognition for work completed contributes to demotivation, a major cause of rework, on the construction site. Studies have shown that managers need to develop healthy worker attitudes by administering praise, building respect, and satisfying self-fulfilled needs (Hazeltine 1976 cited by Barg et al. 2014).

Maloney and McFillen (1987 cited by Barg et al. 2014) stressed the importance of managing variables relating to craftspeople, such as stability of employment, staffing, team building, goal setting and incentives. A study by Mansfield and Odeh (1989) revealed that better management of people is very important in the success of a project. In addition, Love et al (1997 cited by Jarkas 2015a) found that people are one of the fundamental causes of rework. Furthermore, Jarkas (2015a) noted that poor management contributes significantly to construction rework (citing Josephson and Hammarlund 1999). A recent study shows that an authoritarian approach by management is an outdated and ineffective way of achieving a given task successfully (Hancock 2006 cited by Barg et al. 2014). Hancock proposed that managers, when designing a motivation programme, should understand elements of human behaviour, factors influencing behaviour, motivators and demotivators, the uniqueness of the industry/project, and the needs of construction workers, in order to execute a successful project.

The impact of local attributes (i.e. work environment, culture and management style) has confronted construction managers with varying challenges such as motivating construction workers to achieve the desired goals, dealing with culturally diverse project teams, and finding an effective leadership and managerial approach to coordinating these teams. An area of concern in UAE construction is the implementation of QM and RRM which has hindered improvement in the construction industry, particularly on-site. The local attributes are essentially at the core of the

problem of craftspeople's motivation in relation to rework. QM and RRM have been reviewed to understand their significance in achieving a rework-free project delivery while considering the craftspeople's concerns. Since craftspeople are at the centre of construction operations, they constitute an important element in curtailing rework. Identification of factors influencing craftspeople's motivation in building construction projects, thus affecting the project's level of rework, needs to be understood. Thus the study seeks to answer the research questions:

1. Why would the understanding of craftspeople's motivation help to address the issue of rework in building construction projects?

Sub-Questions

a. What are the factors influencing craftspeople's motivation?
b. What kind of motivational driving factors affects the level of rework?
c. Why is it important to understand the types of craftspeople's motivation?
d. What is the impact of rework on project performance?

2. How can the facilitation of craftspeople's motivation enhance project performance?

2. 7 Summary

In summary, this section has defined project and shown its importance to the construction industry. The significance of craftspeople in relation to rework was described. An explanation of rework and its negative impact on project performance was presented. The limitations of QM and RRM in improving overall project performance was linked with its implementation. Its challenge is largely human related, resulting from motivation, management commitment, culture, and empowerment.

A review of motivation in the construction industry suggests that craftspeople's motivation in this context is claimed to be very important because of their close involvement and their central position in delivery of quality projects. Nevertheless, the associated dynamics of factors affecting the craftspeople remains a concern. In the next chapter, a theoretical framework for understanding the influence of those factors on craftspeople's behaviour in relation to the project's level of rework, and its impact on project performance, is described.

Chapter 3.0: Theoretical Framework

3.1 Introduction

In previous chapters, what constitutes rework in construction projects and how its overall effects impact on project performance (Jarkas 2015a) was described. It was argued that the behaviour of craftspeople whose motivation is not perceived to be arising from individual needs, causes quality failure which brings about rework in the construction industry (Brooks and Spillane 2016). Questions as to what undermines craftspeople's motivation and prevents them from performing optimally to deliver a rework-free product formed the research gap identified within this study, particularly for contractors in the construction industry. Many motivation theories have been brought to bear on these questions, but their use in the construction sector has been questionable, unlike other sectors such as manufacturing and service industries, where they have been seen to be workable (Aina 2014). The purpose of the study is to understand how facilitation of craftspeople's motivation would address the project's level of rework in building construction projects. As such, research into the setbacks experienced by motivation theories was reviewed, and the study considered the use of self-determination theory as a promising motivation theory for the construction domain.

3.2 Reviews of Motivation Theories in Construction Domain

Application of motivation techniques in the construction industry is rooted in some of these theories, such as Maslow (1943), Herzberg (1959), Vroom (1964), and McGregor (1960), which underlie such practices in the service and manufacturing industries (Aina 2014). For instance, Vroom's expectancy theory was proposed in the construction domain following surveys administered to construction workers on the importance and satisfaction of various job-related factors (Maloney and McFillen 1986). Based on selected factors such as work, supervision or leader behaviour, and incentives, a conclusion was reached that contractors must manage their work crews in terms of planning, organising, staffing, directing, and controlling so as to increase worker performance and satisfaction. Nevertheless, it was discovered that these earlier research

efforts lacked clarity and rigour in selecting factors, used a limited number of factors, and demonstrated a misunderstanding of motivation theories and concepts (Raoufi and Fayek 2015).

Similarly, Ogunlana and Chang (1998) investigated the application of Maslow's theory to construction sites in Thailand, but the result showed that the theory was not a true reflection of the situation. It was not empirically supported in relation to construction worker behaviour, hence calls for caution in its usage. Furthermore, a clear boundary between motivating and hygiene factors in Herzberg's theory does not exist when applied in the construction industry. It was thought that those definitive categories do not adequately represent the feelings of those currently employed in the construction industry, and the boundaries between them are much more vague than Herzberg proposed (Ruthankoon and Ogunlana 2003). Assessing Magregor's theories, Maloney (1981) concluded that the theories are fundamentally wrong in proposing a "best" way of motivating workers and rigidly categorising workers as X and Y. Maloney claimed that since individuals differ in their behaviour, it is expected that their behaviour be rather conceived as a continuum of the assumptions made in both theories (Aina 2014). Raoufi and Fayek (2015) discovered gaps and shortcomings in motivation theories, but their study failed to recognise the elevation of self-determination (SDT) from an individual basis to a universal level, resulting in the use of two or more contemporary theories in the investigation of its study.

Consequently, these theories have been classified under two headings: content and process (Langford et al. 1995; Aiyetan and Olotuah 2006; Aina 2014). Content theories are concerned with what is within an individual that generates behaviour; they examine the specific nature of the driving force in an individual. Process theories result from more contemporary views of empirical studies, and investigate how motivation can be sustained (Aina 2014): by addressing the basic needs of individuals. With quality levels and interpretations within the construction industry differing across regions and nations, it is recognised that local practices, industry culture and contextual agreements influence the incidence of rework (Jarkas 2015a) and impact on the needs of craftspeople. However, the concept of needs and need satisfaction in these theories differs from that of self-determination theory (SDT), which is grounded in an organismic perspective on human nature and motivation (Sheldon et al. 2003).

The SDT concept recognises that organismic perspectives assume humans are inherently motivated to develop their interests and skills, to connect and contribute to other people, and to move towards their fullest potential; in other words, the energy and impulse to grow and develop are innate. However, this perspective also asserts that the growth impulse is easily derailed or distorted, if environments (i.e. local practices such as work environment, culture and management style), or people's own inner processes, do not support it. It is on this basis that the study is concerned with understanding craftspeople's motivation in relation to rework and facilitating their motivation towards better project performance.

3.3 Importance of SDT to Work Domain

An important aspect of SDT is its differentiated view of motivation. While most other motivation theories view motivation as a unitary concept that varies in amount, SDT emphasises that different types of motivation relate to different quality outcomes. An important distinction between SDT and other theories of work motivation is between intrinsic and extrinsic motivation (Olafsen, et al. 2018). Intrinsic motivation refers to motivation that stems from interest and enjoyment in the activity itself. Intrinsically motivated behaviour concerns interest and enjoyment in engaging in the job itself, rather than for a separable outcome. On the other hand, extrinsic motivation is engagement in an activity on the basis of benefits to be derived from engaging in such activity (reward) or to avoid punishment as a result of not engaging in it. The distinction between SDT and other motivation theories is based on SDT's recognition of different categories of extrinsic motivation. This emphasis distinguishes SDT as a more promising work motivation theory, because not all work is intrinsically motivating, yet relying simply on external contingencies has not worked effectively for promoting high-quality performance and well-being (Cerasoli et al. 2014).

SDT takes into account both an individual's optimal functioning and malfunctioning, and reviews the conditions which stimulate the former or elicit the latter (Ryan and Deci 2000a). Given that motivation is a human-related attribute, SDT seeks to understand the human capability factors which if not satisfied would bring about human errors leading to rework. The tasks of correcting errors and attending to changes in scope, quality deviations and non-conformances are commonly

referred to as rework, which is a wasteful and non value adding activity (Love et al. 2016). According to Christ et al. (2012), some degree of regulation is required over the people who try to control this environment, to ensure compliance with laws and regulations (Brooks and Spillane 2016). The construction industry is believed to be a highly contingent and unpredictable sector (Clegg et al. 2002). Despite this, rework costs that are implicitly accommodated within a project's cost contingency is viewed by Baccarini and Love (2014) to be unacceptable to clients, consultant and contractors alike when stated explicitly. Thus, rework renders consultants and contractors potentially uncompetitive (Love et al. 2016b). The literature review reveals that human errors occur due to physiological or cognitive limitations (Love et al. 2010; Aljassmi and Han 2014; Love et al. 2016; Love et al. 2019). They involve a sort of a deviation: whether from an intended course of action; from a route of actions planned toward a desired goal; or a deviation from the "right" behaviour at work (Busby and Hughes 2004).

3.4 Limitations of SDT

Despite the fact that SDT is considered a theoretical base for examining craftspeople's motivation in relation to a project's level of rework, it is recognised that SDT research studies have certain limitations. There has been limited research examining the theoretical relevance of the individual needs and individual motivation types which are of concern in this study. This shortfall has helped to direct the research design. SDT has gained wide acceptance as a work motivation theory which leads to a host of favourable outcomes, such as well-being and performance (Deci and Ryan, 2000; Gagne and Deci 2005) and is increasingly popular in practitioner-focused literature (Pink, 2009). However, SDT cannot be generalised across all work environments, due to several significant reasons. Across a wide range of psychological fields the concern for different forms of motivation and psychological and behavioural outcomes have been tested. This has revealed that autonomous motivation and controlled motivation lead to very different outcomes, with autonomous motivation tending to yield greater outcomes and better performance (Gagne and Deci 2005). Questions surround the different individual motivation types (extrinsic).

Much research has focused on intrinsic/extrinsic or autonomous/controlled distinctions rather than individual or group motivation types. SDT has been analysed in many fields using a variety of different scales. Those included in the Relative Autonomy Index (RAI) weighted motivation types according to their positioning on the continuum (e.g., Lam and Gurland 2008). These have

sometimes been combined into two subscales; autonomous (intrinsic and identified) and controlled (introjected and external) (Parker et al. 2010; Van der Broeck et al. 2010). Others have taken a "person-centred" approach, using cluster analysis to identify motivation profiles, such as (a) high autonomous/high controlled, (b) high autonomous/low controlled, (c) high controlled/low autonomous and (d) low autonomous/low controlled (Ratelle et al. 2007). Various studies support more autonomous forms of motivation relating to better performance (Amabile et al. 2005; Baard et al. 2004), but some researchers are particularly interested in the context of work (Koestner and Losier 2002).

Arguably, many work tasks are by their nature not intrinsically interesting, and their study would suggest that internalised extrinsic motivation might encourage higher performance in such contexts. Based on a study by Koestner and Losier (2002), performance was a measurement of the researcher's assessment. In other studies, such as field-based organisational studies, data is often available from organisational records, though objectivity is always of concern (Bol and Smith 2011; Bommer et al. 1995). Moreover, in the construction sector, SDT application has been limited to basic psychological needs theory (BPNT) to understand motivation and quality control. However, further research was recommended as a result of the single use of BPNT to understand the complexity surrounding the motivation of construction workers (Brooks and Spillane 2016). There is a need to investigate more SDT micro-theories to understand this phenomenon.

3.5 Self-Determination Theory (SDT)

To begin with, SDT starts from the premise that the natural inclination and progression of humans is towards psychological growth, internalisation, and well-being, and that humans act on, and are acted upon by, the environment in ways that differentially facilitate or hinder the realisation of this natural progression (Deci and Ryan 2000). Furthermore, SDT demonstrates that the satisfaction of three basic psychological needs - autonomy, competence, and relatedness - are essential for individuals to achieve psychological growth, internalisation, and well-being (Deci and Ryan 2000). Specifically, having one's needs satisfied leads to more autonomous forms of motivation (i.e., identified and intrinsic motivation) and improved mental health and well-being. In contrast, unnecessary control can undermine autonomy by creating a perceived external locus of causality.

Thus, basic psychological needs are arguably the most important constructs within SDT, and form a sub-theory called Basic Psychological Needs Theory (BPNT). Much empirical and experimental work in SDT has focused on delineating which characteristics of intrapersonal, social and task environments enhance or detract from the desire to grow and develop, and thus enhance or detract from positive outcomes such as persistence, creativity, flexibility, well-being, and happiness (Lyubomirsky et al. 2003) that are needed to deliver a project successfully. Being a macro-theory, SDT captures motivational complexity through other mini-theories such as Organismic Integration Theory (OIT), to examine the differential effects of qualitatively different types of motivation that can underlie behaviour (Deci and Ryan 2000). SDT is a formal theory that defines intrinsic and varied extrinsic sources of motivation, and describes the respective roles of intrinsic and types of extrinsic motivation in cognitive and social development and individual differences. Craftspeople's motivation in relation to rework is examined on this basis using the concepts of these mini-theories BPNT and OIT.

3.5.1 Basic Psychological Needs Theory (BPNT)

SDT assumes that all individuals have three universal and evolved needs - autonomy, competence, and relatedness - which foster intrinsic motivation and internalisation (e.g., Baumeister and Leary 1995). When the three needs are satisfied, individuals are motivated by their own internal nature to perform. Autonomy means the need "to be self-regulating, to be the maker or at least the owner of one's choices" (Sheldon et al. 2003, p. 366). Competence means the need "to be effective in what one does, mastering new skills in the process" (Sheldon et al. 2003, p. 366). Finally, relatedness means the need "to feel connected and in sympathy with at least some others" (Sheldon et al. 2003, p. 366).

SDT characterises basic psychological needs in two ways that render it unique in comparison to other needs theories. Needs are viewed as innate, and needs must promote psychological growth, internalisation, and well-being (Deci and Ryan 2000). First, within SDT, needs are conceptualised as innate fundamental propensities all individuals possess (Ryan and Deci 2000a), much like physiological needs (Van den Broeck et al. 2016). As a result, SDT focuses on need satisfaction rather than need strength, which is the focus in other motivation theories. Second, SDT is unique among needs theories in that it provides objective criteria for considering some constructs but not others as "basic psychological needs". Within SDT, basic psychological needs are those critical

conditions that enable the expression of our natural inclination towards psychological growth, internalisation, and well-being (Deci and Ryan 2000, p.229). Basic psychological needs in SDT are thus primarily determined via inductive processes. Constructs are classified as needs when enough evidence exists to suggest that satisfaction of the need contributes to psychological growth, internalisation, and well-being over and above other established needs.

3.5.2 Organismic Integration Theory (OIT)

Sheldon et al. (2003) noted that earlier research in SDT focused on intrinsic motivation. However, some desirable behaviours, such as many important but boring or aversive work-tasks, are not intrinsically motivating. The OIT posits that there are various degrees of externally regulated motivation, from external to introjected, identified, and integrated motivation (Ryan and Deci 2000a). At the least-autonomous end of the extrinsic motivation continuum of autonomy, externally regulated individuals perceive their behaviour as being directly controlled by others, often through contingent rewards and threats. Introjected behaviour is self-controlled through processes of self-esteem, ego-involvements, and guilt, as well as concern with status and recognition. A more autonomous form of behaviour is seen in identified regulation, where individuals have personally identified with the importance or value of their work roles and behaviour. Because this behaviour is an internal acceptance of the rationale of acting, it tends to be more autonomous, and thus more sustained. Lastly, at the far right of extrinsic motivation on the continuum is integrated regulation, said to be the most mature and volitional extrinsic motivation. Being integrated in ones behaviour brings a wholehearted engagement focused on the accomplishment of a target without inner barriers or conflicts (Deci et al. 2017). However, the OIT concept maintains that progress along this continuum (i.e. achieving an internalised state), which is shown in Figure 3.1, is only possible when the basic psychological needs of competence, autonomy and relatedness are fulfilled (Ryan and Deci 2000a).

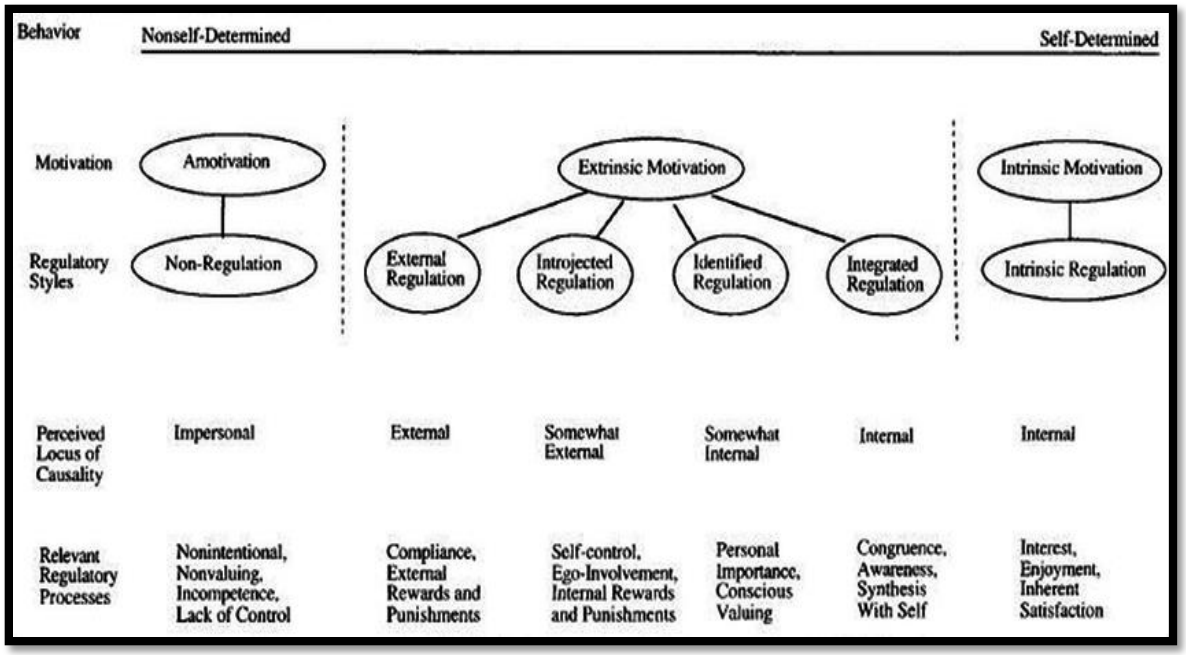


Figure 3. 1 The Self-Determination Continuum Showing Types of Motivation with their Regulatory Styles and Corresponding Processes (Adapted from Deci and Ryan, 2000)

The degree to which individuals are motivated on the basis of these externally regulated motivations depicts the quality of motivation that can be exhibited by the craftspeople. Many social-cognitive motivation theories focus on the distinction between amotivation and motivation (Sheldon et al. 2003). For example, does the person feel helpless, or are his/her actions guided by stable intentions? The theory attempts to predict the strength of people's intentions or the quantity of their motivation. This perception may be understandable given the importance of "motivation versus no motivation". However, SDT proposes that it is also important to address the "quality" of a person's motivation, an issue that is typically not considered within expectancy and utility theories (Sheldon et al. 2003). As argued earlier in this thesis, there is a need to manage this perspective in order to understand the craftspeople's motivational influence in relation to a project's level of rework and project performance.

Extrinsic motivations vary in the degree to which individuals have internalised and integrated the reason for behavioural engagement, that is, the degree to which they experienced the reason for a particular action as part of their self, as studied in this thesis. Originally, the consideration of "quality" is viewed as not more than a distinction between intrinsic and extrinsic motivation

(Sheldon et al. 2003). Amotivation is usually indicated at the far left end of the continuum as shown in Figure 3.1. All forms of extrinsic regulation, even the most controlled, involve intentionality and motivation, so amotivation stands in contrast to intrinsic and extrinsic motivation, for it represents the lack of both types of motivation and thus a complete lack of self-determination with respect to the target behaviour (Deci and Ryan 2000).

The SDT (using BPNT and OIT) is considered in relation to the craftspeople's needs and the reduction in the project's level of rework so as to deliver project to success within the construction industry. This is reviewed in the next section in the light of the influence of local practices such as work environment, culture, and management style on the craftspeople.

3.6 Study Framework – SDT (using BPNT and OIT)

Environmental influence plays a significant role in initiating different behaviour within the construction industry. The cost of rework varies from country to country, depending on the local practices (Jarkas 2015a) within which the craftspeople operate. SDT postulates that the environment affects motivation through its influence on the individual's perception of autonomy, competence and relatedness, which in turn, leads to consequences (Nicholis 1984; Vallerand 1997; Ryan and Deci 2017). The complexity factor associated with building construction project impacts on motivation. Deci and Ryan (1987) observed that socio-cultural context plays a significant role in the initiation and regulation of behaviour. Thus, a person assign meaning to various salient environmental factors which in turn greatly influence his or her behaviour. In this study, the environmental influences considered were work environment, culture and management style, as explained in the literature in (Section 2.6.4). Therefore, the use of SDT is utilise to explain and predict how facilitating craftspeople's motivation can improve the project's level of rework in a complex building construction project. Thus, supporting an individual's psychological needs promotes more autonomous motivation (i.e. intrinsic, integrated, identification), which predicts better performance. Thwarting these psychological needs results in more controlled motivation (i.e. introjected and external), which is more likely to result in negative outcomes. This is expressed in the theoretical framework shown in Figure 3.2.

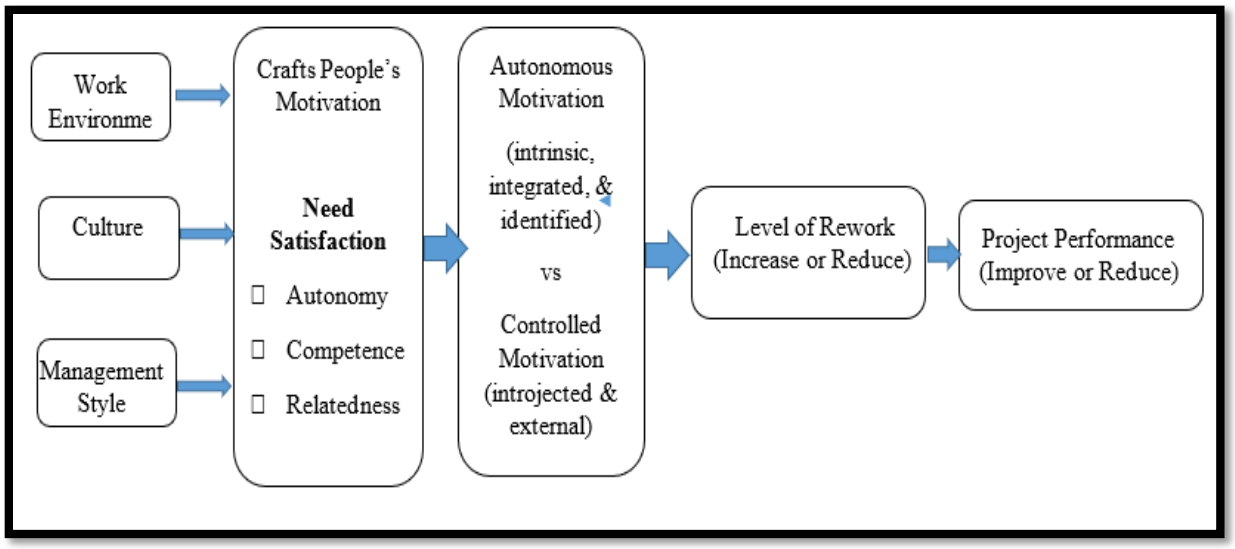


Figure 3. 2 A Theoretical Framework of Craftspeople's Motivational Influence on Rework and Project Performance

The framework identifies the triggering local practices such as work environment, culture, management style as proposed in (Shepherd and Suddaby 2017). These triggering factors are indicated within the construction environment and they are reviewed below (Section 3.6.1). An important concept of this framework is that it is grounded in quality rather than level of motivation, in contrast to other motivation theories in the construction industry. The framework also specifies the different behaviours along the motivation continuum (external, introjected, identified, integrated, and intrinsic) that are expected to produce a self-determined motivation which enhances performance and thus reduces rework. The assumptions of the framework are a) that craftspeople are affected by local practices (work environment, culture, and management style) within their construction environment; (b) the effect of each of these attributes results in various factors influencing the craftspeople's motivation; (c) the basic universal needs (competence, autonomy, relatedness) act as mediating elements on the craftspeople to predict motivation types; (d) the implied craftspeople's motivation is associated with producing either a positive outcome (autonomous) or a negative outcome (controlled), on the basis of assessment of the current level of self-determination which influences their behaviour. It is argued that this framework, building on the existing theory, could lead to an improved motivational rework reduction model that could spur craftspeople to perform better.

3.6.1 Attributes Influencing Construction Craftspeople's Motivation

Love et al. (2019) explained that the individual's cognitive ability can be impaired by constraints and demands imposed by the environment within which a project is delivered, as well as the nature of tasks and associated conditions they have been exposed to during the construction process. The complex nature of construction projects also increases their propensity to incur rework (Love et al. 2019). The level and interpretation of quality differs between regions and nations, and it is recognised that local practices, industry culture and contextual agreements have significant influence on the incidence of rework (Jarkas 2015a). Many researchers have claimed there is more time and cost variance in building projects than in other construction projects (Ramanthan et al. 2012; AbdulRahman et al. 2012; Memon et al. 2010 and Jamaludin et al. 2014). This study considers the construction environment in three main areas: work environment, culture, and management style, in relation to the construction concept of BPNT and OIT. These factors have been examined in the existing literature in order to explore their components.

3.6.1.1 Work Environment

Barg et al. (2014) noted that the work environment is not free from organisationally imposed constraints, and assesses whether the workers possess the necessary skills, ability, and knowledge. Jarkas (2013) defines the work environment as one where employees perform tasks and work every day. As a result, for the purpose of this study, work environment is express as the place where workers carry out their daily task under an imposed constraints. It was found that one-third of construction workers derive growth from their profession and this serves as a form of motivation. Work pressure causing boredom can arise when a person is either prevented from doing what they want to do or forced to do what they do not want to do (Love et al. 2019). It was observed that the quality of workers motivation is used to assess whether current estimates of performance levels are realistic enough to determine which actions are necessary.

External factors acting on the work environment have a great impact on craftspeople. For instance, time constraints (i.e. schedule pressure) imposed by clients without considering the impact on design-related activities places pressure on individuals to omit tasks to achieve a planned goal (Eden et al. 2005). A similar scenario is found in the construction process, when limited resources have been provided to supervise construction activities, and when subcontractors are presented

with over-optimistic schedules to complete their works (Love et al. 2016b). The output is an action or decision that can manifest as either a positive or negative outcome within a project. If no error occurs, then a task is successfully completed. If an error is detected, an NCR may be issued, which may need to be corrected (Love et al. 2019). Inability to enhance a worker's skill through effective feedback from supervisors is one of the major contributors to rework (Josephson and Hammarlund 1999; Shinde and Kulkarmi 2016). As such, supervision is a critical component of the work environment.

According to Deci et al. (1989) and Spreitzer (1995), job autonomy offers employees the freedom to determine their daily time plans, take initiatives, and make judgments in carrying out their work (Ju et al. 2019). Work environments with undue external control and regulation have been shown to shift the workers' perceived locus of causality (Brooks and Spillane 2016). The workers become less interested in the work itself, but are focused on meeting the targets of the regulatory regime and avoiding penalties (Ryan and Connell 1989; Gagne and Deci 2005). Their feelings of competence are undermined as their output is closely examined for faults. Their perception of autonomy is lowered; they are clearly not trusted to work without observation and control. The workers in this environment are likely to have either extrinsic or introjected motivation, which underpins the organismic integration theory of SDT as proposed in this study**.**

This is congruent with controlled motivation (Ryan and Deci 2000b). Controlled forms of motivation, which by definition are not autonomous (i.e., they lack volition), are predominant when the activity is perceived primarily as a means to an end, and are typically associated with goals such as avoiding punishment or receiving a tangible reward (Gagne and Forest 2008). Furthermore, Deci and Ryan (2000) noted that when an individual feels a secure connection with others and feels accepted as part of a group, they experience psychological stability and well-being (Brooks and Spillane 2016). Thus, the need for belonging is met when working in a supportive environment with actions perceived as contributing to the benefit of the group (Riketta and Van Dick 2005).

3.6.1.2 Culture

Earlier studies by Alvesson (2002) and Smith (2003) were instrumental in popularising the notion that certain cultural orientations lead to organisational effectiveness and strong performance. However, empirical studies to confirm the relationships between culture and performance have been relatively limited, and generally not well received (Wilderom et al. 2000). This has been largely attributed to the difficulties in achieving a generally accepted definition of culture and methods of examination. It is recognised that cultural perspectives need to be properly defined to express the context covered within the study in order to be considered valid (Ankrah 2007).

Many researchers have focused on organisational culture and its impact on project performance. This study broadens the cultural horizon to include the impact on the wider environment, such as the cross-cultural norms of the people working within a country and the organisational culture where workers carry out their tasks. Although, culture is defined as "the collective programming of the mind that distinguishes the members of one group or category of people from another" (Hofstede 2001, p.9). Nevertheless, this study adopts Kivrak et al. (2009) definition, which argued that corporate culture includes "characteristics of the industry, approaches to construction, the competence of craftspeople and people who work in the industry, and the goals, values and strategies of the organizations they work in" (p.43). Being a project-based activity, construction involves bringing together various resources to achieve a specific short-term objective (Fellows et al. 2002; Turner 2006). Complex projects involve interactions among a number of bodies, usually from diverse national backgrounds and cultural contexts. Their cultural problems have been associated with misunderstandings, increased transaction costs, friction between project participants and coordination and communication difficulties (Zhang and Liang 2008). This situation is more pronounced among craftspeople across different trades working on the project, due to the fragmented nature of building construction projects.

Despite the many challenges confronting the construction industry with regard to culture, a recent study conducted by the Construction Industry Institute [CII] (2013) reported that one of the major concerns of construction professionals is the lack of understanding of foreign cultures, ethics, and languages (Choi et al. 2015). The study by Ng et al. (2009) noted that culture prescribes stronger behavioural norms for in-role behaviours (i.e. job-related tasks) than for the extra-role behaviours

included in contextual performance. Consequently, the moderating effects of culture may be more likely when task performance is the focus (Ng et al. 2009). Therefore, examining how error causes rework is integral to the development of an organisation's culture, as dealing repeatedly with past errors and mistakes can lead to new problems being resolved and therefore contribute to its progression and maturity (Love et al. 2019). These aspects of workforce orientation have been linked to greater goal commitment and motivation (Maloney and Mcfillen 1986; Smithers and Walker 2000). As found in Leung et al. (2004) the greater the goal commitment, the greater the satisfaction of participants which can be achieved through competence, autonomy and relatedness.

3.6.1.3 Management Style

Management style is seen as how management is achieved. It is defined as a function of behaviour associated with personality (McGuire 2005) and is understood as a way to manage an organisation (Nwaduke and Timinepere 2012; Olatunji 2016). It is not a procedure, but a framework. It has great influence on craftspeople's motivation, and its effect can be shown in the performance of work. Olatunji (2016) recognises factors influencing management style including specific goals people are to achieve, organising the work situation, setting deadlines, providing specific direction, and good relationships. Love et al. (2019) noted that 'errors arise when people are overworked or apply stored and standard routines and rules to inappropriate situations'.

People tend to break rules to make work more efficient or the decisions they make become a trade-off between the information presented to them and the often-limited time to attend to a task (Love et al. 2016a). The study by Smithers (2000) and Love et al. (2016) noted that improving management style will enhance worker motivation and reduce rework. Tuuli and Rowlinson (2010) explained that a project manager's leadership style can influence a project's outcome and the project team's ability to learn and adapt to change. Management style is therefore central to ensuring a culture of collaboration within a project (Lloyd-Walker and Walker 2011; Love et al. 2016b).

3.6.2 Motivation and Emergence of Rework

Within the domain of organisational research, basic psychological needs theory has been used across a variety of topics, including leadership (Yoke Lian et al. 2012), organisational politics

(Rosen et al. 2014), employee well-being (Deci et al. 2001), person-environment fit (Greguras and Diefendorff 2009), job design (Van den Broeck et al. 2008), and proactive personality (Greguras and Diefendorff 2010). The study by Deci and Ryan (2011) reported its application in sport, healthcare, education, parenting, politics and religion. However, its use has been limited in construction management, especially areas involving rework. Although Brooks and Spillane (2016) applied SDT via BPNT in the area of control and motivation in the construction industry, they concluded that further research was needed. Building on the macro-theory of SDT using two mini-theories of BPNT and OIT, craftspeople's influence is explained via the autonomous and controlled motivation perspective with respect to their motivation and the occurrence of rework in construction projects.

According to Baccarini and Love (2014), rework costs are accommodated implicitly within a project's cost contingency, but an explicit allowance for it is unacceptable to clients and contractors, because it is deemed a process that should not occur (Love et al. 2016b). Brooks and Spillane (2016) argued that the quality management policy of the contractor determines the quality outcome of the project. Quality management has become 'reified' and accepted as rational 'best practice', while potential downsides and ethical implications of its implementation have been ignored (Brooks and Spillane 2016). For instance, Al-Sabek (2015) noted the challenges in implementing QMS in UAE as relating to lack of effective realisation of the quality concept. Various approaches to reducing rework in the construction industry, such as visualisation enabled technologies like BIM, have faced challenges in the UAE due to lack of standardisation, resistance to change, shortage of expertise, and lack of top management commitment (Mehran 2016). As discussed in Section 2.6.4, the occurrence of rework is greatly influenced by local practices such as work environment, culture and management style (Jarkas 2015a) Indeed, contractual tenders that include cost, time, and disruption due to rework render consultants and contractors potentially uncompetitive (Love et al. 2016a). In this case, SDT suggests that autonomy supportive environments will enable workers to internalise rules and regulations that are meaningful for them (Gagne and Deci 2005). Recent empirical studies have shown that intrinsic motivators are not only important but also more effective than extrinsic motivators in situations such as the complex work environment of construction, where direct incentive effects are more challenging to facilitate (Cerasoli et al. 2014; Feldman 2011; Frey et al. 2013; Gardner 2012). However, it may be a

simplification to ignore the potential range of motivated behaviour. There has been strong empirical support for this suggestion (Deci and Ryan 2002). In the OIT concept, along a continuum of motivation, five types of motivation are arranged from more controlled to more autonomous. A more autonomous form of motivation is considered better because of its associated positive behavioural and psychological outcomes (Gagne and Deci 2005), whereas a more controlled form of motivation is considered to be poor, since it is associated with negative behavioural and psychological outcomes (Gagne and Forest 2008). The self-determination movement takes a cognitive approach which assumes that active thought processes determine behaviour. Thus, it rejects mechanistic, behaviourist methods where humans are assumed to be predictable and controlled by external forces, and will merely process and respond to external stimuli (Brooks and Spillane 2016).

In traditional theories, work motivation is conceptualised as intrinsic or extrinsic. Intrinsic motivation occurs when an individual finds an activity satisfying in itself – when the activity is undertaken with no thought for external reward. The theory of intrinsic motivation starts with the concept that man has a number of basic psychological needs (competence, autonomy and relatedness) which are 'essential nutrients' to optimal psychological functioning (Deci and Ryan 2011 p.19) and are universal. Environments which support these needs will enhance self-motivation and enhance well-being, social functioning and optimal development. Not meeting a psychological need will lead to an increasing desire to meet it. In the case of extrinsic motivation, an activity is performed for instrumental reasons, or to obtain some outcome separable from the activity per se. The concept of SDT, using BNPT and OIT, acknowledges the motivational impact but considers the continuum of motivation as a way to build more nuance into the motivational outcomes of the project's rework level. Thus SDT it is used, as discussed in Section 2.6.4, to examine craftspeople's motivation in relation to rework and project performance.

For example, when a person engages in an activity to gain a tangible or social reward or to avoid disapproval, they are extrinsically motivated. However, SDT conceptualises qualitatively different types of extrinsic motivation, which themselves differ in terms of their relative autonomy. Some extrinsic motives are relatively heteronomous, representing what in SDT are described as controlled forms of motivation. For example, externally regulated behaviours are those performed

to comply with externally administered reward and punishment contingencies. Also controlled are extrinsic motivations based on introjected regulation, where behaviour is driven by self-approval. Controlled forms of extrinsic motivation are expected within SDT to sometimes regulate (or motivate) short-term behaviour, but not to sustain maintenance over time (Deci et al. 2017). Yet not all extrinsic motives are controlled. When a person engages in an activity not because it is inherently fun or satisfying (intrinsic motivation), but rather because it is of personal value and utility, it can represent a more autonomous form of behavioural regulation.

SDT using BPNT and OIT explains what promotes more autonomous behaviour and considers the propensity by which motivation can be thwarted, which should explain the project's level of rework. Thus, SDT serves as a more promising human motivation in the construction domain, especially as it concerns the issue of rework in complex building construction projects. As such, the first main research question aimed at discovering why the understanding of craftspeople's motivation would help to address the issue of rework in building construction projects. This was addressed through four sub-questions (1a to 1d), where sub-question asked (1a) what are the factors influencing craftspeople's motivation. Sub-question looked at (1b) what kind of motivational driving factors affecting the level of rework. Using a systems thinking approach that bolsters the ability to understand qualitative descriptions of causes and the effects of those factors as a whole, using the causal loop diagram (CLD) and feedback loops identified within the system. Sub-question investigated (1c) why is it important to understand the types of craftspeople's motivation. Sub-question confirmed (1d) what is the impact of rework on project performance? Using the company's information to triangulate subjective information. The second main question focused on how facilitation of craftspeople's motivation could enhance project performance by reducing the project's level of rework.

3.7 Linking the research questions and empirical study

The research questions outline in section 3.6.2, relate the concern of the thesis. The first main research question is expected to be addressed by answering the four sub-research questions through (1a-1d), which would help to understand the main reason behind understudying craftspeople's motivation with respect to the project's level of rework. This is expected to look into the

behavioural and psychological outcomes that is associated with each of the motivation types. The second main research question will lead to the development of a framework for practitioners to be used to improve the project's level of rework through facilitation of craftspeople's motivation positively. Achievng this focus is examined within SDT concept using the two micro-theories (BNPT and OIT) through which the research questions are explored, taking into account the new domain (building construction project) in which they are being administered. A summary of the research question addressed by the empirical study is shown Table 3.1:

Table 3. 1Summary of the research questions linked with the empirical study

Explored (Chapter)	Research Questions	Data Collection Method
Chapter Four	RQ 1: Why would the understanding of craftspeople's motivation help to address the issue of rework in building construction project?	
	1a: What are the factors influencing craftspeople's motivation?	Interviews
	1b: What kind of motivational driving factors affects the level of rework?	Interviews
	1c: Why is it important to understand the types of craftspeople's motivation?	Interviews
	1d: What is the impact of rework on project performance?	Interviews and Document reviews
	RQ 2. How can the facilitation of craftspeople's motivation enhance project performance?	Interviews and Document reviews

The empirical study is triangulated such that interviews with the participants is supplemented by document reviews as noted by (Maxwell 1996).

3.8 Summary

Central to this chapter are the benefits of SDT to improving craftspeople's motivation, which can help address the issue of rework in building construction projects. An introduction to the problem of rework was initiated, and the craftspeople's impact was described. Motivation theories were reviewed, and their drawbacks in the construction industry were highlighted. The present study

will address these gaps in the literature by conducting a research into the use of SDT as a promising human motivation theory in the construction domain to explain the project's level of rework. Limitations and areas needing further research were noted. Then, SDT was introduced as the study framework using the micro-theories of BPNT and OIT to guide the conduct of this research. The triggering local practices that are most pertinent to the construction industry were covered in the study framework.

Chapter 4.0 – Research Methodology

This chapter presents the research methodology adopted for this study by explaining its suitability and justifying its use. It outlines the research philosophy that underlies this study, and then explores the research approach. This leads to a discussion of the researcher's interpretivist position and choice of qualitative approach. The next section discusses the rationale for the research design and strategy. This is explained in a discussion of the adoption of case study method and its justification. There follows an overview of data collection methods and analysis used for the thesis. The chapter concludes with sections on the limitations of the research, ethical considerations and researcher reflexivity.

4.1 Research Philosophy

Research philosophy has been described as the development of research assumptions, its knowledge, and nature (Saunders et al. 2007). Researchers have argued for different types of research philosophy (Saunders et al. 2007; Bryman and Bell 2011; Gephart 1999; Neuman 2005). Central to these types of philosophy is what underpinned research in social science. These are referred to as epistemological, ontological, and axiological positions. Ontology is the philosophical position about the nature of reality while epistemology focuses on what constitutes valid knowledge and how we can obtain such knowledge (West and Turner 2000; Oppong 2013). Furthermore, those authors described axiology as the philosophical position that addresses itself to the place of value in theory and research. In this study, three philosophically distinct categories are stated to be positivism, interpretivism and critical postmodernism (Gephart 1999). Without delving into philosophical arguments among the researchers, the assumption that drives this study adopts an interpretivist stance, and its epistemology and ontology position was looked into.

Interpretivism focuses on understanding actions/meanings rather than causes or historical experiences (Clough and Nutbrown 2007; Neuman 2005). It holds that reality can never be objectively observed from the outside, but needed to be experienced directly from the people. In addition, it posits that no universal laws can be established in the study of human behaviour or social sciences, whereas it is possible in natural sciences (Mack 2010). A central tenet of positivism is that researchers take a "scientific" perspective when observing social behaviour, with an objective analysis possible (Travers 2001). According to Babbie (2005), a positivist position tends

to be based on deductive theorising, where a number of propositions/hypotheses are generated for testing with empirical validation. Considerable amounts of data are required, which favours the use of quantitative methods for analysis of large-scale phenomena (Travers 2001). As such, a positivist is defined as the epistemological position that advocates working with an observable social reality. It employs a highly structured methodology to facilitation replication, and its outcomes is the result of a law-like generalisations (Saunders et al. 2009). Since this approach disregard for values, informed opinion, moral judgments and beliefs as noted by (Shadish 1995) makes it unsuitable as a research philosophy that will meet the purpose of this study. As such, positivism philosophical assumption was not considered.

Critical postmodernism is underpinned by "a force of liberation that engages an on-going conflict with the powers of oppression and seeks to bring about educational reform" (Reeves and Hedberg 2003, p.32). In this philosophical position, researchers assume that social reality is historically constituted and that it is produced and reproduced by people (Myers 2009). Though it proposed that people can consciously act to change their social and economic circumstances, critical researchers believe that such ability is constrained by various forms of social, cultural and political domination. In this way, it has some similarities with an interpretive approach, but it focus on transformation when oppressed participants perceive that it can change the status quo to their advantage. Critical scholarship seeks to transcend beliefs, values and social structures which are taken for granted, by making these structures and the problems they produce visible, encouraging self-conscious criticism, and developing emancipatory consciousness in scholars and social members (Kincheloe and McLaren 1994, p.138). Since this is not the focus of this study, the researcher did not consider taking this philosophical position.

In this study, the investigator seeks to understand how facilitation of craftspeople's motivation can improve a project's level of rework in building construction projects. Knowledge and meanings are acts of interpretation that can be expressed from the perceptions and experiences of the individual in a social setting. As such, an interpretivist stance might prompt a researcher to use inductive theory construction, reversing the deductive process by using data to generate or build theory. Researchers would observe aspects of the social world and seek to discover patterns that could be used to explain wider principles (Babbie 2005). In this case, no single reality exists;

rather, reality is based on an individual's perceptions and experiences (Robson 2002). For this reason, the focus is to analyse the various interpretations that individual actors give to their experiences in relation to the issue on rework, as observed by (Easterby-Smith et al. 2002). Qualitative methods underlie this philosophical position, as it helps provide subjective data necessary for interpretive meanings. Table 4.1 provides a summary of an interpretivist position.

Table 4. 1 Summary of Interpretivist Stance

Central Tenet	Descriptions
Purpose of research	How to facilitate the crafts people's motivation to improving the project's level of rework
Ontology	▪ Multiple realities exist in regards to the phenomenon ▪ The reality can be explore via interactions with human actors and constructing meanings from their perceptions and experiences ▪ It is necessary to discover how people make sense of their social worlds in the natural setting ▪ It is a representation of many social realities which exist due to varying human experience, including people's knowledge, views, interpretations and experiences
Epistemology	▪ The nature of events are understood through interpretations of perceptions and experiences influenced by interaction with social context ▪ The inquire and those inquired from are interlocked in an interactive process ▪ The data collected through an interactive mode and usually personal
Methodology	▪ The data collected via interviews, observations, archives, pictures, and reflective sessions ▪ The research is a product of the values of the researcher

4.2 Research Approach

There are basically two types of research approach: quantitative and qualitative. A quantitative approach requires testing objective theories by examining the relationship among variables using effect statistics such as correlations, relative frequencies, or differences between means. Basically, data is collected in numeric form and analysed using different statistical tools. According to Hughes (2006), quantitative research presents an obvious view of a plan and results which can be confirmed or denied. It uses a questionnaires, surveys and experiments that are used to obtain information which can be tabulated in numbers to allow a statistical analysis (Hittleman and Simon 1997). Stainback and Stainback (1988) listed three basic purposes of quantitative research: to describe, to compare and to attribute causality. It is usually associated with a positivist position, but disregards values being informed by opinions, moral judgments and beliefs (Shadish 1995).

By contrast, a qualitative approach focuses on areas which are difficult for quantitative methods to cover, such as values, perceptions, attitudes and experiences. Corbin and Strauss (2008) and Levitt et al. (2017) explained that qualitative methods are used to explore meanings and gain insights in a given situation. This is of significant relevance to the philosophical stance in this study. It is believed that the adoption of a qualitative approach in this study will produce holistic understanding of rich, contextual, and generally unstructured, non-numeric data, as proposed by Mason (2002), Bryman (2006), and Punch (2013), by engaging in conversations with research participants in a natural setting (Creswell 2009; Gentles et al. 2015). Despite criticism of its unstructured nature, it enables the researcher to develop a level of detail from high involvement in actual experiences (Creswell 2009). It uses a range of data collection techniques, such as interviews, documentary sources, texts, and observations, to achieve this purpose (Dudwick et al. 2006; Saunders et al. 2012; Gopaldas 2016). For this reason, it is adopted as the research approach in this study. Table 4.2 summarises the differences in quantitative and qualitative method.

Table 4. 2 Differences in Quantitative and Qualitative Methods

Stance	Quantitative	Qualitative
World views (i.e. Assumptions)	Single reality	Multiple realities
Research purpose	Facts is deduce from establishing relationship between measured variables	Understanding can be constructed through participant's perspective in a social context
Research methods and processes	▪ Set the procedure of investigation from the beginning ▪ Hypothesis is formulated at the beginning ▪ Uses deductive approach	▪ Unstructured and flexible ▪ Entails a changing research design ▪ Uses an inductive approach
Researcher's role	▪ Objective observer ▪ Can manipulates participants	▪ Subjectively engaged ▪ Cannot manipulate participants
Generalizability	▪ Generalizability is possible	▪ Generates analytical generalization

4.3 Research Design

The research design is a representation of the *logic or master plan* that illustrates how the study is to be conducted. This stage of the research shows the processes and strategies to be used, and at

the same time integrates all as a whole. An interpretivist position is adopted for this study, which seeks to understand how facilitation of craftspeople's motivation can improve a project's level of rework. It uses existing theories in the inquiry and seeks to explore the phenomenon. The research strategy for inquiring into this issue is case study. In the following sections, the case study design, case selections, population size, study participants, interview protocol, and pilot study are described.

4.3.1 Case Study Design

A case study method suits this inquiry because it focuses on "how" and "why" questions (Myers 2009). As a result of the interpretive position held in this study, the case study approach is considered appropriate for this research. It will provide the unique perceptions and concerns of the craftspeople's motivation in relation to project's level of rework. The case study design is appropriate in situations where it is difficult to separate a phenomenon's variables from its context (Yin 2003b). Case study is concerned with describing processes, individual or group behaviour in its total setting, and/or the sequence of events in which the behaviour occurs (Stake 2005). "Case study research consists of a detailed investigation that attempts to provide an analysis of the context and processes in the phenomenon under study" (Johnston et al. 1999, p. 203).

The study involves theory building, which case study supports (Yin 2009). This is particularly useful in areas where existing theoretical and conceptual frameworks are inadequate (Chetty 1996). Case study will play an important role in advancing the field's body of knowledge in this study because 1) facilitating craftspeople's motivation in relation to rework needs to be studied in its natural setting, (2) it is a contemporary issue, (3) the control or manipulation of craftspeople in this instance is not possible, (4) theoretical knowledge of the phenomenon under investigation has not been well developed (Benbasat et al. 1987).

Case study is considered a more appropriate strategy than other available options, such as ethnographic (a detailed portrait of a culture-sharing group), phenomenology (a detailed description of their experiences), narrative (a chronological narrative of an individual's life), action research (research in the form of field experiment), content analysis (systematic examination of facts), historical research (discovery of an issue or event over time), and grounded theory (a theory

generated from the data). These are commonly used in social science research (Creswell 2009; Hancock et al. 2009; Saunders et al. 2012), but are not focused on the concern of this study, and such have not been considered. In addition, case study demonstrates the practical application of research findings, and is used to explore and gain detailed understanding of a process, phenomenon or event in a real life situation.

Case study has faced criticism on the grounds of non-representativeness and lack of statistical generalisability. The richness and complexity of the data collected is open to different interpretations, and possible "researcher's bias" (Cornford and Smithson 1996). Despite these observations, Denzin and Lincoln (2000) argued that case studies can be generalised: "looking at multiple actors in multiple settings enhances generalizability" (p. 193). Furthermore, an analytical generalisability has been argued by Yin (2003a), where the researcher's aim is to generalise a particular set of results to broader theoretical propositions.

Case study can be used in both qualitative and quantitative research. Since the philosophical nature of this study supports an interpretive approach, which seeks to understand meaning from the perceptions and experiences of the actors in the social context, qualitative methods are adopted. Despite this view, several studies have shown the significance of a collaborative approach in data collection. For instance, Leonard-Barton (1992) adopts the use of interviews and archive documents. In case study, methods of data collection include direct observation, interviews, focus groups, documentary sources, and archival records (Mouton 2001; Myers 2009; Vohra 2014), and as such, Leonard-Barton's approach is adopted.

Use of interviews will permit concentration on how 'interactions are performed' (O'Leary 2007, p.126) and will help to understand and assess the constructs in their natural setting (Berg 2007; Cohen et al. 2007; Punch 2005). Archive documents (i.e. documentary sources) help the researcher uncover meaning, develop understanding, and discover relevant insights (Merriam 1998). Documentary sources serve as triangulation within the study. This is necessary in qualitative research, where the researcher seeks convergence and corroboration through different data sources and methods (Bowen 2009). Table 4.3 presents a summary of the case study strategy used in this study. Project value and detail schedule, daily work sheets, non-conformance reports (NCRs), and

financial data all helped to identify rework events and determine the effect of rework on project performance.

Table 4. 3 Summary of Case Study Strategy

Design	
Purposeful Sampling	The selected cases were "information rich" and illuminative; this means that they provide substantial information in the direction of the understudy phenomenon of interest, so has to gain insight into the phenomenon (Patton 1990).
Data Collection	
Interview	Researcher has the opportunity to conduct a face-to-face interview with the participants to obtain/understand the people, situation and phenomenon under study (Coyle 1977).
Documentary sources	Collection of archive documents such as NCR's, financial report etc.
Data Analysis	
Thematic Analysis	The analysis of the participants' interview will be done through a thematic analysis following a six steps approach (Braun and Clarke 2006).
System Thinking Approach	System thinking is a holistic approach to problem. It deals with the dynamic nature of the problem via a feedback process so as to understand the causes and effects of elements interacting within a system. It is visualized through causal loop diagram (Senge 2006).
Documentary Analysis	Archive documents will be analyse via adopting document analysis which depends on a systematic procedure for reviewing or evaluating documents – both printed and electronic materials (Bowen 2009).

4.3.2 Multiple Case

This study employs multiple cases rather than a single case, because of the needs of the research questions. Yin (2003a) noted that multiple case findings are more compelling and robust, allowing theory to be better grounded in more varied evidence, with the particular advantage that they allow

for cross-case comparison. Furthermore, multiple cases contribute to theory development which is central to this study. Figure 4.1 shows a typical multiple case design adopted for this study, where research questions were formulated based on an identified gap, and existing theories were used, in relation to the phenomenon, to thematise the study, facilitating case selection and providing a pilot study. This led to establishing data across the cases, analysing the data, making comparisons among cases, and reporting the findings and conclusion. Selection of cases is influenced by the type of research questions to be answered, and guided by an existing theory. The rationale for using multiple cases focuses on the need to establish whether the findings of the first case occur in other cases. This will provide an avenue to carry out exploratory study on a larger scale, when sufficient insight into the phenomenon has been gained.

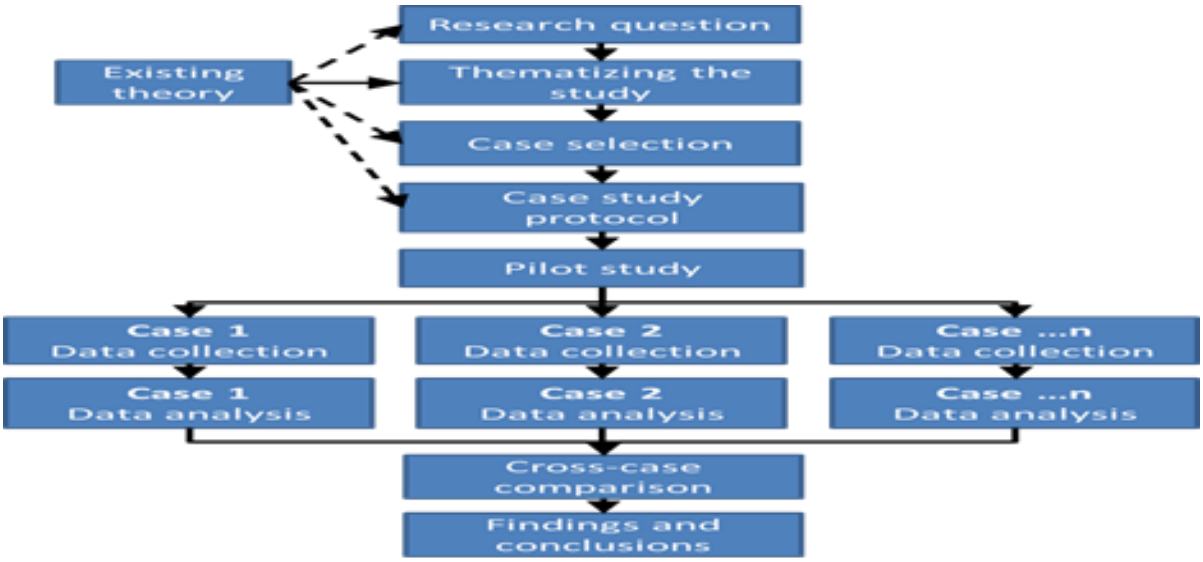


Figure 4. 1 Steps in a Multiple Case Design

4.3.3 Case Selection

The case selections are bounded by location (i.e. UAE), common to the Gulf region, and project type (i.e. building construction project). A purposeful sample was used to select the case studies, since a number of criteria were needed in the selection of those cases, including number of NCRs, number of workers in project, number of sub-contractors, and nationalities. Purposeful sampling is a non-random method of sampling where the researcher selects 'information-rich' and illuminative cases for an in-depth study (Patton 2002). This means those selected cases provide

substantial information towards underlying phenomena of interest, so as to gain insight into the phenomenon. As noted by Patton (2002), it is the commonality of patterns across a wide variation of interest to capture perceptions and experience central to certain elements with a given setting.

This study is concerned with exploring the perceptions and experiences of craftspeople's motivation, their relationship with the project's level of rework, and understanding their motivation for better project performance. Using three building construction projects, this was explored in the UAE. In order to maintain anonymity, the three case studies were referred to as case I, case II, and case III, but sufficient information about the cases was provided to aid the investigation. The participants within each case were construction workers (i.e. craftspeople) whose importance is central to the completion of the construction projects. Craftspeople constitute a large proportion of construction costs, and the amount of craftspeople's time spent performing a construction task is more susceptible to the influence of management than are materials or capital. Thus, facilitating craftspeople's motivation for improved performance is a major concern for a project's level of rework.

Participants shared several characteristics. In all three case studies, the craftspeople worked in a male dominated environment, and were largely employed by main contractor and sub-contractors. They were mainly migrants with varying skills and experiences. Each participant had at least one year of experience as a craftsperson in a construction trade such as mason, carpenter, plumber, electrician, steel fixer, scaffolder, and painter. Despite these similarities, the participants worked on different building construction projects (i.e., villas, hotel apartment, and hospital). Likewise, participants had varying years of experience, nature of work, nationality status, education & training requirements and construction trades.

Three building construction projects located in two major emirates (Dubai and Abu Dhabi) in the UAE were examined. Of these projects, two case studies were selected in Dubai and one in Abu Dhabi, where large construction work is ongoing. The three cases were procured through a design and build contract. Notably, both emirates operate using the Civil Transactions Code (Federal Law 1/1985, as amended) which covers general contract principles as well as a section on construction. In addition to federal laws, Dubai has numerous regulations, standards, codes of practice,

guidelines and circulars issued by the Dubai municipality and the free zones (e.g., those operated by TECOM and the Jebel Ali Free Zone (JAFZA)) in relation to building standards in their relevant jurisdictions. These standards include building standards, environmental standards, health and safety guidelines and other technical conditions. Case studies in Dubai and Abu Dhabi operate under similar regulations, though their "licensing" and "classification regime" in both emirates are slightly different. Nevertheless, they fall within accepted criteria necessary for the present investigation.

4.3.3.1 Case I: Villas

The project comprised 213 villas with some of the facilities incorporated for development in each villa, including underground parking, a landscaped podium and a swimming pool. The contract value was 60, 473, 000 USD with a contract period of 32 months. The project was procured using a design and build contract, and consisted of 2459 craftspeople from 18 nationalities. 1540 workers made up the contractor's manpower, with another 919 from a total of 107 subcontractors. The site is located in Dubai, UAE. The contractor operated under 'G licensing' in Dubai, and satisfied the requirements of the Dubai Municipality in carrying out contracting. The craftspeople worked on site but had their accommodation 80 km from the site location. They were usually transported by the company's bus to the construction site. At the point of data collection, the project had experienced 8.5 months delay and cost overrun. For instance, one craftsperson said "…experience of the supervisor is very important in term of regular inspection and good work coordination'" (Electrician 01). This type of impression by the craftsperson enhances positive behaviour to work, which makes this case an interesting one to study. Table 4.4 illustrates the case characteristics.

Table 4. 4 Main Characteristics of the Project

Project Name	Villas Project
Project scope	Construction of 213 Villas
Location	Dubai - UAE
Contract value	60473000$
Planed Progress	100%
Actual Progress	87%
Numbers of NCR	490
Planed duration	32 months
Time overrun	Total 8.5 months *59 days delay* related to NCR, *6.5 moths* related to change and material delivery delays and others.

4.3.3.2 Case II – Hotel Apartment

The project is a hotel and apartment building complex consisting of basement, ground floor, 3 podiums (16 type + roof). The building was planned to contain 14 studio apartments, 53 1-bedroom apartments, 61 2-bedroom flats, 4 3-bedroom apartments and 1 duplex bedroom. The contract value was 35, 068, 493 USD with a contract duration of 24 months. This project was procured via a design and build contract. The total number of craftspeople in the project was 1965, from 14 different nationalities. The main contractor's manpower was 1140, and another 825 craftspeople were employed under 86 sub-contractors. The contractor operated under "G licensing" in Dubai and satisfied the requirements of the Dubai Municipality in carrying out contracting, while the sub-contractors had only their contractual agreement with the main contractor. Their performance was not attached to their payment system. As such, craftspeople's motivation has a considerable long term effect on project performance, which can impact the project's level of rework. For instance, one of the craftspeople said:

"…although the salary was not satisfactory at my work place, but as a result of the convenience by which I carry out my work and the good relationship with the supervisor, and with one another, coupled with the timely payment of salary, added up to my continuous stay in this company" (Steel fixer 02).

This indicates elements that stimulate the craftspeople's motivation, which makes this case an interesting one to study. Table 4.5 illustrates the case characteristics.

Table 4. 5 Main Characteristics of the Project

Project Name	**Hotel Apartment**
Project scope	Hotel apartment consists of (1) basement, ground floor, 3 podiums (16 type + roof).
Location	Dubai - UAE
Contract value	35068493 $
Planed Progress	40%
Actual Progress	31%
Numbers of NCR	78
Planed duration	24 months
Time overrun	Total 68 days -*36 days delay* related to NCR, *32 days* related to mobilization, material delivery delays and consultant rigidity.

4.3.3.3 Case III – Hospital

The project was the construction of a hospital consisting of 713 beds, with a total floor area of 358,000m^2, two underground basement floors and six stories above ground floor level, and about 1600 car parking spaces. It was a project sought from Abu Dhabi. The principal contractor belonged to the "special grade" classification, i.e. the highest category, allowing the contractor to perform projects with a value in excess of AED 100,000,000 (approx. US$27,224,218). The contract value was 821,917,000 USD with a contract period of 48 months. The project was procured via a design and build contract. The total of craftspeople was 4580 from 18 nationalities: 2530 working for the main contractor, and 2050 workers employed by the 297 subcontractors. The site location was Al Ain, Abu Dhabi, UAE. In this case, the challenges faced included the following, as reported by a craftsperson:

"……but we still have the language differences which makes understanding his instructions difficult to carry out'" (Carpenter 02).

This type of expression indicated that there are different ways to facilitate the craftspeople's motivation to improving the project's level of rework, which makes this case an interesting one to study. Table 4.6 illustrates the case characteristics.

Table 4. 6 Main Characteristics of Project

Project Name	Main Hospital
Project scope	Construction of hospital, comprising approximately 713 beds and cover approximately 358000m2. It consists of (2) underground basement floors and (6), stories above the ground floor level and provides for circa 1600 car parking spaces. The buildings are surrounding by circa 15000m2 of extensive hard and soft landscaping.
Location	UAE
Contract value	821917808 $
Planed Progress	85%
Actual Progress	64%
Numbers of NCR	453
Planed duration	48 months
Time overrun	**Total 306 days** -*36 days delay* related to NCR, *270 days* related to change and material delivery delays.

4.3.4 Study Population

The study used a purposive selection of individuals, to decide which craftspeople to include in the study. This was achieved via phone conversations, followed by face-to-face discussion with the QA/QC and project manager who is also referred to as site manager to seek appropriate participants who fall within the criteria necessary to achieve the study objectives. Such criteria include diverse nationality, age, years of experience, and involvement in rework occurrence according to NCR project documents, etc. This was necessary in order to obtain sufficient data to analyse, and to avoid or limit sample bias. The discussions with QA/QC and site managers also determined which participants were willing to provide the information needed for this study. Thus, the QA/QC manager and site manager serve as "key informants" in this case. The "key informants" not only provide insights, but can also suggest sources of corroboratory or contrary evidence (Yin 1994, p. 90) where necessary in the interview process. It was ensured that participants were 18 years and above, had a work experience with their employers' for at least one year.

The recruitment process for the interviews in each case targeted 24 participants. The initial plan was to interview 30 participants, as recommended by Saldana (2011), who stated that "a minimum of ten to twenty participants is needed to ensure more credible and trustworthy findings" (p. 34). But due to data saturation, 24 was the chosen sample size for the three cases, where 8 participants were selected from each case. Data Saturation is the state where no new information is available based on information collected from participants (Lincoln and Guba 1985; Morse 1998). In each case, four participants were from the main contractor and the other four craftspeople were from different subcontractors. In addition, three project managers (who also take the position of site manager) and three QA/QC managers from the main contractor were interviewed as rich information sources in each of the three cases.

4.3.5 Study Participants

Selection of craftspeople for this study cut across the different crafts trades within the construction project. The main focus of the study was on the craftspeople working in the construction projects, assessed from the contractor's perspective. Nevertheless, around 40% of craftspeople working on UAE construction sites were said to be employed by sub-contractors. Thus, both the main contractor's and the sub-contractors' craftspeople were the participants. The craftspeople make an

invaluable asset in the delivery of construction projects, though the number of non-conformance reports (NCRs) are usually as a result of their poor workmanship/performance. In this study, their nationalities, numbers of NCR's and percentage of craftspeople across different construction trades were the criteria for the selection. Table 4.7 shows the participants' percentage ratio for each case. Participants were contacted by their site manager, who also serves as project manager on the site. The role of the project manager was to administer, integrate and coordinate the consultants and subcontractors. In each of the cases selected, the QA/QC managers were also present as principal contractor representatives, to determine and record the non-conformances within the project.

Table 4. 7 Percentage Participants Ratio

Participants	Case I	% NCR's	Case II	% NCR's	Case III	% NCR's
Mason	2	25	2	25	2	25
Carpenter	2	25	1	15	2	25
Plumber	1	15	1	10	1	15
Electrician	1	15	1	15	1	15
Steel Fixer	1	10	2	25	2	20
Scaffold	1	10				
Painter			1	10		
Project Manager	1		1		1	
QA/QC	1		1		1	
Total	10	100	10	100	10	100

Table 4.7 shows the various craftspeople across construction trades, with 4 selected from different subcontractors and 4 from the main contractor in each case study. These include: mason, carpenter, plumber, electrician, steel fixer, scaffolder, and painter. These selected craftspeople were essential

workers needed to carry out work on any building construction activities. The QA/QC and site manager (i.e. project manager) served as key informants. The "key informant" not only provides insights, but can also suggest sources of corroboratory or contrary evidence (Yin 1994, p. 90). The demography of the participants is presented in Table 4.8, which shows the number of nationalities, age bracket, and language spoken. Since construction is a male dominated industry, women were not part of the diverse sample. Most of the participants listed were from Pakistan, Indian, Sri Lanka, and Thailand, with a few from Egypt. Participants were restricted to those who had worked on the project for no less than one year, and who knew and understood the project's problems.

Table 4. 8 Demography of Participants

Nationalities	**Age**	**Language Spoken**	**Case 1**	**Case 2**	**Case3**
Iraq	18 and Above	Arabic/English	1	1	1
Pakistani	18 and Above	Urdu/English	1	1	2
India	18 and Above	Urdu/English	2	2	2
Sri Lanka	18 and Above	Sinhala/ Little English	1	2	2
Egyptian	18 and Above	Arabic	2	1	2
Thailand	18 and Above	Thai/Little English	3	3	1

4.3.6 Interview Protocol

The main research question seeks to understand the satisfactory needs and motivation types as defined under the concept of SDT (i.e. BNPT and OIT), within the UAE's local practices of work environment, culture, and management style, with respect to craftspeople's motivation, which can propel optimal performance to improve the project's level of rework in building construction projects. As such, an interview protocol was devised from items necessary to impact craftspeople's motivation with the local practices of work environment, culture and management.

In the interview, participants described their perception of local practices i.e. work environment, culture, and management style, in relation to the issue of rework. It focused on the satisfaction of craftspeople's needs within the construction environment in relation to their job task and their motivation to engage in those activities. The aim of the protocol was to assess the need satisfaction and motivation type which will help in understanding those driving factors and their facilitation to reduce the project's level of rework and enhance better project performance. The protocol was tailored to obtaining highly motivating behavioural factors and those factors that can thwart behaviour, thus affecting project performance within the UAE local practices context.

Participants were asked to give an account of activities they considered fascinating while carrying out their work and also, what they considered to impede successful execution of their work. This type of question allowed them to think about challenges they faced, and how they were able to accomplish tasks and satisfy their needs. They were able to give specific reasons relating to the local practices (work environment, culture and management style). The focus on critical incidents allows participants to express tangible, self-generated examples rather than abstract emotions (Chell 2004). As noted by Reis et al. (2000), global impressions of work are likely to be influenced by mood, so focusing on task-specific activities is designed to help remove this bias. The interview protocol is attached in Appendix 1.

4.3.7 Pilot Study: Preliminary Investigation

Prior to commencement of the main interview with the participants, a pilot study was carried out. This was considered necessary to pre-empt any problems during the main interview (Randall et al. 2007). The pilot study was designed with the help of an interview protocol. The protocol allows for flexibility by adopting semi-structured interviews that leave room to ask more detailed questions where appropriate. The interviews took place in mid-March 2016, and were held during a scheduled visit at the construction environment. The interviews were not recorded, but note-taking was adequately practised, which substituted for verbatim transcript (Pole and Lampard 2002), and their accuracy was confirmed with the participants before leaving the room (Randall et al. 2007). The interviews were conducted during a scheduled visit to the construction site, without disrupting construction activities, and to enhance participants comfort (Creswell 2009). The

perceptions and experiences expressed during the interviews related to their work in the last two weeks, and were guided based on background information (i.e. NCRs) available to the researcher prior to the conduct of the interview. An average of 60 minutes was noted, and a total number of four participants: mason, electrician, plumber, and carpenter, took part. The mason and electrician were from two sub-contractors, while the plumber and carpenter were from the main contractor. During the interview, probing questions were used to gain further insight into the participants' responses. These were generated into descriptive codes using the exact word(s) of the participants.

The pilot study with participants was used to obtain information on the clarity of the interview questions and more importantly, whether they elicited responses that were relevant to the focus of the study. In particular, it was conducted to check for possible problems relating to participants' comprehension of the wording. Although the pilot interviews were not included in the full study, their outcome assisted in refining the interview protocol. The number of participants included in the pilot seemed satisfactory as their responses produced tangible results after the analysis was carried out. Furthermore, the outcome of the pilot study was used to modify some questions, test and validate the research methodology

4.4 Data Collection Techniques

Primary and secondary data were collected from the work site at varying stages of each project's completion. The primary data were information collected by the researcher, with the aim of understanding directly the participants' perceptions in relation to the problem of rework. Documentary sources were used to explore the impact of rework on project performance with respect to the craftspeople's motivation which was under investigation.

4.4.1 Primary Data: Interview

A face-to-face semi-structured interview was used in the data gathering. This also helped to acquire demographical information in the initial part of the interview. The consent of participants was sought, and this was done by having each participant sign an Informed consent form before the interview began. As part of the interview section, a series of open-ended and semi-structured qualitatively determined questions were posed. Open-ended questions seek to encourage

participants to express their perspectives and relate their stories in relation to activities in the construction projects. The semi-structured interviews used by the researcher were intended to capture the meanings and perspectives of participants (Pattons 2002). Further probing questions were used to clarify questions when necessary. The interviews maximise the opportunity for more complete and accurate communication of ideas between researcher and participants (Creswell and Miller 2002). They were adapted to provide some level of flexibility and also to provide focus during the actual interviews.

This study used semi-structured interviews, rather than structured or unstructured ones, in order to maintain focus and facilitate cross-case analysis (Carson et al. 2001). This method provides room to explore new and relevant issues that emerge. Interviews were held between 6 January and 13 February 2017 in quiet, private offices where distractions are minimal. The data were collected from 24 participants (craftspeople), 8 in each project. In each case 4 participants were from the main contractor and the other 4 from different subcontractors. In addition 3 project managers (who also take the position of site manager) and QA/QC manager from the main contractor, were interviewed as rich information sources. In case I, case II, and case III, completion levels at the time of collecting the information were 87%, 31%, and 64% respectively. The flexibility provided by this approach is advantageous as questions can be adjusted to a participant's level of knowledge of the issue. All participants were asked to sign an informed consent form before the interview began. The craftspeople have varying degrees of academic qualification and length of experience on the job, and semi-structured interviews cater for appropriate interpretation. In addition, the semi-structured approach promotes rapport between researcher and participants.

The primary interviews were conducted with the craftspeople: masons, steel fixers, carpenters, electricians, plumbers etc. A second phase of the interview process involved the QA/QC manager and site manager with the aim of understanding the working procedure expected of the craftspeople, and to serve as confirmation of internal consistency in view of comparison between craftspeople's perspective and the superior's perspective. According to Punch (2005, p. 188), it is important to establish "internal consistency" in the chosen sample during a qualitative study, and this must fit with the focus of the study. Each interview lasted between 45 and 60 minutes and was digitally recorded after obtaining permission from the participants. Interviews were carried out at

a pre-planned time, in order to avoid disruption of construction operations that might further impact on the schedule of the project. Participants were assured of the anonymity of their responses and that the purpose was purely for the management of project performance. Interviews were conducted in the English language with craftspeople who understood English. For those who could neither speak nor understand English, a translator assisted by translating English to Sinhala and Thai. To eliminate bias in the formulation of themes, these were generated based on the outcomes of the interviews. This stage was also pre-arranged and agreed to by the participants

4.4.2 Secondary Data

The archive documents relating to the project served as documentary sources. They consisted of detailed project reports, financial documents, non-conformance reports (NCRs) and project detailed schedules. The NCRs are a record of the number of rework incidents and their associated causes.

Documentary sources provided by the contractor and subcontractors were used in this study. The researcher was given full access to documents such as project details schedule, financial data, daily working sheet, and non-conformance reports. The documents collected in form of non-conformance reports (NCRs) show that rework occurrence cut across the craft trades selected in each case. This helped to determine the type of crafts trade involved in rework occurrence, and contributed to identifying rework events and determining the effect on project performance (time and cost) by understanding human related causes of a project's level of rework in a building construction project.

4.5 Data Analysis

The main focus of analysing the data is to discover patterns, concepts, themes and meanings from the perceptions and experiences of the craftspeople with regard to their motivation type which impacts the project's level of rework. To do this, thematic analysis was used. Themes generated from this analysis were used in the development of a causal loop diagram (CLD) based on collaborative effort and confirmation of themes from the "key informants". The CLD was developed using Vensim PLE software. Lastly, the documentary analysis of archive documents

collected to identify rework events and also, to determine the time and cost impact on the project performance was described.

4.5.1 Thematic Analysis

A preliminary consideration revealed that thematic analysis can provide descriptive findings. This approach is adopted in this study to reduce the amount of information collected in case study (i.e. interviews) into meaningful themes necessary to give direction to the research questions (Braun and Clarke 2006). It is unlike other analytic methods that seek to describe patterns across qualitative data. It is independent of theory and epistemology, and can be applied across a range of theoretical and epistemological approaches (Braun and Clarke 2006). Generally, thematic analysis is seen as qualitative analysis (Holloway and Toders 2003). Due to its flexibility, it is considered a useful research tool, which potentially provides a rich and detailed account of the data collected.

The study seeks to understand the effect of facilitating craftspeople's motivation in relation to the project's level of rework. Thematic analysis provides the basis and flexibility to answer the research questions and develop the study's research theory. To do this, an inductive approach was adopted to allow patterns, themes and categories to emerge from the data collected. According to Thomas (2006), the main purpose of using an inductive approach lies in the following: (1) to condense extensive and varied raw text data into brief, summary format; (2) to establish clear links between the research focus and summary findings derived from the raw data; and (3) to develop a model or theory about the underlying structure of experiences or processes evident in the raw data. Braun and Clarke (2006) explained that themes or patterns within data can be identified either in an inductive "bottom up" way or in a theoretical, deductive "top down" way (citing Boyatzis 1998 and Hayes 1997).

Although an inductive approach was used, this can be interactive as it helps to keep specific interest in identifying themes influenced by the theoretical framework. It is recognised that one of the disadvantages of thematic analysis is its flexibility, which can lead to inconsistency and a lack of coherence when developing themes derived from the research data (Holloway and Todres 2003).

This is taken care of in this study by following the six-step framework (Braun and Clarke 2006). This includes: familiarisation with the data; generating initial codes; searching for themes; reviewing themes; defining and naming themes; and producing the report.

4.5.1.1 Step I: Familiarisation with the data

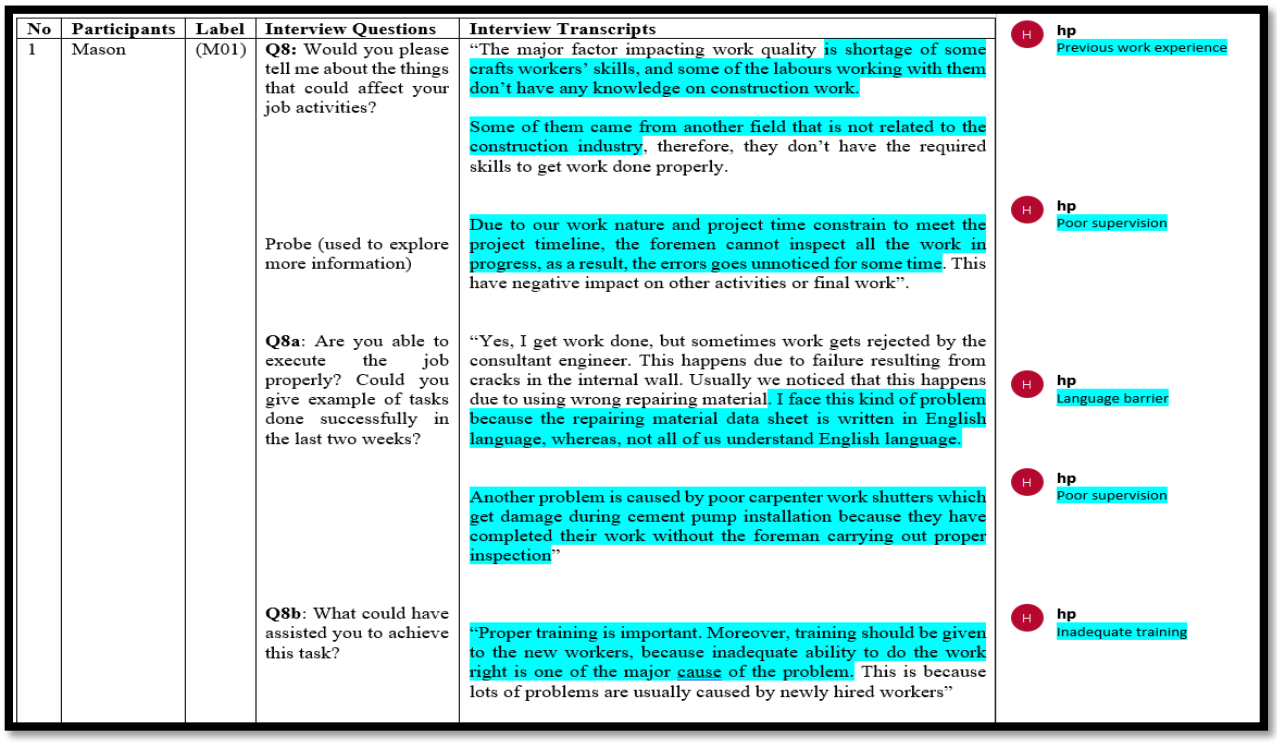
It was necessary to familiarise myself with the content of the interview recordings, so as to understand the pitch of the recordings. This was followed by internalisation via transcribing of the interviews. The recordings were listened to several times to ensure that the actual wording of the recordings had been properly transcribed. Transcribing took place immediately after a scheduled interview was completed, in case any clarification was needed. This helped to ensure the transcript followed a particular order (Perakyla 1997). This process was done with each of the ten participants in each case. The activities were carried out on Microsoft Word Office.

4.5.1.2 Step II: Generating initial codes

Transcription of the interview data was followed by reading each individual's interview notes several times and colour coding the sections relating to identification of factors impacting craftspeople's job function. This was based on relevance to the theoretical framework of the study. The coding process focused on features of the data that reflected factors affecting craftspeople's motivation in relation to rework, and was used later to highlight highly motivated or unmotivated behaviour as defined in the study framework. Key phrases were first independently coded into preliminary low level themes referred to as the initial codes, as shown in Figure 4.2. A hierarchical coding was used each time the portion of data relating to these factors had been identified and grouped. During the process of coding, continuous revision was made to the code within each transcript, and re-grouping occurred if appropriate.

It was an iterative process that continued as the data were analysed and interpreted. Codes were generated, deleted or re-grouped as necessary (King 2004). The research questions were structured around identifying factors affecting craftspeople's motivation in relation to the project's level of rework in building construction projects in the UAE. Thus the research involved a focus on how craftspeople were affected within the following local conditions: environmental culture, work environment, and management style. This suggested that a data-driven approach was adopted

within this context. Notably, it was recognised that the coding can be done manually or through a software programme (Kelle 2004; Seale 2000). A manual process was used, which was directed towards capturing behavioural elements that can lead to highly motivated (i.e. more autonomous) behaviour, and those that are thwarting the craftspeople's motivation (i.e. more controlled) in the course of executing their job functions.



No	Participants	Label	Interview Questions	Interview Transcripts	
1	Mason	(M01)	**Q8:** Would you please tell me about the things that could affect your job activities?	"The major factor impacting work quality is shortage of some crafts workers' skills, and some of the labours working with them don't have any knowledge on construction work.	hp Previous work experience
				Some of them came from another field that is not related to the construction industry, therefore, they don't have the required skills to get work done properly.	
			Probe (used to explore more information)	Due to our work nature and project time constrain to meet the project timeline, the foremen cannot inspect all the work in progress, as a result, the errors goes unnoticed for some time. This have negative impact on other activities or final work".	hp Poor supervision
			Q8a: Are you able to execute the job properly? Could you give example of tasks done successfully in the last two weeks?	"Yes, I get work done, but sometimes work gets rejected by the consultant engineer. This happens due to failure resulting from cracks in the internal wall. Usually we noticed that this happens due to using wrong repairing material. I face this kind of problem because the repairing material data sheet is written in English language, whereas, not all of us understand English language.	hp Language barrier
				Another problem is caused by poor carpenter work shutters which get damage during cement pump installation because they have completed their work without the foreman carrying out proper inspection"	hp Poor supervision
			Q8b: What could have assisted you to achieve this task?	"Proper training is important. Moreover, training should be given to the new workers, because inadequate ability to do the work right is one of the major cause of the problem. This is because lots of problems are usually caused by newly hired workers"	hp Inadequate training

Figure 4. 2 Example of Extracted Data from Interview Transcriptions (Highlighted Text Used as Part of Data Analysis)

4.5.1.3 Step III: Searching for themes

Development of themes started by categorising the final codes. Boyatzis (1998) identified the importance of collating codes into potential themes and gathering all data relevant for each potential theme. At this stage, each transcript was read through once again, following the trend of responses as provided by the participants. The codes were then grouped into broader themes which narrated something interesting about the data. Figure 4.3, 4.4 and 4.5 shows snapshots of the process of searching for the themes across case I, case II, and case III. The participant's profile aided the extraction of key meaning units for each individual and contextual data relating to the

experience of the interviewee in terms of the participant's attitude, level of motivation, and cooperativeness.

This process allows the unique patterns of each case to emerge before the researcher attempts to generalise patterns across cases. Many initial codes were grouped, which aided more codes to be categorised as the final code. After developing the final codes into preliminary themes, each case resulted in 41, 36 and 35 codes across case I, case II, and case III. These included worker's experience, safety practices, on-site experience, salary payment, on-time payment, communication difficulties, poor coordination, shortage of staff, long working hours, and following instructions etc. Since this is an iterative process where a back and forth movement is necessary, some final themes were re-modified. The researcher ensured that the basis for each interpretation was fully scrutinised to ensure that outcomes were backed up by meaningful units from within the interview text in the form of phrase, sentence or paragraph, and could be identified to represent each context or theme.

Case Study	Transcripts	Participants	Initial Codes	Final Codes	Preliminary Themes
Case I	"I worked in UAE for 6 years now. I started with this main contractor company on this project for close to 1 year and 4 months. I noticed that the stander of work was high in term of technical drawing. I have always tried to keep up with the need of the work to be done according to specification".	C02	Technical Work Requirement		
	"I am a mason and I had 7 years of working experience. I have worked 5 years in India, and presently, I have spent around two years in Dubai. I realized that the quality of project work required in Dubai is far more of what I engaged in India, so I need to work hard in order to increase my knowledge to do my work right	M01	Skills development	Technical Knowledge	Work Experience
	"I work as a plumber on this project and I have more than 4 years' experience in UAE. I started as helper for the first 2 years, and then I progressed as plumber assistant for another 2 years. I have had to learn more to be able complete my task as it is required of me".	Pl 01	Personal Experience	Personal improvement	

C=Carpenter; M=Mason; Pl=Plumber

Figure 4. 3 Snapshot of Emerging Themes from Case I

Case Study	Transcripts	Participants	Initial Codes	Final Codes	Preliminary Themes
Case II	"…lack of getting the proper instructions which usually occurs due to challenge of understanding one another"	E01	Poor understanding skills		
	"…. the lack of understanding one another caused some problems in the final work especially when it relates to the management of technical drawing. There is poor interpretations of the technical manual because they are written in English language but I find it difficult to read"	C01	Language Challenge	Language barriers	
	"Another challenge we do face is with respect to team misunderstanding the supervisors, because he is an Arabia and does not speak Urdu, which is a common language among the teams".	M01	Language difficulties	Language differences	Communication difficulties

E=Electrician; M=Mason; C=Carpenter

Figure 4. 4 Snapshot of Emerging Themes from Case II

Case Study	Transcripts	Participants	Initial Codes	Final Codes	Preliminary Themes
Case III	"In order for my company to speed up the work in the project they involved various subcontractor, but it was difficult for the main contractor to inspect and cover all work that were carried out…"	M01	Number of supervisors		
	"….our work is usually not checked properly by the supervisor, at the end of completing the task, we are being told that a particular task was not accepted. This usually affect us seriously, because of the need to do the work again".	C02	Poor inspection	Inadequate Supervisors	Quality and Numbers of Supervision
	"The other challenge is based on the fact that some of the new foremen do not have enough experience to give us good feedbacks which are sometimes required for our job".	S. Fix. 01	No good feedback	Poor supervision skill	

M=Mason; C=Carpenter; S. Fx=Steel Fixer

Figure 4. 5 Snapshot of Emerging Themes from Case III

4.5.1.4 Step IV: Reviewing themes

At this stage, there was a reduction in the main category of themes across each case. In the process of reading through the codes to explore whether they supported the themes or not, a further reduction was made. Where themes could be moved into existing themes for a better fit, this was done. This resulted in the generation of main themes in each case, with case I having 36 themes, case II having 35 themes and case III with 32 themes. This is shown in Table 4.9.

Table 4. 9 Emerging Themes across the Three Cases

Case I	**Case II**	**Case III**
Worker's experience Safety practices Contracting by workers On-site training Salary payment Long working hours Timely payment Language challenges Effective supervisions Work inspection/monitoring Work planning/coordination Different nationalities Productivity loss Workload Schedule pressure Work procedure Work acceleration Worker's behaviour Worker's morale Job security Out-of-sequence Material usage Lack of focus Error Experience in current job Consultant rigidity Rework Schedule delay Learning and development Cost of Rework Tiredness Project performance Worker skill set Crafts people motivation Staff turnover Job satisfaction	Extensive overtime Payment method Communication barriers Work planning/coordination Productivity loss Work pressure Rushing work activities Contracting by workers Diverse experience Safety measures On-job-training Regular payment Diverse culture Worker's attitude Worker's Morale Quality and number of supervision Work processes Personal Development Workload Salary Rate Tiredness Staff turnover Error Job satisfaction Consultant rigidity Worker skill set Rework Schedule delay Cost of Rework Project performance Crafts people's motivation Material usage Learning and development Lack of focus Experience in current job	Varying experiences Long working hours Communication difficulties Site training Safety culture On-time payment Work planning/coordination Work monitoring Qualified and adeq. Supervision Contracting by workers Work procedure Work acceleration Staff turnover Salary payment Workload Schedule pressure Workers morale Learning and development Experience in current job Rework Error Schedule delay Material Usage Lack of focus Cost of Rework Tiredness Consultant rigidity Crafts people's motivation Project performance Worker skill set Diverse culture Job satisfaction

The data associated with these themes were colour-coded. Associated data were read to consider whether the data really did support the generated themes and whether the themes related to the overall story as indicated in the data set. This entailed making clarification from the participants

in relation to what had been described in the interviews, so as to ensure researcher bias was not incorporated in the interpretation and generation of the themes.

4.5.1.5 Step V: Defining and Naming Themes

At this stage, themes across each case were developed and grouped according to their formation, based on the craftspeople's perceptions and their experiences of factors impacting the project's level of rework. It was necessary to refine the themes to determine the main essence of each theme. Further, themes were assessed to examine their relation with each other. This brought about the cross-case synthesis of the case studies, which generated 32 broader concepts for understanding critical factors influencing craftspeople's motivation.

4.5.1.6 Step VI: Producing the Report

This final stage consists of the write-up. A review of the themes was done in relation to existing literature within the context of this study. As supported by the participants' clarifications, it provided the basis for a genuine outcome.

4.5.2 System Thinking – Causal Loop Diagram (CLD)

As the construction environment is highly complex, system thinking is considered important in this study. Its approach enables recognition of increasing complexity and subtle structure amid the wealth of details, pressures and crosscurrents management need to attend to (Senge 2006). This study used a qualitative systems thinking approach (Wolstenholme and Coyle 1983; Vennix 1996; Coyle and Alexander 1997; Wolstenholme 1999) based on the concept of systems thinking.

The application of systems thinking resulted in the CLD, which provides a platform for linking variables of people's perceptions and experiences of problems in relation to one another (Williams and Hummelbrunner 2010). It helps to map out the structure and feedback of a system in order to understand its feedback mechanisms. The CLD uses standard notation: "a positive (+) arrow from variable A to variable B means that A adds to B, or, a change in A causes a change in B in the same direction; a negative (−) arrow from A to B means that A subtracts from B, or, a change in A causes a change in B in the opposite direction" (Sterman 2000). Some of the relationships create

feedback loops. These loops are reinforcing if the variables influence each other in the same direction, and they are balancing if they influence each other in different directions. The benefits of CLD are enormous. For example, it is a primary tool for system thinking; it is exploratory in nature, cost effective, and provides a forum for discussion and communication. It has some limitations: it is conceptual only; it can be too cluttered; and it needs experience to understand the loops. It was of particular value in this study. Considering the large amount of themes generated from the initial thematic analysis, which might otherwise prevent practitioners from identifying critical factors and underlying themes explaining the influences on craftspeople's motivation in relation to the project's level of rework.

4.5.2.1 Loop Analysis

The outcome of the thematic analysis of the three case studies was used to create a holistic systems model. This was achieved with the aid of the discussions (i.e. interviews) held with the key informants (project manager and project QA/QC manager). The purpose was to have an in-depth understanding of the relationship between factors influencing craftspeople's motivation and the project's level of rework. The outcome of this discussion led to a collaborative and confirmatory statement of those broader themes.

The Vensim Personal Learning Edition (PLE) was used in the development of the causal loop diagram (CLD). Vensim is software designed to enable easy construction of a mental model in a pictorial visualised manner to enable stakeholders to search for possible solutions. The Vensim platform comprises of an interface that resembles a workbench and a set of tools. The main Vensim window is Workbench, which always includes the Tile Bar, the Menu, the Toolbar, and the Analysis tools. With the use of Vensim PLE software, the CLD is generated, through which the themes influencing craftspeople's motivation in relation to the project's level of rework are represented and drawn. This is illustrated in Figure 4.6.

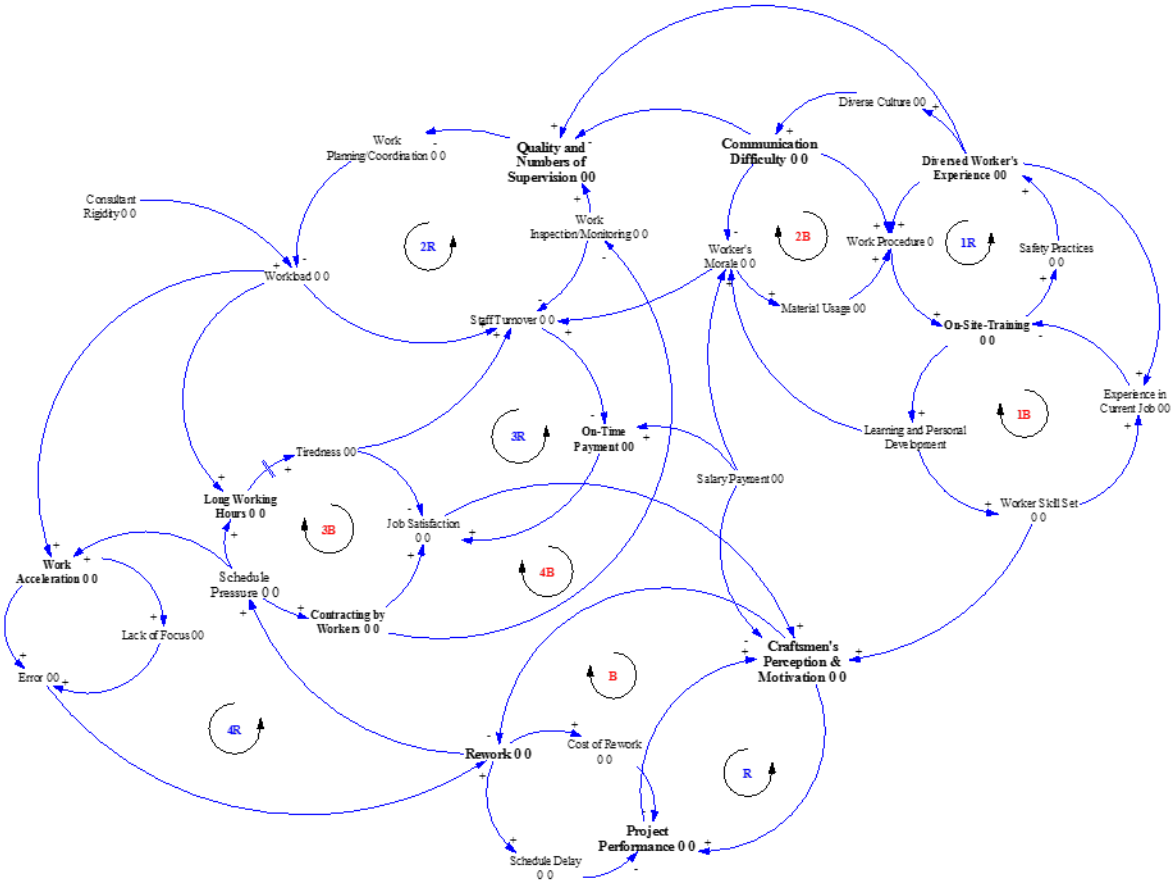


Figure 4. 6 Illustration of the Polarity of Factors Affecting Craftspeople's Motivation

This diagram is intended to highlight the relationship of the themes as they interact within the system. By temporarily ignoring much of the other detail, it produces a better view of the driving forces within the system through feedback loops. The complexity of the system lies in the difficulty of identifying the relevant factors that can be described as key factors influenced by the UAE's local practices: work environment, culture and management style.

The variables are presented and causally linked to each other using arrows. Each arrow is assigned a direction and polarity "+" or "-", where the positive sign implies that a change in the first variable in a certain direction causes a change in the second variable in the same direction compared to the situation causing the first. For instance, an increase in worker experience is brought about by the

pull of resources across different nationalities, which increases the cultural diversity among the craftspeople. A negative sign shows that there is a decrease in the second variable when there is an increase in the first variable. This is illustrated in the case of **"**quality and number of supervision". Quality of supervision depends on the skills and knowledge of the supervisor to provide valuable feedback on the job, whereas number of supervision refers to an adequate number of staff to provide guidance to the craftspeople, such as direction on the job, providing workable solutions, and planning. An increase in "quality and number of supervision" will increase the "work planning/coordination" of work activities. This in turn reduces the amount of "workload" that needs to be accomplished by the craftspeople. Increase in "staff turnover" leads to an increase in "workload", and this results in the use of "work acceleration" as a means to address "schedule delay" in the project.

Some causal effects take time, and this can be seen in the case of "long work hours" and "tiredness". A delay exists between these two variables, and is represented by a double line on the arrow (//). This indicates a time lag between introducing a long work hours policy and tiredness of the craftspeople, which is affected by the degree of involvement/motivation. This is illustrated in Figure 4.7 and Figure 4.8.

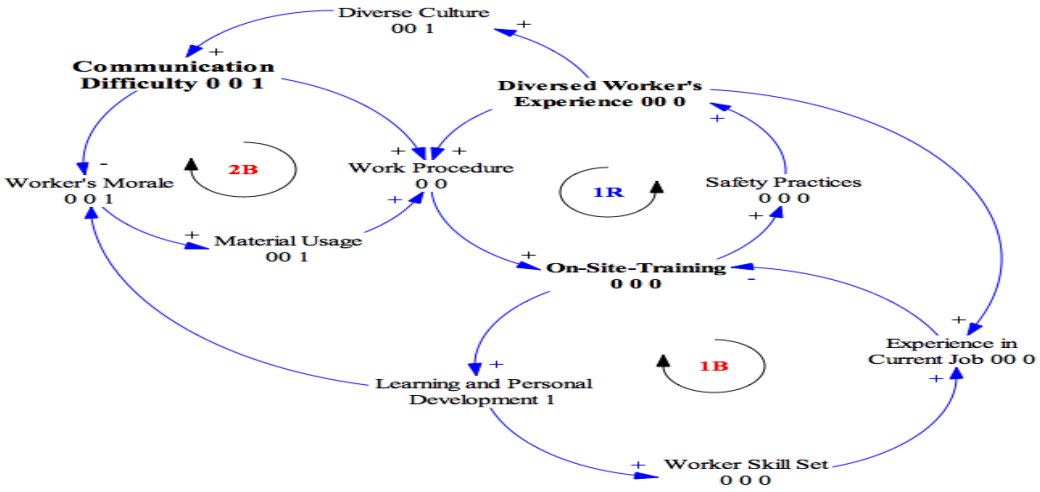


Figure 4. 7 Factors Affecting Craftspeople's Motivation (Feedback Loops A)

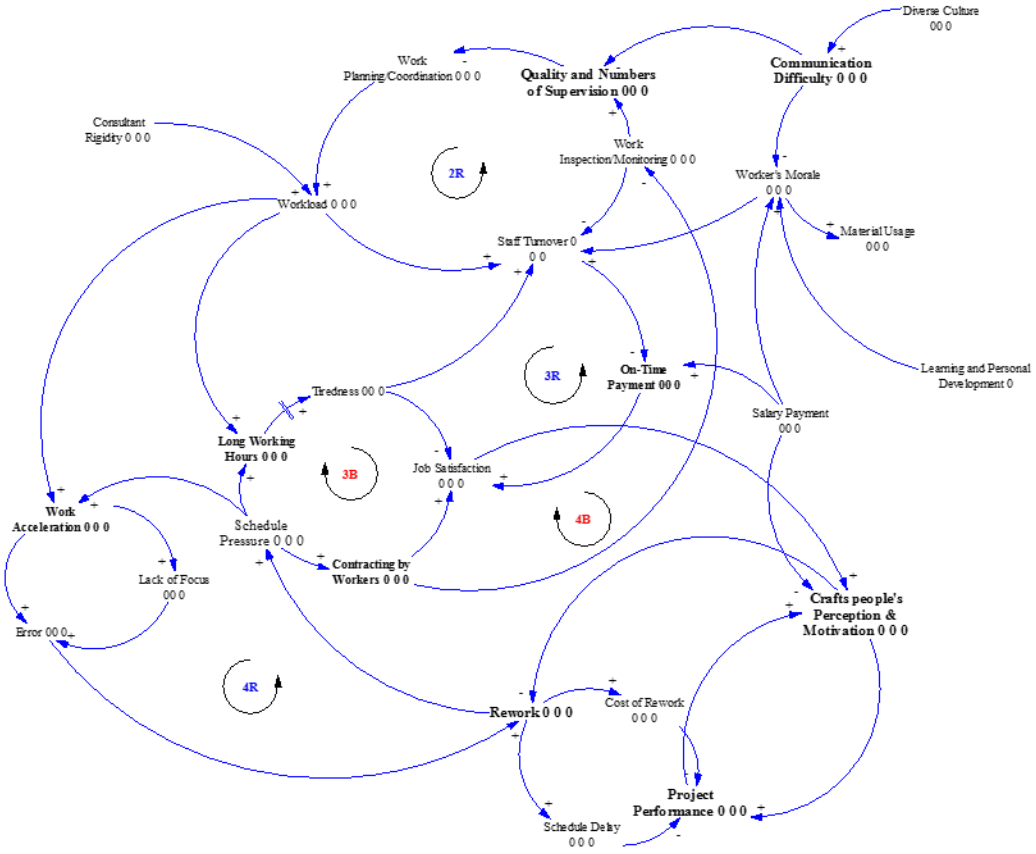


Figure 4. 8 Factors Affecting Craftspeople's Motivation (Feedback Loop B)

In Figure 4.7, the loop starts with diverse worker experiences, resulting in diverse culture of workers on the site within the project environment (craftspeople with varying work experience from different nationalities coming together to work). Inadvertently, this diversity built up communication difficulties among craftspeople when working on site, thus increasing the work procedure needed to execute the job. Work procedures impact an individual's ability to participate in the job, hence, the need for on-site training which should improve their participation. An increase in on-site training has a direct influence on worker's learning, personal development and skills, which increases their experience on the current job (balancing loop represented by 1B). Consequently, this brings about an increase in safety practices to cater for the diverse workers' experience (reinforcing loop represented by 1R). On the other hand, communication difficulties decrease worker's morale, which brings about high material usage (in the form of rework) due to communication difficulties (balancing loop represented by 2B). This situation is controlled by an increase in work procedure.

In Figure 4.8, the reinforcing loop (2R) reduces work planning and coordination as a result of the increase in lack of quality and number of supervision, which gives rise to an increase in workload. This is aggravated by consultant rigidity, which impinges on the work to be done. Consultant rigidity is associated with the level of approval or disapproval of project deliveries by the consultant engineer. With a management policy on schedule delay, the craftspeople are made to work long hours so as to reduce the workload. Furthermore, work acceleration is encouraged. Work acceleration is associated with doing more work within a limited time frame, to address the schedule delay. This creates work error that leads to rework, and an increase in work activities resulting from rework suggests more schedule pressure will be imposed to meet the schedule delay. The management introduces contracting of workers to get more work done, and this has been perceived as positive, but it will increase the need for more work inspection and monitoring. The reinforcing loop (3R), suggests that on-time payment leads to job satisfaction among craftspeople, bringing about an increase in their motivation. This in turn reduces the amount of rework within the project system. With an increase in rework, more schedule pressure is created, which brings about long working hours. The prolonged use of long working hours results in tiredness, which often leads to staff turnover.

The feedback loop associated with long working hours is represented by a balancing loop indicated by (3B). Long working hours are associated with tiredness over a period of time, which shows the delay symbol (=) that resulted in tiredness. There is a reduction in job satisfaction, which is created by the level of craftspeople's motivation. There is an expectation for rework to be reduced when the craftspeople's motivation increases, but unfortunately, an increase in rework leads to an increase in schedule pressure. The balancing loop (4B) in Figure 4.8 results from an increase in the use of contracting by worker, which brings about job satisfaction. This allows craftspeople's motivation to increase, thereby reducing the amount of rework. As rework increases there will be more schedule pressure within the project system. Lastly, the reinforcing loop (4R) results from the use of work acceleration, which gives rise to errors, creating more rework. When rework increases, schedule pressure tends to increase.

4.5.3 Documentary Analysis

The researcher had the opportunity to access project information and reports, which was facilitated by good working relations with the project parties' representatives. The project documents and reports enabled assessment of rework events. Visits to the project site, and extensive contact with project parties, including contractors and subcontractors, enabled clarification of project information and reports. At this point, within each case the occurrence of rework events was noted, and the main causes within the scope of this study were highlighted. An example of the categorisation of NCRs by construction activities is illustrated in Appendix II. The cost and time impact on project performance was calculated using the formula in Chapter Two (Section 2.4.4. – equation (i) & (ii) respectively). An illustration of case I is depicted in the following example.

$$\textit{Rework Cost} = \frac{\boldsymbol{Total\ direct\ pluse\ indirect\ cost\ of\ rework\ performed\ in\ the\ field}}{\boldsymbol{Toatl\ field\ construction\ phase\ cost}}$$

$$\text{Rework Cost} = \frac{1752150}{52611510} * 100 = 3.33\%$$

Note: The total rework cost in the table include:

i. Direct labour and supervision cost of rework

ii. Direct equipment cost of rework

iii. Material cost of rework

iv. Subcontractor cost of rework

Percentage of rework delay = $\frac{\boldsymbol{Total\ rework\ delay}}{\boldsymbol{Total\ project\ delay}}$ *100%

Percentage of rework delay = $\frac{59}{\mathbf{85150}}$ *100% = 23.13%

Percentage of rework time = $\frac{\boldsymbol{Total\ rework\ time}}{\boldsymbol{Total\ project\ duration}}$ *100%

Percentage of rework time = $\frac{189}{\mathbf{32*30}}$ *100% = 19.68%

As a result of the above calculations, the cost and time overruns within the project were revealed. Table 4.10 shows the impact of rework on project performance. The result shows the percentage cost of 3.33%. In addition, the rework delay and percentage of rework time in case I is 23.13% and 19.68% respectively. The mathematical calculations were replicated in the other two case studies (i.e. case II and Case III). The outcome shows case II with percentage rework cost of 2.6%; percentage of rework time of 55.38% and percentage rework delay of 15.27%. Lastly, case III showed the percentage of rework cost as 2.10%; percentage of rework time as 14.23% and percentage of rework delay as 16.66%. Table 4.11 and Table 4.12 represent the main contractor and sub-contractors' activities and their associated percentage impacts.

Table 4. 10 Impact of Rework on Project Performance – Case I

Activities	Activities Initial Cost	NCR frequency	Subcontractors Rework Cost USD	Contractor Rework Cost USD	Total Rework Cost USD	Rework Cost%	Rework Duration (days0)	Rework delays (days)
Excavation& Foundation	3114600	29	53100	109300	162400	0.309	19	13
Concrete work	14494470	135	321500	604680	926180	1.760	62	14
Block work	3520754	33	52800	72700	125500	0.239	11	8
Plaster work	11274646	105	149500	71000	220500	0.419	42	10
Plumping work	2793671	26	17200	29600	46800	0.089	13	
Electric work	4671900	43	20600	18100	38700	0.047	12	1
Paint work	1515211	23	18170		18170	0.035	9	5
Flooring and Wall cladding work	4414105	19	112100	0	112100	0.213	7	3
Wooden and metal work	4156267	16	36400	0	63400	0.121	6	
Others	2655886	46	38400	0	38400	0.073	8	5
NOT ISSUES	0	15	0	0	0	0.00	0	0
Total		**52611510**	**490**		**1752150**	**%3.33**	**189**	**59**

Others: -Unapproved material, - Improper storage of materials, - Diesel contamination.

Table 4. 11 Impact of Rework on Project Performance – Case II

Activities	Activities Initial Cost	NCR frequency	Subcontractors Rework Cost USD	Contractor Rework Cost USD	Total Rework Cost USD	Rework Cost%	Rework Duration (days)	Rework delays (days)
Excavation& Foundation	271174	2		1560	1560	0.014	3	
Concrete work	6839246.56	49	64150	180366	244516	0.245	48	36
Block work	698082.332	5	6050	1350	7400	0.068	13	
Plaster work	1677140.03	12	19640		19640	0.180	27	
Plumping work	838570.04	6	4760	1940	6700	0.062	2	
Electric work	424730.28	3	3260		3260	0.030	4	
Others	141576.76	1	800	0	800	0.007	11	
Total	**10890520**	78			**283876**	**%2.60**	**108**	**36**

Others: - Unapproved material, - Storing shuttering above water tank, - Tower crane assembly –non safety

Table 4. 12 Impact of Rework on Project Performance – Case III

Activities	Activities Initial Cost	NCR frequency	Subcontractors Rework Cost USD	Contractor Rework Cost USD	Total Rework Cost USD	Rework Cost%	Rework Duration (days0)	Rework delays (days)
Excavation& Foundation	57863013.67	49	78000	1499560	1499560	0.28507	3	
Concrete work	300361643.7	259	2764120	6480366	9244486	1.75742	78	36
Block work	8100821.914	7	16050	1350	17400	0.00331	9	
Plaster work	2314520.547	2	39640		39640	0.00754	5	
Plumping work	5786301.367	5	14960	6780	21740	0.00413	7	
Electric work	29036712.31	25	33640	0	33640	0.0064	13	
Paint work	12782465.75	11	13760	0	13760	0.00262	15	
Flooring and Wall cladding work	31351232.86	27		96800	96800	0.0184	19	
Air condition work	8100821.914	7		22800	22800	0.00433	8	
Wooden and metal work	15833424.56	14		35480	35480	0.00674	12	
Suspending ceiling	2319780.821	2		18750	18750	0.00356	3	
Roof installation work	5944109.586	5		36900	36900	0.00701	7	
Others	7943013.695	7		12100	12100	0.0023	11	
NOT ISSUES	38289534	33		0	0	0	0	
Total	**526027397**	**453**			**11093056**	**2.10%**	**190**	**36**

NB: Others - unapproved material, improper storage of materials, diesel contamination

4.6 Establishing Trustworthiness

The traditional criteria for research data to be credible were based on objectivity, reliability and validity, but these standards apply to quantitative studies that are carried out experimentally. This is due to the fact that they are based on standardised instruments and can be assessed in a relatively easy manner. Contrarily, qualitative studies have been difficult to evaluate because they are not based on standardised instruments, and use smaller and non-random samples. Interpretivist researchers have sought ways to ensure the transparency of their research. Qualitative research generally takes an interpretive approach, which seeks to understand the meaning and interpretation of a phenomenon. Eisner (1991) noted that researchers in qualitative research seek believability, based on insight, coherence, and instrumentalities.

Merriam (1998) cautions the association of the constructs of reliability and validity to qualitative research because they are essentially a positivist view, and as such, adopted in quantitative research. Thus, Guba and Lincoln (1981) and Creswell (1998) suggest that "the trustworthiness of qualitative research can be established by using four strategies: credibility, transferability, dependability, and conformability", and are constructed parallel to the analogous quantitative criteria of internal and external validity, reliability and neutrality. Each strategy in turn uses criteria like reflexivity, triangulation and dense descriptions. Taking this argument into consideration, and taking the interpretive position which underpins this study, the researcher prefers to use the term trustworthiness, commonly used by others. Trustworthiness is the corresponding term used in qualitative research as a measure of the quality of research.

4.6.1 Credibility

Credibility can arise from that which is believable, convincing, plausible, and realistic (O'Leary 2004). In qualitative research, credibility is defined as the extent to which data and data analysis are believable and trustworthy. The term "credibility" is analogous to internal validity, being used by quantitative researchers to imply how research findings match reality. The word "reality" in qualitative research is, however, relative given that the philosophical underpinning of this position is constructed by human social actors to imply multiple interpretations and meanings in regard to the social world. As such, what is valid to a researcher may not be considered as representative of the real world to another. Therefore it is up to the reader to judge the extent of research credibility based on his/her understanding of the study.

Most rationalists would propose that there is not a single reality to be discovered, but that each individual constructs a personal reality (Smith and Ragan 2005). Thus, from an interpretive position, understanding is considered to be co-created because there is no objective truth to which a study can be compared. Therefore, certain criteria which are believed to increase the credibility of a study were considered. To start with, member checking was included in the findings. This implies confirmation of interpretations and conclusions from the participants themselves and that of the 'key informants' with regard to the findings. Lincoln and Guba (1985) considered that clarifying statements from participants to avoid wrong description of participants' opinions and

avoid researcher bias increases the credibility of the study. They noted that member checking can be done at two points: during the research, and after completing the research. This approach confirms whether the thematic analysis adopted within the study accurately expresses the participants' experiences and perceptions. It will help to correct wrong interpretations of findings.

4.6.2 Transferability

Transferability refers to the possibility of replicating the outcome of a study within a different context. It is analogous to external validity, that is, the extent to which findings can be generalised (Bitsch 2005; Tobin and Begley 2004). Generalisability refers to the extent to which one can extend the account of a particular situation or population to other persons, times or settings than those directly studied (Maxwell 2002). This is absolutely challenging from a qualitative research perspective because of the subjectivity which emphasises the researcher as the main instrument. Thus, transferability in qualitative research is enhanced by detailing the research methods, contexts, and assumptions underlying the study. For instance, the choice of craftspeople involved in the NCRs served as one of the sample selection methods that resulted in purposeful sampling to gain deep understanding of the issue under investigation (Schutt 2006). Moreover, Seale (1999) and Bitsch (2005) noted that ensuring a "think description" and "purposeful sampling" so as to be able to judge its applicability of the findings to other settings increases transferability. Teddlie and Yu (2007) proposed that selecting information-rich cases that are central to answering the research question is vital. A theoretically informed approach can strengthen the transferability of any findings. These are ways through which transferability has been enhanced in this thesis.

These criteria were taken into consideration during the conduct of the research. For instance, proper documentation and justification of the research methodology were ensured. The procedure and processes that helped construct, shape and connect meanings associated with the phenomenon were described. The issue of researcher bias was addressed by being sensitive to possible multiple interpretations of reality. Miles and Huberman (1994) describe the use of cross-case analysis as appropriate in establishing transferability. Thus the outcomes of each case were presented and a cross-case analysis was made of the three case studies. Shenton (2004) noted that "without this

insight i.e. thick description, it is difficult for the reader of the final account to determine the extent to which the overall findings 'ring true'," (p. 69). Therefore, a detailed description of the context and background of this study has been presented in this thesis for readers to assess the relevance of this research to other situations. As noted by Ritchie and Lewis (2003, p. 268), "it is a matter of judgment of the context and phenomena found which allows others to assess the transferability of the findings to another setting".

4.6.3 Dependability

Dependability has to do with the consistency of observing the same finding under similar circumstances. Thus, it is analogous to reliability. Merriam (1998) refers to dependability as the degree to which research findings can be reproduced under similar conditions and context. This emphasises the importance for the researcher to account for or describe the changing contexts and circumstances that are fundamental to the consistency of the research outcome. In the case of social actors, reliability is impracticable because their behaviour is not static: it is highly contextual and changes continuously depending on various influencing factors, as presented in this study. Furthermore, it is complicated by the ability to generate multiple interpretations of the reality.

Merriam (1998) suggests that reliability in this case should be determined by whether the results are consistent with the data collected. The following techniques are useful in this regard: explaining the assumptions and theory behind the study, using multiple methods of data collection and analysis (i.e. triangulation), and explaining in detail how the data were collected to allow for an audit trail, if necessary. Six strategies have been suggested (Merriam 1998) to cater for internal validity in qualitative research, and these are presented as follows:

i. Triangulation – the use of multiple sources of data;
ii. Member checks – clarification of collected data from the participants with whom interviews have been conducted;
iii. Peer examination;

iv. Participatory or collaborative modes of research;

v. Clarifying the researcher's biases, assumptions, worldview and theoretical orientation at the outset of the study.

These approaches were adopted in the thesis. It is worthy of note that dependability tends to be achievable through an audit (Seale 1999). Auditing for dependability requires that data and descriptions of the research should be elaborate and rich. This may require altering the study research design as new findings emerge during data collection. For example, the use of pilot study to better understand the type of questions to use as research questions was helpful in the development of the interview protocol.

4.6.4 Confirmability

Confirmability refers to the degree to which the results can be confirmed or corroborated by other researchers (Baxter and Eyles 1997). It is "concerned with establishing that data and interpretations of the findings are not figments of the inquirer's imagination, but are clearly derived from the data" (Tobin and Begley 2004, p. 392). It is analogous to objectivity, which implies the extent to which a researcher is aware of or accounts for individual subjectivity or bias. Seale (1999) argued that a procedural documentation of a research can be used for confirmability such that the researcher make methodological provisions of how the research was conducted. This study presented the steps taken through a detailed methodological approach, and organised the data in a retrievable manner so as to support the findings when necessary and in an appropriate format. This includes the use of tape-recorder to record interviewees (Nair and Reige 1995). The availability of recorded audios will enable the interviews to be heard over and over again to ensure consistency of transcripts.

4.7 Model Validation

Validation of the underlying theoretical model was done throughout the model's development as part of the quality assurance process (Coyle and Exelby 2000). This process involves member checks, in which clarifications of collected data from the participants' interviews was done. Key

participants were asked to respond on the link within the main resulting variables with respect to their experience on the overall project in relation to the rework issue. Documentary analysis of companies' relevant project information established credibility and collaborated the resulting variables. For this reason, the correctness of the model was ascertained through a triangulation method of interviews across varying participants, and where possible, through the available document on the rework issue. It is expected that the model development answered the main research questions within the context of this study. In addition, literature conducted experimentally and empirically in other domains was used to compare the study outcome.

4.8 Ethical Consideration

In compliance with the regulations and policies of Bournemouth University and its ethical review committee, permission to conduct research on human actors was sought and granted. Since the study is predominantly qualitative research, constant interactions with participants is necessary; thus, entering their personal domains of values is involved within the study. As noted by Creswell (2003) the researcher has an obligation to respect the rights, needs, values and desires of the participants. Merriam (2009) noted that "in any qualitative study, ethical issues relating to protection of the participants are of concern" (p. 161). Several issues that researchers need to take cognisance of when analysing data were put into consideration (Miles and Huberman 1994). Moreover, Miles and Huberman (1994) caution researchers to be aware of these and other issues before, during, and after the research had been conducted. The following have been described in this thesis:

- Informed consent (Do participants have full knowledge of what is involved?)
- Harm and risk (Can the study hurt participants?)
- Honesty and trust (Is the researcher being truthful in presenting data?)
- Privacy, confidentiality, and anonymity (Will the study intrude too much into group behaviour?)

Conducting the study in a multi-cultural environment raises concerns. Silverman (2000) argues that the relationship between the researcher and the subject during an interview needs to be considered in terms of the values of the researcher and the participants' cultural values. In view of the aforementioned, the following selections were described in relation to the study's ethical considerations.

4.8.1 Informed consent

The selection of the case studies was done through purposeful sampling. Eligible participants were appointed by the project manager responsible for organising and coordinating the affairs of the teams and entire project work. This led to the identification of potential participants as a result of his familiarity with the work progress and behavioural nature of the team/subcontractors. The researcher explained the focus of the study to the participants, and sought their consent via a participant information and consent form (Appendix III and IV).

4.8.2 Harm and risk

The participants were assured that no harm and risk was involved in participating in this study. It was explained to them that the study was strictly for academic purposes and no interference with their work behaviour was intended.

4.8.3 Honesty and trust

Adhering strictly to the ethical guidelines as stated in this thesis implies that the honesty and trustworthiness of the data collected and data analysis is ensured.

4.8.4 Privacy, confidentiality, and anonymity

The participants were assured of the anonymity of their responses, and that information provided by them would only be for academic purposes, and that such information would not be used against them in any way. This was ensured within the thesis by maintaining anonymity and confidentiality

of information provided by the participants. Thus participants' responses could not be identified and attributed to particular names; instead, they were coded using abbreviations.

4.9 Researcher Reflexivity

During the data analysis, several attempts were made to manage how my assumptions influenced my interpretations of the data. Reflexivity in qualitative research pertains to the "analytical attention to the researcher's role in qualitative research" (Dowling 2006). In the course of the thematic analysis, I reflected actively on the assumptions upon which my interpretations were based. I conducted a post-interview summary while listening to the interview recordings to capture ideas generated about the interview and its underlying meanings. This provided a useful summary of the data analysis in order to reconsider and refine my interpretation of the interviews. It enabled clarification from participants to ensure that the theme categorisations reflected their perceptions.

I have worked over 25 years in the construction industry on a variety of projects, such as railway projects, pipeline projects, road construction, infrastructure, and building projects. Though my first degree is in geology, I have a diploma in project management, which has enabled me to engage in many construction projects. As a construction manager in mega-building projects, problems are evaluated in a holistic manner rather than via a linear traditional method. I am currently general manager of a construction company in Libya. After encountering lots of challenges relating to rework in construction projects in my country, Libya, I decided to study for my MSc in project management at the British University in Dubai, UAE. My dissertation title was "Project management - an analysis of causes and effects of rework on construction projects". My zeal to understand the causes of rework, perhaps from the "people dimension", may have influenced my interpretations of the interview data as it made me focus on what motivates the craftspeople and how it can be affected. Being attuned in this way may have affected my interpretation with respect to coding, and perhaps theme generation, as I needed to know explicitly how craftspeople's motivation can be influenced in construction projects, and its effect on rework.

4.10 Summary

In summary, the research philosophy was influenced by the assumption that there is not a single reality but multiple realities. This led to the interpretivist approach adopted for the study. In order

to deduce meaning from the participants in their natural settings, a qualitative method was adopted. Choice of case design was justified over other qualitative research approaches. A purposeful sample of multiple cases was selected to explore the phenomenon. Case selection was rigorously designed to determine cases that fell within the context of investigation. The study population, study participants, interview protocol and a pilot study were described. Suitable data techniques were used for the collection of primary and secondary data, with interviews serving as the primary source of data. Documentary sources were archive data such as non-conformance report, financial data, and project report. In conclusion, the analysis explained in turn the thematic approach, causal loop diagram and documentary analysis, and gave details of the findings with respect to the theoretical framework. The trustworthiness of the study was established and ethical approval was obtained. Furthermore, the researcher's reflexivity was addressed.

Chapter 5.0 – Research Findings

This chapter presents the findings from the case studies and explains their impact in relation to the theoretical framework and the research questions. The description of the findings includes the outcome of the thematic analysis based on the interview transcripts of participants. It investigates the interrelationship of the variables holistically using the concept of systems thinking. The systems thinking outcomes are driving factors obtained from the feedback loops. The feedback loops are extractions impacting largely the overall system within a CLD which was developed using Vensim PLE software. Then, the resulting motivation type of the craftspeople emerged. Finally, the documentary analysis outcome is presented to show the cost and time overruns experienced across the case studies. As recommended by Yin (2014), the description is done first within case, with across-case synthesis afterwards, as follows.

5.1 Within Case Studies

It was noted from the case studies that the UAE construction industry is dominated by state-backed or owned conglomerates building very large-scale, multi-use urban development projects. Large construction firms are involved in the development of the construction works. Directly under these development companies are a small number of large multinational corporations who hire professional migrants but generally do not directly employ the lower-wage manual labourers and craftspeople who specialise in different construction trades. These multinational firms work on a different scale in the contracting chain, where some take the role of main contractors, while others are subcontractors who provide specialist services or provide construction workers such as craftspeople. The craftspeople examined in this study are an important component in the delivery of construction projects, because they engage in various construction trades such as steel fixers, electricians, painters, masons etc. The craftspeople are employed by both the main contractors and subcontractors at a percentage of 60% to 40% respectively.

Generally, both the main contractors and the sub-contractors are foreign companies owned by nationals but employing different nationalities such as Indian, Pakistani, Bangladeshi, Sri Lankan, Thai and Egyptian. Some subcontractors take on specific job phases which require specialist skills and fewer employees such as mechanical, electrical work, and plumbing (MEP). The inductive approach adopted for the study, as described in Chapter Three, was used to allow themes relevant

to each of the local practices (work environment, culture and management style) to emerge from the data that was collected via interviews (Patton 2002). These themes, alongside their interpretations as they relate to the local practices, are adapted from definitions by Jarkas and Radosavljevic (2013) and Barg et al. (2014) as in work environment; Kivrak et al (2009), Abeysekera (2002) and Hofstede (2001) as in culture; McGuire (2005) and Olatunji (2016) as in management style. The theoretical understanding of those themes was adopted from Deci and Ryan (2000) and other literature contexts on SDT using BPNT and OIT. Thereafter, it was supported with the examples as expressed by the participants. The concept of universal psychological needs (autonomy, competence, relatedness) which served as the mediating elements to sustain the craftspeople's behaviour, was explained. The findings support self-determination motivation studies which found that the environment influences the worker's needs for autonomy, competence and relatedness (Ryan and Deci 2000a; Van den Broecks et al. 2016; Van den Broecks et al. 2008). The conditions within which local practices (work environment, culture, and management style) influence the craftspeople's motivation and its link with the theoretical framework in this study are explained in the following section.

5.1.1 Case Study I (Dubai Location)

The study findings showed many themes generated on the basis of factors affecting craftspeople's motivation. In total, 36 themes were the variables affecting craftspeople's motivation in this case in relation to the issue of rework as shown in Table 5.1.

Table 5. 1 List of Themes in Case I

S/N	Themes	S/N	Themes	S/N	Themes
1	Worker's experience	13	Productivity loss	25	Experience in current job
2	Safety practices	14	Workload	26	Consultant rigidity
3	Contracting by worker	15	Schedule pressure	27	Rework
4	On-site training	16	Work procedure	28	Schedule delay
5	Salary payment	17	Work acceleration	29	Learning and development
6	Long working hours	18	Worker's behaviour	30	Cost of rework
7	Timely payment	19	Worker's morale	31	Tiredness
8	Language challenges	20	Job security	32	Project performance
9	Effective supervisions	21	Out-of-sequence	33	Worker skill set
10	Work inspection/monitoring	22	Material usage	34	Crafts people's motivation
11	Work planning/coordination	23	Lack of focus	35	Staff turnover
12	Different nationalities	24	Error	36	Job satisfaction

These variables emerged due to the influence of the local practices (work environment, culture, and management style). For instance, work environment entails effective supervision, on-time payment, work inspection/monitoring, schedule pressure, productivity loss, experience in current job, material usage, out-of-sequence, crafts people's motivation, error, consultant rigidity, rework, schedule delay, staff turnover, cost of rework, salary payment, learning and development, worker's skill set, tiredness, project performance, and workload. As noted, work environment as understood in this organisation is the place where the construction workers carried out their daily construction activities, and they are governed by factors concerning the nature of the work. Some examples illustrate the participants' concerns, e.g. in the case of work inspection/monitoring:

"The first one is the responsibility of the foreman, this is due to his improper checking on the work activities coupled with the site engineer's indifference to make regular checks on work done". (Case I: Carpenter (02))

Other participants acknowledged that lack of inspection contributed to the many problems evident on the site. Participants noted that if there had been sufficient inspection conducted on their work,

many of the problems would have been detected at an earlier stage. In an example, the electrician noted that:

"The problem of not looking at our work at the right time is another challenge and this has been a major reason behind redoing a lot of work" (Case I: Electrician (01))

Emphasis by the participants reflected that the problem of not carrying out inspection at the right time was a major challenge when it led to redoing work activity. In this case, the participants are affected by the psychological need of competence due to not getting good feedback at the right time, and the associated working relationship also presented a problem. This shows that the inability to effect inspection of work at the appropriate time tends to unleash undue external control on the participants, thereby shifting the locus of causality.

On the other hand, culture involves variables such as language challenges, different nationalities, on-site training, safety practices, job security, and work procedure. Culture in this context encompasses the characteristics of the industry, approaches to construction, the competence of craftspeople and of people who work in the industry, and the goals, values and strategies of the organisations they work in. As noted in this case, one of the participants reported that:

"….the lack of understanding one another caused some problems in the final work especially when it relates to work according to technical drawing, which sometimes create errors" (Case I: Carpenter (01)).

This emphasis in relation to rework was noted by other participants.

"Sometimes, it is not easy for us to read or understand the data sheet of this material because it is written in English. This is essential as the right materials are needed for the repairing". (Case I: Mason (02)).

Problems relating to *competence and autonomy* emerged from the participants' expression of language challenges which inhibited their ability to perform. These descriptions show that

language challenges impact the craftspeople's ability to execute their job functions, and thus, thwarts their motivation.

Other instances occurred during variables such as o*n-site training*. Many participants recognised the need for formal training as this would help to increase their understanding and proficiency on the job. Interviews conducted during the case showed that no formal training is usually done. This supports findings in the literature, which also revealed that formal training is inadequate even when it is done. While some participants appreciated the importance of on-site training, they believed that lack of formal training influences rework. For example, a plumber mentioned that:

"We got most of our experience by doing our daily work and we learn from our mistakes" (Case I: Plumber (01)).

Such description aids participants in sustaining their motivation to achieve the need for competence and autonomy on their job functions, thereby leading to a more autonomous form of motivation.

Management style encompasses variables such as work acceleration, contracting by worker, work planning/coordination, worker's behaviour, worker's morale, long working hours, and schedule pressure, lack of focus and job satisfaction. Management style as noted in this organisation is seen as a way of getting things done, largely by the superiors. The influence of management style on the craftspeople is described in some of the illustrations by the participants. For instance, one participant mentioned that:

"The nature of our work demands that we complete an activity which we have commenced; as such, we often work overtime. Depending on the activity, we are most likely to work 3 to 5 hours as overtime on a daily basis….." (Case I: Scaffold (01)).

Some participants, despite their satisfaction, claimed that long working hours caused absenteeism for some craftspeople as a result of tiredness. Thus, long working hours represents a controlled

motivation, as it hinders craftspeople's motivation. Nevertheless, the decision to get the work done is driven by avoiding fear and punishment in not completing the job.

5.1.2 Case Study II (Dubai location)

In this case, themes that were generated resulted in 35 variables known to be influencing the craftspeople's motivation in relation to the issue of rework. This is illustrated in Table 5.2.

Table 5. 2 List of Themes in Case II

S/N	Themes	S/N	Themes	S/N	Themes
1	Extensive overtime	13	Diverse culture	25	Consultant rigidity
2	Payment method	14	Worker's attitude	26	Worker skill set
3	Communication barriers	15	Worker's morale	27	Rework
4	Work planning/coordination	16	Quality and number of supervision	28	Schedule delay
5	Productivity loss	17	Work processes	29	Cost of rework
6	Work pressure	18	Personal development	30	Project performance
7	Rushing work activities	19	Workload	31	Crafts people motivation
8	Contracting by workers	20	Work inspection/monitoring	32	Material usage
9	Diverse experience	21	Tiredness	33	Learning and development
10	Safety measures	22	Staff turnover	34	Lack of focus
11	On-job-training	23	Error	35	Experience in current job
12	Regular payment	24	Job satisfaction		

The variable results are based on the influence of the local practices (work environment, culture, and management style) within which the craftspeople work. For instance, work environment was categorised to include: payment method, productivity loss, work pressure, diverse experience, regular payment, personal development, workload, work inspection/monitoring, tiredness, staff turnover, error, job satisfaction, consultant rigidity, worker skill set, rework, schedule delay, cost of rework, project performance, craftspeople's motivation, material usage, learning and development, experience in current job, quality and number of supervision. In this organisation, the work environment describes where the craftspeople carry out their daily construction activities under the specified regulations and policies surrounding their work. As an example, on regular payment, one of the participants expressed that:

"…...I am not happy with the salary; however, I get it on time. I like the fact that I get it on time because I am able to resolve some of my family's matter as required. Really, it has not been easy moving to another company. Thus, I have to maintain the job I currently have, because going back home is not a good option" (Case I: Electrician (01))

Such statements and others relating to regular payment expressed aspects of relatedness and possessing an autonomous motivation which is an indication of how they sustain their motivation towards project delivery. Such comment by the Steel Fixer (2) and other participants that conveyed salary related issues in this pattern indicated how participants dealt with challenges of low salary to keep their motivation on the job. Contrarily, salary issues are a form of extrinsic motivation that is used to control the behaviour (Deci, 1975) of the craftspeople in the UAE construction industry.

Moreover, the UAE construction work environment is populated by various nationalities seeking gainful employment in such an economically viable country. For this reason, there are wide differences in experience, competence and attitude. For instance, one participant mentioned that:

"…poor work of some activities results from some electricians with different background who failed to follow the instruction as expected, probably due to lack of experience and method of doing their work which does not go well with the instructions of supervisors" (Case II: Electrician (01)).

This type of description is associated with controlled motivation. Many of the participants' perceptions and experiences pointed in this direction. This indicates that differences in nationality present challenges on the construction site.

Culturally related themes included communication barriers, safety measures, diverse ethnicities, work processes, and on-job training. In this case, cultural factors has to do with the characteristics of the industry, values of the organisations in which the craftspeople work and operational strategies of the organisation. The influence of the culture is expressed within the thematic analysis of the participants' interviews based on their experiences and perceptions, as depicted below:

"Sometimes, the inability to understand ourselves, usually between the team and our supervisors often brings about problems resulting from coordination of activities, and this creates poor work" (Case II: Painter (01))

Aside from the fact that rework occurred as a result of this description, aspects of it affected the craftspeople's psychological needs of competence, autonomy, relatedness more generally. As a result, participants within this category are under a controlled motivation because the communication and good feedback that is expected to nourish their competence has been thwarted by communication difficulty between the team and their supervisors. The description explains what causes the rework and also the resulting impacts. Furthermore, participants highlighted the practice of on-site training, which is generally the norm in the UAE construction environment. Although participants expressed the view that lack of formal training played an important role in the occurrence of rework, they acknowledged the importance of on-site training. For example;

"… what I have been able to understand on this job is that we mostly learn on the job over time". (Case II: Steel fixer (01))

It is important that craftspeople have adequate expertise to effectively execute their work functions. However, in a labour constrained environment, new and inexperienced craftspeople characterise the UAE construction environment. It was noted by participants that they largely get their skills and experience from working on the job over and over again. In this case, aspects of competence, autonomy, and relatedness emerged from participants' descriptions of on-site training on how they are able to sustain motivation in getting their job functions done within the construction environment.

Management style includes work planning/coordination, rushing work activities, contracting by workers, worker's attitude, lack of focus, worker's morale, and excessive overtime. The approach to management style within this organisation is based on a methodology used by superiors to get the work done. This is expressed in the interviews conducted with the participants. For example:

“We work every day from 11 to 12 hours, out of which we get 2 hours every day for working beyond extended hours, and the company pays us the money for working for that hours with our monthly salary” (Case II: Carpenter (01)).

In response to further probing on duration of working and their perceptions and experiences in relation to rework, the participant explained:

“We manage with those hours, as we appreciate the money attached with it, although it is not always easy working that long hours in this hot environment. I have seen workers getting tired, at times, and out of their tiredness, they don’t get the job right” (Case II: Carpenter (01)).

For some of the craftspeople, the work demands that they stay longer on the job. As a result, financial incentives serve as a great motivator in such situations to keep them working on the job. This was noted by some of the participants. For example:

“I work with the teams that are involved with concrete work most of the time, and we work sometimes for a very long hours in the night due to the nature of our work, but we are satisfied because we are given money to help us cover for those time” (Case II: Mason (01)).

Participants showed aspects of autonomy and a form of autonomous motivation, arising from a recognition that working longer hours was part of their job function. Though they were motivated by the reward, the long hours were not without consequences, as lengthy periods of engagement on the job made them tired, and led to disapproval of their work activities. Contrarily, money is generally seen as a controlled motivation which is expected to last only a short while. In this case, the money helped the craftspeople to maintain and sustain their motivation for a long time on the job. Other instances include work morale: participants appreciated working on construction activities as a result of solving problems together. For example:

“I am glad working as a steel fixer, more so my teams are helpful to me. We work cooperatively and most especially my foremen try to explain whatever we ask him” (Case II: Steel Fixer (01))

Aspects of competence, autonomy, and relatedness are inherent in this description. Participants experienced a tendency to grow via solving problems together, and appreciated the cordial relationship that exists among team members. The description explains the way they embrace challenge and get it resolved. This produces an autonomous motivation.

5.1.3 Case Study III (Abu Dhabi Location)

The study findings resulted in the categorisation of all factors relevant to the participants' interview transcripts using the thematic analysis. A total of 32 themes emerged as variables impacting on the craftspeople's motivation in relation to the issue of rework. This list of themes is presented in Table 5.3.

Table 5. 3 List of Themes in Case III

S/N	Themes	S/N	Themes	S/N	Themes
1	Varying experiences	13	Job satisfaction	25	Lack of focus
2	Long working hours	14	Salary payment	26	Cost of Rework
3	Communication difficulties	15	Staff turnover	27	Tiredness
4	Site training	16	Workload	28	Consultant rigidity
5	Safety culture	17	Schedule pressure	29	Crafts people's motivation
6	On-time payment	18	Workers morale	30	Project performance
7	Work planning/coordination	19	Learning and development	31	Worker skill set
8	Work monitoring	20	Experience in current job	32	Diverse culture
9	Qualified and adequate supervision	21	Rework		
10	Contracting by workers	22	Error		
11	Work procedure	23	Schedule delay		
12	Work acceleration	24	Material usage		

The variables resulted from the influence of local practices (work environment, culture and management style) being attributes under consideration within this study. The work environment included: varying experiences, on-time payment, work monitoring, qualified and adequate supervision, salary payment, productivity loss, workload, schedule pressure, learning and development, experience in current job, rework, error, schedule delay, material usage, cost of

rework, tiredness, staff turnover, consultant rigidity, craftspeople's motivation, project performance, and work skill set. The work environment is regarded as a place where construction activities take place in accordance with the stated objectives. In respect of the variables, some participants noted that their activities were impacted by the environment in terms of the weather, and this resulted in productivity loss. This is expressed in an example as stated below:

"The hot weather mainly impact on our ability to work well. But sometimes if we don't put enough water to cement it will be affected as well, so during this period our specifications is changed to meet the change in the weather conditions which we have to follow". (Case III: Carpenter (02))

Aspects of controlled motivation emerged from participants' descriptions as their ability to perform was controlled by changes in the weather conditions. In other instances, questions demanding the participants to express themselves on the nature of the job and reason for rework showed that schedule pressure was a major factor affecting the quality of work. For instance, a participant mentioned:

"We are stressed out when asked to speed up the construction activities, largely because there is a need to meet time schedule. Usually, the pressure on us by our foremen only results to trying to meet the time rather than being cautious of the work. This leads to decrease in the work quality and create problems such as concrete honey combing and segregation". (Case III: Mason (01))

Aspects of controlled motivation were found to influence the major part of the project delivery during this situation. Results found that when schedule pressure which is usually associated with meeting a timeline is intensified within the construction activity, it produces a controlled form of motivation. Another example included quality and number of supervision. A participant mentions that:

"In our project we don't have enough of supervisors and some of them are not experience enough to look over our job. Some of the problem resulting from lack of inspection is concrete defects. It

resulted from the final subfloor levelling before the pouring of the concrete". (Case III: Carpenter (01))

Indications of controlled motivation emerged from the participants' statements. The participants are affected by lack of a skilled supervisor to oversee and prevent problems associated with concrete defects. This is exemplified by the following:

"The other challenge is based on the fact that some of the new foremen do not have enough experience to give us good feedbacks which are sometimes required for our job". (Case III: Steel fixer (01))

The description included participants struggling to sustain their motivation due to insufficient feedback, which would have aided their competence.

Culture in this organisation is regarded from the perspective of the industry's characteristics, approaches to construction, competence of the craftspeople, and goals, strategies and values of the organisation. Some of these values reflect the challenges experienced in this case such as: communication difficulty, on-site training, safety culture, work procedure, and diverse culture. This was expressed by some of the participants:

"I believe my supervisor have a good knowledge but the problem which I faced sometimes is based on the fact that he does not understand us very well because we speak different language, and this impacts the way work is completed. Normally another foreman translates between us, but he is not always free all the time to translate exactly what we ask for" (Case III: Plumber (01))

Aspects of competence were affected by controlled motivation, as the description expressed how the communication difficulties impinge on the craftsperson's ability to achieve a desired result on the construction activity. Similarly, a participant expressed issues relating to work procedure:

"As I said, I have more than 15 years' experience, and I think I have enough knowledge to do my work in a good way; however, work has to be done according to the company policy i.e. we should follow the company's work procedures step by step. Over time, I have realised that there are ways to get job easier and faster but it is always safe to follow the instructions" (Case III: Carpenter (01)).

From the description, aspects of competence, and controlled motivation emerged from the participant's descriptions. The participant explained the challenge to maintaining his motivation for the job while having to persistently follow the company's laid down instructions in executing his job functions.

Management style is found to be the way in which the craftspeople's manager deals with them at work and exercises authority over them to get work done. Themes generated within the participants' interview transcripts using thematic analysis include: long working hours, work planning/coordination, contracting by worker, work acceleration, lack of focus, and worker morale. The participants expressed the relationship of those themes in some of the examples as follows. For instance, work acceleration is associated with an increased in sequence activities and means to facilitate the job being completed on time. In an example, a participant mentioned that:

"We get instructions from our managers to rush to finish the work" (Case III: Carpenter (01))

This description found that work acceleration led to controlled motivation where participants are only aiming at meeting the schedule time rather than the work quality. On the other hand, themes generated on the basis of contracting by worker showed competence, autonomy and autonomous motivation emerging from the participants' descriptions. For instance:

"Another important factor causing rework is working without adequately reviewing work done by the worker. When some of our supervisors give some tasks to the work team with an estimation time to complete the work, which is usually done without a regular check-up leaves the workers at his discretion to complete work at his own pace. While work is usually completed on time, we

sometimes experience disapproval on completed work as a result non-follow up by the supervisor". (Case III: Mason (02))

The descriptions showed that participants are motivated towards getting the work done on time and in accordance with specifications; nevertheless, cases of disapproval were noted at some points due to non-following up.

The next section dealt with the cross-case analysis of the findings to investigate the four research sub-questions needed to understand the research question (1) that was expressed in Chapter One and Two. It builds on the thematic analysis of variables found to influence the craftspeople's motivation across cases by further expressing the aspects of SDT using the basic psychological needs and organisms integrated theory to explain their implications for rework within the construction industry.

5.2 Across Case Synthesis

The three case studies showed similarities on the basis of definitions and interpretations of the local practices (work environment, culture, and management style) within their respective organisations. As a result, it allowed the formation of broader themes, which are directed towards answering the research questions. This served as the basis for looking into the four research sub-questions. Specifically, the first sub-question (a) what are the factors influencing craftspeople's motivation? This was addressed by identifying the 32 broader themes which are presented in Table 5.4.

Table 5. 4 Broad Themes of the Cases and their Definitions

S/N	Case I	Case II	Case III	Definitions	Broader Themes (Similarities)
1	Worker's experience	Diverse experience	Varying experiences	Is the knowledge and skills gained by workers over the period of working on a specific job or field	Worker's experience

2	Safety practices	Safety measures	Safety culture	It is ability to adhere to safe act when engaging in job functions	Safety practices
3	Contracting by worker	Contracting by workers	Contracting by workers	The act of assigning a task to a worker which when completed earlier allow the worker a free time	Contracting by workers
4	On-site training	On-job-training	Site training	The act of training workers on a specified skill of the construction trade on site or particular location arranged by the organization	On-site training
5	Salary payment	Payment method	Salary payment	A monetary reward given to a worker usually on a monthly basis	Salary payment
6	Long working hours	Extensive overtime	Long working hours	An extension on time to engage in work activity	Long working hours
7	Timely payment	Regular payment	On-time payment	Monetary reward that is made within the specified period of time	On-Time payment
8	Language challenges	Communication barriers	Communication difficulties	The inability to convey and understand ideas and concept of others	Communication difficulties
9	Effective supervisions	Quality and number of supervision	Qualified and adequate supervision	To ensure that subordinates are progressing as planned on a task and gets the necessary support on the job	Quality and number of supervision
10	Work inspection/ monitoring	Work inspection/ monitoring	Work monitoring	This is the process on ensuring that work meets required specifications	Work inspection/monitoring
11	Work planning/coordination	Work planning/coordination	Work planning/coordination	The act of ensuring that team members knows what needs to be done.	Work planning/coordination
12	Different nationalities	Diverse culture	Diverse culture	Multicultural diverse people	Diverse culture
13	Productivity loss	Productivity loss		The lack of engagement in work	
14	Workload	Workload	Workload	The amount of work to be done	Workload
15	Schedule pressure	Work pressure	Schedule pressure	The level of work that has been imposed on workers to complete within a short timeframe	Schedule pressure
16	Work procedure	Work processes	Work procedure	The steps that needs to be taken in ensuring work is done accordingly.	Work procedure
17	Work acceleration	Rushing work activities	Work acceleration	The process of increasing the amount of work to be done per time	Work acceleration
18	Worker's behaviour	Worker's attitude		The human actions and mannerisms express towards work	
19	Worker's morale	Worker's morale	Workers morale	An overall expression in term of attitude and/or satisfaction towards work	Worker's morale
20	Job security			The level at which working on the job can be retend	
21	Out-of-sequence			Working in an unplanned manner	
22	Material usage	Material usage	Material usage	The amount of materials used on a given work	Material usage
23	Lack of focus	Lack of focus	Lack of focus	The inability to concentrate on the job	Lack of focus

24	Error	Error	Error	The process of omitting an aspect of work needed to be done.	Error
25	Experience in current job	Experience in current job	Experience in current job	The length of time to acquire a skill on a given job	Experience in current job
26	Consultant rigidity	Consultant rigidity	Consultant rigidity	Is the delay of work approval from the consultant	Consultant rigidity
27	Rework	Rework	Rework	The act of doing what has already been done once	Rework
28	Schedule delay	Schedule delay	Schedule delay	The temporal inability to work as expected	Schedule delay
29	Learning and development	Personal development	Learning and development	The act of acquiring skills and experience and being persistent on it	Learning and personal development
30	Cost of rework	Cost of rework	Cost of Rework	The amount of monetary value involve to repeat work	Cost of rework
31	Tiredness	Tiredness	Tiredness	The state of being restless to work duty	Tiredness
32	Project performance	Project performance	Project performance	The ability to manage work on time and cost	Project performance
33	Worker skill set	Worker skill set	Worker skill set	A particular categories of knowledge, abilities and experience expected to perform a given job	Worker's skill set
34	Crafts people's motivation	Crafts people motivation	Crafts people's motivation	People who work as a construction artisan to perform a specified skill	Crafts people's motivation
35	Job satisfaction	Job Satisfaction	Job Satisfaction	The state of being contended with the nature of job	Job satisfaction
36	Staff turnover	Staff turnover	Staff turnover	A situation whereby worker leave the organization	Staff turnover
				Total Overall Broader Themes from Cases	**32**

The second sub-question (b) what kind of motivational driving factors affect the level of rework? This sub-question was addressed based on the outcome of the system thinking which allows feedback loops from the development of a CLD, as presented in Chapter Four. The explanation on the feedback loops resulted in the identification of eight driving factors, and linked to the motivation type. Subsequently, the third sub-question (c) why is it important to understand the types of craftspeople's motivation? This was assessed with respect to the impact of psychological needs on the craftspeople's motivation. As noted in Brooks and Spillane (2016), the influence on the motivation types was built on this premises. It was assessed against characteristic features of the perceptions and experiences of the craftspeople, and reviewed against literature in different fields. This is discussed in the following sections.

5.2.1 Implications of Driving Factors and UAE Construction

The findings from the CLD analysis were based on the categorisation of variables as producing either autonomous or controlled motivation based on the description in Section (5.1). From the development of the CLD, which linked the relationship among the variables, several balancing and reinforcing loops resulted, as described in Chapter Four (Section 4.5.2). In a balancing loop, a variable tends towards the desired or reference value and is assigned a negative sign; whereas, in a reinforcing loop, variables are usually in an increasingly positive state (Barlas 2002). It was found that eight driving factors resulted from the feedback loops within the diagram. A feedback loop or causal loop is defined as the transmission and return of information (Richardson and Pugh 1981). In other words, a feedback loop creates a closed sequence of cause and effects; that is, a closed path of action and information (Richardson and Pugh 1981).

Within this diagram, the experience loop (1R) is driven by the diverse worker experience. As a result, work procedure increases to enable work activities to be harmmonised. On-site training is utilised to facilitate skills acquisition by the workers, which in turn enhances safety practices within the construction environment. The diverse worker experience is found to be controlling the craftspeople's motivation owing to the challenges and differences in the perspective of the workers, which is often a cause of rework occurrence.

The training loop (1B) shows that with an increase in numbers of craftspeople from different nationalities, on-site training increases. On-site training refers to training acquired to enhance skills and experience relevant to the job at hand. It is commonly done within the construction environment, usually without formal training in place, and is not adequate. This affects the craftspeople's motivation as it does not satisfy their desire for quality work. This engenders a controlled motivation because it serves as a faster way to get the worker on the job. Over time, an increase in on-site training increases learning and personal development, which in turn improves the worker's skill set. There is an increase in experience in the current job when the worker's skill set improves. Significant to the UAE construction industry is a lack of training institutes that can engage labourers or craftspeople in vocational skills. Rather, the construction industry relies on hiring based on academic qualifications, not skills (Middle East Economic Digest (MEED), 2019). This makes on-site training a common practice in the UAE construction industry.

The supervisor's loop (2R) refers to quality and number of supervision, which tends to control craftspeople's motivation due to its effects within the system. Quality and number of supervision was found to influence rework, which served as the cause of the system behaviour within the closed loop 2R. Quality and number of supervision involves the ability to provide the required feedback needed to ensure that work is done appropriately with the numbers of supervisors necessary to monitor, inspect and check the progress of work. Participants found that the skill and experience of the supervisor played an important role in curtailing rework. Thus, an increase in the need for sufficient skilled and experienced supervisors will lead to an increase in work planning/coordination. When work planning/coordination is inadequate, it generates an increase in the workload, which creates long working hours. When craftspeople work longer than expected, they become tired, but it takes time for tiredness to set in. An increase in tiredness produces a decrease in job satisfaction, hence craftspeople's motivation is reduced, leading to rework. Reports have shown that contractors' experience and their supervision have great impact on the project (Faridi and El-Sayegh 2006). Poor supervision within UAE construction is of great concern to the construction manager, and remains a major cause of construction delays in the UAE (Faridi and El-Sayegh 2006).

In the communication loop (2B), communication difficulty is found to be controlling. The CLD showed that communication difficulty depends on the diverse culture (different nationalities) present on the construction site. Communication difficulty leads to challenges embedded in understanding one another on job related tasks that require a common goal. Increased communication difficulties impact on worker morale, material usage, and work procedure. As communication difficulty increases, this affects the morale of workers, as they have difficulty understanding one another effectively and efficiently. This results in inappropriate use of material for construction activities as a result of communication differences. A rise in material usage results in pressure for the use of work procedures. Nevertheless, due to the array of nationalities present on the construction site, a unified work procedure becomes problematic. The problems include differences in understanding technical requirements of job functions, safety practices, and work experience. This outcome is significant in the UAE context, where diverse teams suffer more from poor cohesion and social integration than homogeneous teams (Hambrick 1994), with communication difficulties being a major factor (Adler and Gunderson 2008).

The prolonged work hour loop (3B) represents a growing use of overtime within each of the organisations resulting in tiredness of the workers over a period of time. Long working hours involves an extension of work hours beyond the usual or regularly accepted length of time. A rise in tiredness reduces the interest and engagement of the worker, thus decreasing job satisfaction. The craftspeople's motivation is impacted negatively, and this brings about rework. Although craftspeople cope with the long working hours due to the financial benefits they get from working long hours, nevertheless, the consequence of long working hours is disengagement. Thus, it is found to be controlling the craftspeople's motivation. There is a need to enact policies to regulate the amount of time permitted to work on the construction site without reaching the limit where disengagement will occur. Central to this finding is the use of a sponsorship (or kafala) system, which makes workers completely dependent upon their sponsor. Sponsorship is widely used in the UAE and more importantly in the construction industry. The system gives employers a lot of control over workers, who have little negotiating power over the terms and conditions of their work, leaving them vulnerable to exploitation and rights violations. As a result, long working hours are not usually reported by the workers for fear of losing their jobs (Andrieu et al. 2016).

The payment loop (3R) emphasises the importance of on-time payment to the craftspeople. An on-time payment is a monetary reward made within the specified period of time. The craftspeople found job satisfaction due to payment that is received to meet their needs as and when due. An increase in job satisfaction increases the craftspeople's motivation, which in turn reduces the amount of rework experienced on the job. This creates an autonomous motivation when doing the job. There is a gradual progression in the work when there is less rework activity, and this reduces schedule pressure. A reduction in schedule pressure allows for autonomous motivation because craftspeople are able to work appropriately, applying skills and experience as required, and completing the job within an allowable time. There is always a reduction in staff turnover in such situations, as they are less likely to be working longer than expected and becoming tired. The outcome contrasts with previous reports in the UAE construction sector, which showed that non-payment of wages was widespread (HRW 2006), although there have been reports that due to electronic payment of wages into bank accounts set up for the workers, there has been an appreciable improvement (HRW 2009). Nevertheless, recent report by HRW (2015) found that this has not been effective in detecting late payment or non-payment at all.

The contracting loop (4B) shows that workers are passionate and perform well when there is a sense of ownership of their job. Contracting by worker is the act of assigning a task to a worker which allows them to complete work activities within an allowable time, with the remaining time free for relaxation. It promotes autonomous motivation in the craftspeople because of the ability to work appropriately. An increase in contracting by worker leads to job satisfaction, which in turn increases craftspeople's motivation. Further use of contracting by worker signifies a reduction in rework, as there is less schedule pressure on the work activities. Contracting by worker is rather a new concept that has been adopted in the UAE construction environment, particularly by construction management to improve operations. It has been found to be effective but requires more experienced workers to enable its satisfactory use.

An acceleration loop (4R) emphasises the need to get the work done. An increase in work acceleration produces errors, creating a need to correct the errors. Work acceleration is the process of increasing the amount of work to be done per time. It controls craftspeople's motivation as they are made to work more than is expected as a result of more work to be done in order to meet the project deadline. This increases rework when more errors are occurs, and more schedule pressure is required to get the work back on time. As schedule pressure increases, it further results in the management having to increase the use of work acceleration so as to deliver the project as scheduled.

The identification of driving factors within the feedback loops helps to indicate the type of motivation resulting from craftspeople's behaviour. Table 5.5 shows the driving factors and their motivation types.

Table 5. 5 Identification of Driving Factors

S/N	Driving Factors (Themes)	Types of Motivation
1	Contracting Workers	Autonomous Motivation
2	On-Time Payment	
3	Communication Difficulties	Controlled Motivation
4	Work Acceleration	
5	Long Working Hours	
6	Diversity Work Experience	
7	Quality & Numbers of Supervisions	
8	On-Site Training	

5.2.2 Relationship of the Driving Factors with SDT

The concern for non-intrinsically motivated practices such as building construction projects lies in how they are acquired. The findings on the impact of driving factors on craftspeople's motivation was considered via influences on the craftspeople's locus of causality. On the basis of the motivation types identified in the previous section (Section 5.2.1), influences on both internal and external locus of causality were examined from the perceptions and experiences of the craftspeople with regard to the driving factors. They were evaluated based on the following: (i) Reasons found interesting in task (intrinsic); (ii) Reasons found integral to the self (integrated); (iii) Reasons found congruent with belief and values (identified); (iv) Reasons found connected to the ego (introjected); and (v) Reasons found due to external controls (external).These regulatory styles use the definitions from the SDT literature provided in Chapter Three as a guide.

5.2.2.1 Autonomous Motivation

The two driving factors identified in this group were contracting by worker and on-time payment. Participants' perceptions and experiences throughout the course of the interviews with respect to these themes reflected that craftspeople feel fully self-endorsing of their behaviour, even if they do not enjoy it. This reflects an identified regulation. The craftspeople engaging with the activities perceive the behaviour as their own, because they identify with the reason for the activity. The

goal of the behaviour is personally endorsed and considered important. In the case of contracting by workers, a competency-autonomous environment is created which allows the craftspeople to work independently, using their capability to get the job done. For instance,

"An important reason for working in this company is the fact that I can do my work on my own. This allows me to a great extent to be able to do work satisfactorily, moreover, benefit includes working without stress or pressure and we can have good rest once the job is completed". (Case I: Carpenter (02))

"… those moment I enjoyed most in this company are the times I had the ability to get task done as it was required. Because those periods usually allow me to have free time after completing the work requested of me". (Case I: Painter (01))

In this instance, the craftspeople exhibit the ability to get the work done (competence), and in a manner that reduces stress (autonomy), while ensuring the work is done. This is facilitated by the type of interpersonal relationship they have with their supervisors (relatedness). It was found that when there is an interest in the job, which is not propelled by external pressure or control, such behaviour is said to have an internal locus of causality. Although the participants portray an element of interest, nevertheless such action has not been taken as a full responsibility; rather, they undertake it so as to relieve themselves from certain obligations. This type of regulation style is referred to as identified regulation. It is concluded that when the psychological needs (competence, autonomy, relatedness) that led to this type of regulation are affected, the craftsperson will shift the locus of causality. This can be found in situations where the work is closely examined for faults, which reduces their feeling of competence; or where they are required to complete a work assignment within an unreasonable time schedule, which will impact on their autonomy. As a result, the worker become less interested in the work itself, but focuses on avoiding penalties or attaining a reward that is attached to the task (Ryan and Connell 1989; Gagne and Deci 2005).

In the case of on-time payment, participants acknowledged that their work is impacted by constraints resulting from schedule delay, but are motivated to ensure the work is completed well. Besides, the on-time payment helps them to meet their needs at the right time, thus, their action

becomes an avenue through which their needs are met and they are eager to ensure that congruence is achieved between needs and job. To preserve this position, participants sought both competence and relatedness. This type of regulation style is referred to identified regulation.

"We have to work hard in order to meet the project timeline, but we received payment on time which is very important to me. As a result, I tried to do my best to finish the required work as it is required and on time." (Case II: Steel Fixer (01))

"Because of my salary which is always received regularly, I am happy doing this job, even though the way work is to be done here demand greater attention as compared to those ones in my home country, …" (Case III: Carpenter (02))

"..although the salary was not satisfactory at my work place, but as a result of the convenience by which I carry out my work and the good personal relationship with the supervisor and with one another, coupled with the regular payment of salary, added up to my continuous stay in the company" (Case II: Steel fixer (2))

This suggested that an environment which seems not to be overly controlling can manifest autonomous motivation. Although salary or reward is known to be controlling, it was found that for an uninteresting work environment, on-time salary that fulfils the needs of the worker can be autonomous, once there is potential to complete the work well (competence), and the worker knows how to complete the work (autonomy). In agreement with Deci (1975), when payment is given in a non-controlling manner, and not contingent on an individual's performance, the negative impact on intrinsic motivation is reduced (Brooks and Spillane 2016).

5.2.2.2 Controlled Motivation

In this type of motivation, behaviour is said to be controlled by external pressure. Moreover, negative feedback (Deci et al. 1995), competition, threats (Deci and Cascio 1972), or even positive influences such as praise and monetary reward are regular factors producing an external locus of causality. In this study, communication difficulties, work acceleration, long working hours, diverse work experience, quality and number of supervision and on-site training have been identified as

driving factors that undermine the attainment of autonomous motivation. Such actions becomes controlling when those factors are dictated by others. In contrast, communication is a medium through which competence is achieved, thereby promoting autonomous motivation. Communication difficulties among the craftspeople undermine their motivation due to difficulty in understanding one another. For example,

"Actually we used to work according to company's work procedure which is written in English, this gives me challenge on the job, because I don't understand English, I find it difficult to understand the job requirements" (Case I: Steel Fixer (01)

"Sometimes, difficulty in understanding between the team and their supervisors as a result of language differences which often brings about coordination problems and created poor quality work. This affect us, as some team members complain of this problem a lot" (Case II: Painter (01))

"I have long years of experience and I know very well how to do my work, but still I face some challenges when it comes to the work statement and technical drawings because these are all written in English and updated as well in English but I can't read in English language" (Case III: Steel fixer (01))

Rather than communication serving as a medium by which competence is achieved, it poses problems to the craftspeople by thwarting people's innate psychological needs. Communication difficulty hinders the craftspeople from getting the good feedback needed to support them on their job functions (competence). Moreover, it limits the relationship due to difficulty in understanding one another, and makes them subservient to the will of other people (autonomy). As a result, communication difficulty becomes a controlled motivation. This type of motivation indicates that craftspeople only engage in the activities in order to avoid feeling guilty or to avoid being considered bad workers, which is expressed in the form of an introjected regulation.

Likewise, most participants also reported challenges when engaged in activities involving deadlines. Such challenges bring about behaviour aimed at avoiding punishment, which is an attribute of an external motivation (Gagne and Deci 2005). External regulation is negatively

predictive of giving knowledge and unrelated to receiving it (Foss et al. 2009). Thus, when the psychological needs of the craftspeople are thwarted by an imposed external locus of causality, it leads to controlled motivation. This is expressed in the example below:

"…. Those times I find very challenging are the time our supervisor ask us to complete a job task within a specified time. In most cases, I found it difficult to do the job well, but I have to complete those work has required" (Case I: Painter (01))

"…I call recall that most work that are not approved occurred mostly during the time we had to rush the work to completion. In fact, even the best among us on this job make mistake in those time. Really it can be hard trying to complete a job under high pressure" (Case III: Steel fixer (02))

"Having to work on previously completed work usually result from times that we are made to rush work due to time constraint" (Case II: Steel fixer (01))

In relation to long working hours, it was found that the activity is done because it is compelling in nature. Moreover, it is executed since reward is attached. Sheldon et al. (2003) noted that activities done to attain financial gain, or because the external situation seems to compel or require action, are externally regulated. Nevertheless, long working hours associated with non-interesting activities were considered by the participants to be appealing to them. This is because of the reward that is attached to doing the activity. This is expressed in the example below:

"Whereas, when the work is even more pressing, we had to work overtime for as close to 10 hours. Despite this long hours of working, we are still required to resume to work the following day, really, it is challenging" (Case I: Mason (01))

"We work around 12 hours per day and sometimes up to midnight, depending on work demand, which may include an urgent or repairing work that has to be effected. Sometimes, we work all day without break and end up feeling stressed out. At times, when mistakes are detected, you image whether you actually carry out the work because you will know that this is not right, but you cannot help the situation" (Case II: Plumber (01))

“We are always working 10 hours on a daily basis and sometimes go an additional hours of 3-5 hours as overtime. Although we get additional payment, but really, it can be sometimes stressful. I tend to lose my focus at work whenever I engage in long hours at the job” (Case II: Steel Fixer (01)).

In such situations, craftspeople exhibit behaviour that aims to avoid guilt or to attain ego enhancements such as pride. This is a form of introjected regulation. As noted by Deci and Ryan (1995) and Ryan and Deci (2000a), an introjected regulation describes a behaviour that aim to avoid guilt or to attain ego enhancement.

Participants showed that their work experience was very relevant to their performance at work. However, cultural factors influenced their performance, since their experiences varied according to their background and environment. Craftspeople in such an environment find their actions controlling, because of the problems caused by co-workers on the job. They however, engage in such an activities only to demonstrate their ability or avoid failure. This is regarded as an introjected regulation. For instance, some participants expressed that:

“I work as a carpenter in this company, though I have about 8 years’ experience in UAE. The experience I have working on this project is about 3 years and 4 months”. I enjoyed working as a carpenter because this has been the job I have been doing before coming to UAE, but the way the work need to be completed here is difficult. They always want work completed exactly as it is drawn without any differences. I try to get along with the way they want work to be completed” (Case I: Carpenter (01))

“I have 8 years of work experience as an electrician. I worked 5 years in India and 3 years in UAE. Though my team mate are equally very good, but I know that sometimes we have different approach to work installation. This happen when instructions seems not very clear” (Case II: Electrician (01))

“Foremen, carpenters and labourers have at least 13 nationalities and they came from different countries with different experience. This is one of the major cause of work errors, because of the way each nationalities are skilled at doing their work” (Case II: Carpenter (01))

Dealing with quality and number of supervision, participants reported lack of experience in their supervisors, and insufficient numbers of supervisors were not available to oversee the construction activities, which could have facilitated timely feedback. Supervisors are expected to stimulate workers by adopting an autonomy-supportive supervisory style that recognises their subordinates' feelings, offers choices, and provides meaningful feedback. During the course of the interviews, participants said they lacked effective feedback from supervisors, and that this reduced their ability to do their work properly. Engagement in such activity is limited, but done to show that they have done their job. This illustrates an introjected regulation, which is depicted in some of the examples as follows:

"…. Issues like this are caused as a result of lack of adequate skills of scaffolds, but the foreman who owns the responsibility to supervise the work done should have detected the problem earlier. This usually happen because not all the foremen possess the required skills and experiences for this job" (Case I: Mason (02))

"Although, he has good experience in electrical work, but lacked the required knowledge to effectively deals with problems relating to plumbing works" (Case III: Plumber (01))

"Thus, the ability to get work done properly is sometime affected because we don't have enough supervisors to check our work when activities have been completed. Many times we have to wait for inspection, but sometimes, we are asked to complete the work without inspection due to schedule delay. These are some of the reason that causes quality/work problem" (Case III: Scaffold (01)).

In relation to on-site training, there is a real concern for the customer's need for a quality outcome. Craftspeople recognised the need for training, but were not satisfied by on-site training, since it is perceived as a way to get workers on the job quickly. This imposes on the craftspeople's motivation, by affecting their competence and autonomy. Thus, it serves as an external locus of causality. Engagement is attained to show that the work has been done, which implies an introjected regulation. This is expressed as follows:

"Also training should be given to the new workers. This is because lots of problems are usually caused by newly hired workers" (Case I: Plumber (01))

"Yes, in our job whenever we have new workforce, even if they have gotten experience, we have to put him through some trainings to make sure he can do the job as it will be required because many can do the job but not as it is required here. This is one of the reason for doing the work that has been completed before" (Case II: Scaffold (01))

"Lack of the formal trainings make us to go through several try and error to get work done the way that is expected" (Case III: Mason (02)).

5.3 Documentary Analysis Outcomes

Based on the documentary data analysis in Chapter Four, the impact of rework on project performance across the three case studies was revealed when the documentary data such as the project value and detail schedule, daily work sheets, non-conformance reports (NCRs), and financial data were analysed. The outcome was used to address the sub-question (iv) what is the impact of rework on project performance. The result indicated that rework increased the cost of the projects from 2.10% to 3.33%, and recording schedule delays in all the projects. This is summarised in Table 5.6 and subsequently explained.

Table 5. 6 Summary of Time and Cost Impact of Rework Across Three Cases

Case study	Total project cost(USD)	Total project duration (months)	% Rework cost	%Rework time (days)	% Rework delay (days)
NO.I	60473000	32	3.33%	19.68	20.70
NO.II	35068493	24	2.60%	55.38%	15.27%
NO.III	821917808	48	2.10%	14.23	16.66

An increase in the original duration from 15.27% to 20.70% was noted within the three case studies. Further analysis of the NCRs of the construction activities across the case studies was done. Figure 5.1 shows the root causes of defects, errors and omissions resulting from the NCRs

of construction activities. In this Figure, case I serve as a snapshot to represent how the categorization was done, which were based on the frequency of their occurrence within the NCR's.

Case I: NCR Root Causes Analysis

NCR Number	Summary of NCR Description	Inadequate supervision	Shortage of Staffs	Communication Challenge	An insufficient manpower skill level	Excessive overtime	Work Acceleration	Use of unapproved or defected material	Workers Carelessness	Contract Document deviation	Errors in the drawing	Insufficient Protection	Payment Delay	Lack of proper training	Improper Inspection	Use of wrong equipment's	Others
001	Stockpile for Excavated Soil																✓
001	Using Un Approved Material-Using hollow block in substructure	✓						✓									
003	Ground floor and Frist floor column are not vertically aligned	✓			✓										✓		
004	Using over size shutter round column	✓			✓							✓			✓		
005	Concrete segregation/honeycomb of tie beams				✓												
006	Concrete repairing of column not fit with specification			✓	✓												
007	Backfilling Without Completion the MEP Building Work	✓			✓												
008	Dismantling shutter without concrete cube test results	✓					✓										
	Total Frequency	5		1	5		1	1				1			2		1

Figure 5. 1 Snapshot of Case I root causes of rework based on frequency of occurrence

Subsequently, Table 5.7 presents frequency of the root causes of rework as categorised from the NCR's of the three case studies. The table revealed the root causes within each NCR generated across the construction phases for the case studies that resulted in rework.

Table 5. 7 NCR Root Cause Analysis Across Cases

NCR Root Cause Analysis Across Cases	frequency	Ratio% Case I	frequency	Ratio% Case2 II	frequency	Ratio% Case III
Inadequate supervision	56	17.95%	257	27.36%	296	27.36%
Shortage of Staffs	16	5.13%	8	17.95%	3	0.28%
Communication Challenge	32	10.26%	67	17.95%	92	8.50%
An insufficient manpower skill level	48	15.38%	178	17.95%	146	13.49%
Excessive overtime	31	9.94%	103	17.95%	69	6.38%
Work Acceleration	21	6073%	82	17.95%	119	11.00%
Use of unapproved or defected material	5	17.95%	25	17.95%	39	3.60%
Carelessness due to workers Attitude	17	1.60%	49	17.95%	88	8.13%
Errors in the drawing	2	%0.64	3		9	0.83%
Wooden and metal work	2	%0.64	12	17.95%	9	0.83%
Insufficient Protection for completed	5	%1.60	19	17.95%	14	1.29%
Payment Delay	32	%10.26	98	17.95%	75	6.93%
Lack of proper training	29	%9.29	101	17.95%	88	8.13%
Improper Inspection	9	%2.88	12	17.95%	16	1.48%
Use of wrong tools or equipment's	4	%1.28	3	17.95%	6	0.55%
Others	3	%0.96	7	17.95%	13	1.20%
Total	**312**	**100.00%**	**1024**	**100.00%**	**1082**	**100.00%**

The result indicated in Table 5.7 shows some links with the outcomes from the thematic analysis. A number of the themes linked to the participants re-emerged during the root cause analysis that resulted from the NCRs. For instance, inadequate supervision and shortage of staff were the variables most mentioned by participants as causes of rework, and this was regarded as quality and number of supervision, based on the lack of effectiveness and insufficient numbers of supervisors.

Similarly, a communication challenge appears to result from the communication difficulties experienced by the participants as a result of varying nationalities working on the project site. Other factors that emerged were insufficient manpower and skill level, and carelessness due to workers' attitudes. These were linked to diverse experience based on the multi-nationality of project members. The analysis revealed excessive overtime as one of the causes of rework, and this is linked to long working hours, as mentioned by the participants.

In addition, there is work acceleration, which increases the work week/hour. It is characterised by excessive pressure on the craftspeople, which leads to further errors. Therefore its benefits may not be worth the time saved (Ballard and Howell 1998). Payment delay brings about demotivation, and lack of regular inspection during contracting by workers results in unsatisfactory quality. Lastly, lack of proper training was reported, and on-site training appears to have been insufficient to reduce the level of rework occurrence. Interestingly, those factors mentioned above possessed high frequency based on the categorisation of rework root causes, and were primarily the driving factors as explained in Section 5.2.1

5.4 Summary

The thematic analysis of the data collected for this study has led to the identification of factors influencing craftspeople's motivation in building construction projects in the UAE. The driving factors were identified using the causal loop diagram (CLD). The driving factors are elements of the local practices (work environment, culture, and management style) through which this study has been examined. Understanding the factors influencing craftspeople's motivation would help to determine ways to address negative behaviour causing rework and its impact on project performance. The documentary data analysis of the NCRs across the case studies has identified the resulting rework root causes through the construction phase, and provided insight into the cost and time impact on project performance.

In the next chapter, the outcomes of the findings will be reviewed against the existing literature. Areas of similarity, contrast, and improvement will be discussed. The contribution of this chapter will be used to develop the study model, which is expected to help project managers to manage the driving factors influencing craftspeople's motivation.

Chapter 6.0 – Discussion

The findings from this study identified those factors influencing craftspeople's motivation with regard to the project's level of rework in building construction projects using a multiple case study design. The thematic analysis presented in Chapter Four was used to identify all factors from the respective case studies. Afterwards, a cross-case synthesis led to broader themes of factors affecting craftspeople's motivation on the issue of rework. Using a systems thinking approach, the dynamics of those factors produced driving factors, which influenced the craftspeople's motivation on the basis of their feedback loops. Thereafter, it facilitated the understanding with respect to the different motivation type affecting the craftspeople, which was discussed in Chapter Five. In addition, the documentary analysis of archive documents of the multiple case studies showed the impact of rework on time and cost within the projects. The findings provided evidence of how self-determination theory (SDT) using these two mini-theories BNPT and OIT may be used to improve the understanding of craftspeople's motivation and how this can impact on the issue of rework and performance.

This chapter proceeds with a discussion of the findings, and how these findings corroborate or differ from previous research in construction and other fields in relation to the use of SDT to improve craftspeople's motivation with respect to the project's level of rework in building construction projects. Examining craftspeople's motivation via the lens of self-determination theory (SDT) may improve our understanding of how this complex construct of human factors influences the project's level of rework. The following section discusses the findings in relation to the guiding research questions, which leads to the development of the study model to facilitate understanding within construction domain as it concern rework issue.

6.1 Discussion of the Findings

Despite the research that has been conducted with respect to construction workers' motivation, evidence has shown that most of the studies are found wanting or need to be treated with caution as treated in Chapter Three (Section 3.2). In this study, the theoretical model set up with respect to craftspeople's motivation was to look into factors influencing their motivation, which impacts on rework and performance. There has been a growing trend towards the use of self-determination theory (SDT) as a human motivation tool par excellence. Despite its limitations, its application is

deeply rooted in various disciplines. Within the construction industry, SDT's use has been limited to the micro-theory of basic psychological needs theory (BPNT), but SDT has far reaching effects because of the experience of the motivation continuum that has been expressed by other micro-theories such as organismic integrated theory (OIT).

Motivation theories have found limited significance in the construction industry because of the varying behaviour exhibited by construction workers (Ogunlana and Chang 1998; Raoufi and Fayek 2015), which collaborates findings from Chapter Four in relation to the thematic outcomes. This had led to difficulty in understanding craftspeople's motivation and its resulting effects on project performance. One challenge has been identifying factors and driving factors influencing craftspeople's motivation, because of the array of different construction trades skills possessed by each craftsperson and their management. This was achieved in thematic analysis in Chapter Four (Section 4.5.1), and Chapter Five through cross-case analysis section which revealed the influence of those driving factors on craftspeople's motivation type in relation to the occurrence of rework. This challenge was answered in the sub-questions (1a) What are the factors influencing craftspeople's motivation? In Chapter Four, this sub-question was addressed, where across the three cases, 36, 35, and 32 themes emerged respectively. The case synthesis, using a systems thinking approach, addressed sub-question (1b): What kind of motivational driving factors affect the level of rework? The feedback loops of the CLD resulted in eight driving factors: communication difficulties, diverse workers experience, quality and number of supervision, on-time payment, long working hours, on-site training, contracting by worker, and work acceleration, as found in Chapter Five.

The first guiding research question asked why would understanding craftspeople's motivation help to address the issue of rework in building construction projects; and the second question focused on creating a model that would show how the facilitation of craftspeople's motivation would enhance project performance. Building on the outcomes of Chapter Four and Chapter Five, the SDT using its two micro-theories (BPNT and OIT) principles has been found significant in this regard. The eight motivational driving factors were found to be significant factors that influenced the craftspeople's motivation in relation to the issue of rework in building construction projects. These variables are discussed in relation to SDT (using BNPT and OIT concept) as it affects

craftspeople's motivation in relation to rework in the first guiding research question, and they formed the components that facilitated the understanding of craftspeople's motivation in enhancing the project's level of rework in the second guiding research question through a redefined motivation theory that was initially developed (Deci and Ryan 2000). This is discussed in the following sections.

6.2 Relevance of SDT to Craftspeople's Motivation

This present study explore factors influencing craftspeople's motivation in relation to the issue of rework, because of the effect of the interdependency and complex relationships that contribute to rework has been noted to be impacted by people's motivation (Love and Smith 2019). There are many factors acting within the local practices (work environment, culture, and management style). In this study, based on the view of Maloney (1986 cited by Barg et al. 2014), work environment focused on the context and content of the job. Where the contextual variables were found to be quality and number of supervision and on-time payment, the content involved diverse worker experiences in relation to the job. The findings in relation to those factors have been noted to affect rework as revealed in Chapter Five. This agrees with the historical literature, which indicated that supervisor incompetence and workplace incentive affects performance outcomes (Dozzi and AbouRizk 1993; Naaharuddin and Sadegi 2013). In this study, quality and number of supervision focused on inadequacy of skills and experience in the supervisors, and their availability to oversee construction activities being carried out by the craftspeople in a timely and adequate manner within the work environment. This variable impacts on individual as well as collective craftspeople's motivation, as shown in Chapter Five (Section 5.2.2.2).

The case of on-time payment which is associated with autonomous motivation as found in Chapter Five was rather an improvement over previous studies conducted with respect to construction worker payments in the UAE. A recent study showed that the UAE government has taken steps in recent years to address instances of non-payment and combat wage theft. Its Wage Protection System (WPS) first adopted in 2009 legally requires that employers pay wages directly into workers' bank accounts (Wickramasekara 2015, p. 27). In order to protect the contractors, Arafat and Skaik (2016) argued that late payment in the UAE construction industry has severe implications down the supply chain as it exposes companies, such as subcontractors, to insolvency.

It was suggested that a 'Security of Payment' scheme which has been successfully implemented in countries like UK, Australia and Singapore should be introduced to the UAE to safeguard the contractors. One of the problems is that contractors' late payment results in delayed payment to construction workers such as the craftspeople, many of whom are migrants and are the low-skilled and lowest-paid workers. Research conducted by Ailabouni et al. (2009) identified that late payment of salaries characterised the UAE construction industry; nevertheless, there has been an improvement in the system. Despite on-time payment, it was found in this study that some participants complained about low salaries, though this was not a deterrent to their motivation because their psychological needs were met within their current environment. Nevertheless, many are aware of the implications of the kafala system, if they revolt against low payment. The kafala system is the sponsorship system where employers exercise an extraordinary degree of control over construction workers. A major feature of the kafala system is the requirement for an annual fee to be paid to national sponsors; but this has been illegally extracted from workers by the employers (Buckley et al. 2016).

As revealed in Chapter Five, diverse worker experience resulted from hiring diverse nationalities, many of whom have different backgrounds, education, skills, and knowledge, into the construction workforce. The lowest-skilled UAE construction migrants are from India, Pakistan, Bangladesh, Nepal, Sri Lanka and the Philippines. Many are largely illiterate and low-skilled in their various construction trades (Buckley et al. 2016). Their varying skills, resulting from the different backgrounds, education and training which they have received from their home countries, often impedes the way work is executed during construction activities. According to the Organisation for Economic Cooperation [OECD] (2015) defined skills as the bundle of knowledge, attributes and capacities that can be learned and that enable individuals to successfully and consistently perform an activity or task, and can be built upon and extended through learning. In this study, skill is regarded as a measure of the worker's expertise in carrying out assigned work. Youha et al (2013) noted that the United Arab Emirates received many labourers from different nationalities and with different skill levels. Although the percentage of low-skilled migrants living in Abu Dhabi, the UAE's second largest city where migrants work mainly in construction, is unknown, a larger percentage of them are concentrated in Dubai (HRW 2009). Throughout most of the

interviews, participants cited problems arising from the diversity of craftspeople's skills and experiences as a main cause of rework.

The finding chapter (Chapter Five) showed that addressing the cultural factors within this study is associated with the influence of culture such as communication difficulty and on-site training, within the construction industry which impacts on craftspeople's motivation in relation to work. In this study, culture is explained on the basis of the "characteristics of the industry, approaches to construction, the competence of craft workers and people who work in the industry, and the goals, values and strategies of the organisations they work in" (Kivrak et al. 2009, p.43). In this regard, the findings presented in this study found factors influencing craftspeople's motivation in relation to rework to be communication difficulty and on-site training. It has been noted that miscommunication between supervisors and their diverse workforce influences construction outcomes, especially as regards quality of work completion (Casey et al 2015; Mitropoulos and Memarian 2012; Kath et al. 2010). The findings based on participants perceptions and experiences agreed that communication difficulties impact on the work that is completed. During the interviews, many participants expressed their views on how communication difficulties led to misunderstanding between supervisors and workers, and the impact on their work.

Despite the problems associated with communication as noted in this study, it was reported that not all cultural differences may affect construction site communication (Al-Bayati 2016b). The author concluded that "active cultural difference" is required in relation to communication as it affects construction site work. This is considered an area for future research.

The finding revealed that participants noted that training comes in two different forms: on-site training and off-site training (formal). Participants explained that they learn from working on the job, but many considered formal training very valuable. Though this type of training was hardly impacted at the construction site. In similar study, it has been noted that formal training in the construction industry is not common (Kazaz and Ulubeyli 2006). In addition, it was reported that lack of training in the US construction industry is considered the lowest of any major sector of the economy (Centre to Protect Workers' Rights [CPWR] 2007). According to Allmon et al. (2000), the lack of job training is due to the increased percentage of non-union work. In the UAE, unions,

collective bargaining, and strikes are prohibited for migrants (Buckley et al. 2016). It is generally noted that employers "poach" trained workers from competing employers instead of investing in the skills of their own staff (OECD 2015). This often leaves other employers unwilling to provide training and can result in an overall underinvestment in skills development (Johanson 2009). In this study, training is regarded as the step taken to teach a person a practical skill of the trade or craft work relevant to the construction industry, which is necessary to improve the performance of work done. The participants in this study agreed that generally lack of formal and adequate training affects their motivation and causes major problems in construction activities. Thus, this showed the controlling nature it can have on the craftspeople's to effectively carry out their work in the most fulfilling manner.

Base on the findings in Chapter Five, the perceptions of the craftspeople in relation to management style resulted in variables such as long working hours, work acceleration, and contracting by workers. The management style is a reflection of how work needs to get done. Participants acknowledged the use of long working hours as one of the ways by which they had to complete their job. They recounted that long working hours were a burden because it made them feel tired, and less focused on the job. The occasional reward they received went some way towards compensating for their low salary, but brought little comfort when they were overtired. Thus, the craftspeople are controlled by these variables as used by their superiors (such as foremen and site manager) on the construction site.

Long working hours have been noted to be very common in the UK, especially in the construction industry (Kodz et al. 2003). The authors specified they had little robust statistical evidence concerning the workers' motivation. They considered its relationship with performance should not be conclusively negative, except that it led to deterioration of task performance because of its detrimental effect on such things as rates of error, pace of work and social behaviour. Nevertheless, the UAE case study research suggests there is an impact on both craftspeople's motivation and the outcome of work that has been completed. This is expressed in many of the interviews with the participants, where they noted that carrying out completed work again as a result of engaging in long working hours demoralised them. This is considered as rework, since rework results from re-

doing an activity which has been completed. Fargues et al. (2019) reported that construction workers in the UAE were subjected to very long working hours beyond what was specified in the contracts. Although they were sometimes compensated for the overtime, nevertheless, the workers had not been able to adjust to it as a normal way of working.

Similarly, work acceleration was common when schedule delay was compromised in the project and the manager needed to adjust for this delay. There was a tendency for supervisors to push workers to work more in a shorter time frame in order to complete the job as required. Such tendency affect the craftspeople's motivation. Participants expressed their discomfort with the way they were being pushed to get work completed. Furthermore, the finding showed that one of the new methods that has been adopted by the UAE management as a way of getting work done is the use of contracting by workers. Contracting by worker is an approach where craftspeople are assigned to a particular task and are expected to complete the work within a specified period of time. In such cases where the work is completed before the allotted time, the craftspeople have the remaining time for personal use, except that they are not allowed to leave the construction site. Participants expressed their consent to such an approach to getting work done, since it allowed them sufficient time to get things done for themselves. Participants build on competence, creativity, and problem solving skills to be able to engage in this type of managerial approach to completing work.

In order to understand the craftspeople's motivation in relation to the issue of rework, it was necessary to understand the types of craftspeople's motivation, and this was addressed in sub-question (1c) why is it important to understand the types of crafts people's motivation, as explained in Chapter Five. The findings suggested two motivation types, autonomous and controlled motivation, which reflect outcomes in previous study (Deci and Ryan 2000). These are sustained by the presence of the three basic psychological needs for autonomy, competence and relatedness (Deci and Ryan 2011). Their effect was demonstrated through expressing the link of these motivation types with rework and their impact on project performance, as answered in sub-question (1d) What is the impact of rework on project performance? Addressing the first guiding research question, which focused on understanding craftspeople's motivation on the issue of rework in building construction projects, is seen from a number of points associated with either

autonomous or controlled motivation. Autonomous motivation is associated with engagement in an activity because it is considered personally valuable or intrinsically interesting (Deci and Ryan 2000). Furthermore, it is generally correlated with positivity. For instance, work-related well-being and optimal performance is conducive to the satisfaction of the three basic needs (Gagne and Deci 2005; Van den Broeck et al. 2008). Based on the study's findings, autonomous motivation is seen through intrinsic, integrated and identified regulation in this study, as opposed to the categorisation by (Visser 2010), which associated autonomous motivation only with intrinsic and integrated regulation. Getting work done, as experienced by the interview participants, tends towards identified regulation. Identified regulation means that the associated behaviour is more congruent with one's personal goals, values and identity, such that the person experiences a greater sense of freedom of choice.

Findings from the interviews suggest that the work was not absolutely intrinsically motivating nor was it being integrated, because integration is assumed to be a personally meaningful motivation which has become an integral part of their system of values and convictions. This was not the case in this study. However, the activities were recognised as sufficiently congruent with personal goals to encourage high performance, as in the case of identified regulation. The implication of this within the construction industry is that craftspeople's motivation has the tendency to move along the continuum of motivation between intrinsic, integrated and identified motivation to produce more positive outcomes depending on the influence of the local practices (work environment, culture and management style) impacting on the craftspeople. This suggests that future research can look into local attributes within the construction domain that can facilitate craftspeople possessing intrinsic and/or integrated motivation. However, sustaining these regulation types is facilitated by the basic psychological needs for autonomy, competence and relatedness, explained in Chapter Two. Satisfaction of these needs is believed to be what can shift motivation from controlled to autonomous motivation, and this has been supported by a large body of research (Baumeister and Leary 1995). Concern for these needs was identified in the interviews conducted with participants. For instance, the need for competence is thwarted when the craftspeople lack good feedback and clear instructions to enable smooth operation of activities. Nevertheless, autonomy can be encouraged without it producing an autonomous motivation, even though some studies suggested otherwise. Autonomy is necessary to experience a sense of choice and

psychological freedom in the initiation and continued engagement in one's actions. Apart from relating to employees' optimal functioning, basic need satisfaction is also useful in understanding the motivating impact of supervisors' leadership styles, as noted by (e.g., Deci et al. 2001). It was revealed that the interviews indicated the need for relatedness was also an important parameter to foster autonomous motivation.

In contrast, the findings resulting from controlled motivation showed that these basic psychological needs were thwarted. Therefore, similar to other study, controlled motivation is associated with certain negative outcomes (Visser 2010). In this study, controlled motivation relates to events associated with attributes such as rewards, deadlines, language difficulties, controlling interpersonal behaviours, conceptual learning, and flexible problem solving (Deci and Ryan 2002; Vansteenskiste et al. 2005; Ryan et al 2006). Many of the attributes found within this study led to an increase in introjected regulation, in which an external reason for performing an activity has been partially internalised but not fully endorsed or assimilated (Deci and Ryan 2002). For instance, some participants found their motivation was thwarted by inability to express or be heard properly due to difficulties in communication. They eventually do the work but are challenged due to communication difficulties. This may be the case, for instance, when a person does something out of guilt, shame or anxiety or to bolster his self-worth (Vansteenkiste and Kaplan 2009), which are associated with introjected regulation based on external influence.

In some cases, it may be hard to determine whether attributes of introjected regulation are associated with positive or negative outcomes, as in the case of long working hours, which, although externally imposed, participants found acceptable because of the financial attachment to this variable. Despite the activity being reported positively, many participants felt they had to get the work done because of the associated reward. At some point, they considered the activity to be stretching beyond normal, because they became tired, lacked focus on the job, or were unable to concentrate adequately, and this could cause injury or other safety related issues. These findings correlated with studies in other domains, which found that introjection can be experienced either positively or negatively. This may depend on whether the motivation is focused on approach (such as building self-esteem or feeling proud) or avoidance (guilt or feeling bad about oneself) (Assor

et al. 2009). Nevertheless, it is implied in this case to be negatively inducing because of the associated rework or other safety related risks that were attributed to the variable.

Another regulation found to be controlling in this study concerns imposition of deadlines. The finding revealed that participants expressed that deadline led to mistakes and errors on the job. Participants are usually not passionate about doing such tasks, but are totally pressurised to get them done; in such cases, it is considered as external regulation. In the construction environment where schedule delay on projects is associated with claims or penalties, and in some cases loss of the company's reputation, management imposes work deadlines which are damaging. In this study, the associated regulations (i.e. introjected and external) obtained in respect of controlled motivation are mediated by the basic psychological needs for autonomy, competence and relatedness. It was deduced that the inability to enhance workers' competence through provision of adequate or timely information hinders autonomous motivation. Likewise the craftspeople's autonomy is impacted by the inability to make free choices that determine how a construction activity is to be executed or completed. The autonomy of the workers is reduced, as they are debarred from directive inquiry and reflection on the manner or approach in which the work is to be completed. Similarly, when there is no close relationship which makes a worker part of an accepted group, workers feel disconnected. Relatedness is characterised by unconditional positive regard, but where it fails to exist, the craftsperson is perceived not to be part of the group and feels their work is not contributing to the overall goal of the organisation. This result in some of the craftspeople's perceptions of diverse worker's experience and the challenges encountered by workers who lack the skills and experience required for the work, as discussed in Chapter Five.

As a result of these findings, variables that thwart the attainment of autonomous motivation, such as communication difficulties or deadlines, hinder several aspects of craftspeople's behaviour such as the ability to solve problems flexibly or to persist in work engagement. This is supported by quite a lot of studies (Deci and Ryan 2002; Vansteenkiste et al. 2005; Ryan et al. 2006). Therefore there are implications in the measurement of both introjected and external regulations as regards the use of external contingency within the local practices (work environment, culture and management style) in relation to considering quality over quantity of motivation at work. In support of these findings, Van den Broeck et al. (2010) found that SDT's concept of autonomy is

somewhat different from the conceptualisations of autonomy typically held in organisational psychology (e.g., Morgeson and Humphrey 2006). Hackman and Oldham (1976) defined autonomy as "substantial freedom, independence and discretion to the individual in scheduling the work and in determining the procedures to be used in carrying it out" (p.258). It was noted by the authors that unlike SDT which refers to the subjective experience of psychological freedom and choice during activity engagement, these definitions refer to autonomy as a task characteristic.

Despite the fact that autonomy as a task characteristic is likely to contribute to feelings of psychological freedom, people might also experience autonomy satisfaction when they depend on others and even when they follow others' requests. Employees might, for instance, follow up a request from their supervisor (and thus fail to be independent) but nonetheless act willingly because their supervisor provided them a meaningful rationale for doing so (Soenens et al. 2007). Also, enhancing the need for competence (such as good feedback, communication) among workers is found to adapt workers to complex and changing environments, whereas competence frustration is likely to result in helplessness and lack of motivation (Deci and Ryan 2000). Lastly, the need for relatedness is satisfied when people experience a sense of communion and develop close and intimate relationships with others (Deci and Ryan 2000).

In view of the supporting literatures detailed above, it appears that the driving factors found in this study, such as quality and number of supervision, communication difficulty, lack of training, payment, work acceleration, long working hours, diverse work experience and contracting work resulting from poor inspection, are indeed the causes of rework. It has also been shown that rework is a significant contributing factor to time and cost overruns in construction projects (Chan and Kumaraswamy 1997; Love 2002; Thomas and Neapolitan 1994). Time and cost overruns were apparent in this study in the three cases, the percentage of rework cost was found to be ranging from 2.10% to 3.33% of total project cost (USD), while the amount of delay in the schedule from 15% to 20% of the construction duration.

Most literature falls within the same range of time and cost overruns as found in this study. For example, Smith et al. (1998) found in a residential study that rework directly contributed 3.15% cost of the contract value. Alwi et al. (1999) conducted a study on ten high-rise buildings and

demonstrated that rework costs ranged from 2.01% to 3.21% of total project costs. Shinde and Kulkarni (2016) noted that particular attention needs to be paid to supervision during construction projects as it is a major cause of rework. Josephson and Hammarlund (1999) reported that the costs of residential, industrial, and commercial building projects range from 2 to 6% of their contract value. Wafy (2010) indicated that rework increased the cost of different work categories from 2% to 30% in residential-commercial tower projects.

On the average, Love (2002) found schedule overrun to be 20.7%. Moreover, the cost growth and schedule overruns were significantly correlated with direct rework costs, which suggests that rework can adversely influence project performance (Love 2002 cited by Palaneeswaran et al. 2007). Within this study, since these driving factors are repeatedly evidenced and emphasised, it is clear that project managers need to manage their influence on craftsmen's motivation in relation to rework. This addresses the research question posed in 1(d). The ability to express the influence of these driving factors in relation to craftspeople's motivation explain why it is important to understand craftspeople's motivation in addressing the issue of rework as posed in the guiding research question 1.

6.3 Facilitating Craftspeople's Motivation for Better Performance

The initial developed framework designed by Deci and Ryan (2000) brings together different types of behavioural regulation along a continuum ranging from controlled to autonomous (i.e. self-determined) motivation. This theory, referred to as OIT, alongside the basic psychological needs theory (BPNT) discussed in Chapter Three, provided the impetus to understand the craftspeople's behaviour and variables influencing the project's level of rework as a result of their motivation within three local attributes (work environment, environmental culture, and management style). Insofar as factors causing rework have been researched and reported in so many journals, there is still ambiguity in the literature as to how this impacts project performance.

The present study explored factors affecting craftspeople's motivation through a perception and experience based case study design, to understand their influence on the project's level of rework and its impact on project performance. Based on the initial study framework designed by Deci and Ryan (2000), and the outcome of the study's findings, the researcher was able to use the existing motivation theory (SDT) and introducing eight new participants elements identified in this study

to develop a new motivational rework reduction model for better project performance in UAE building construction domain. This resulted in a framework for project performance as illustrated in Figure 6.1. The framework is explained through the following three stages: craftspeople's perception elements, mechanisms of motivation based on continuum, and contextual outcome.

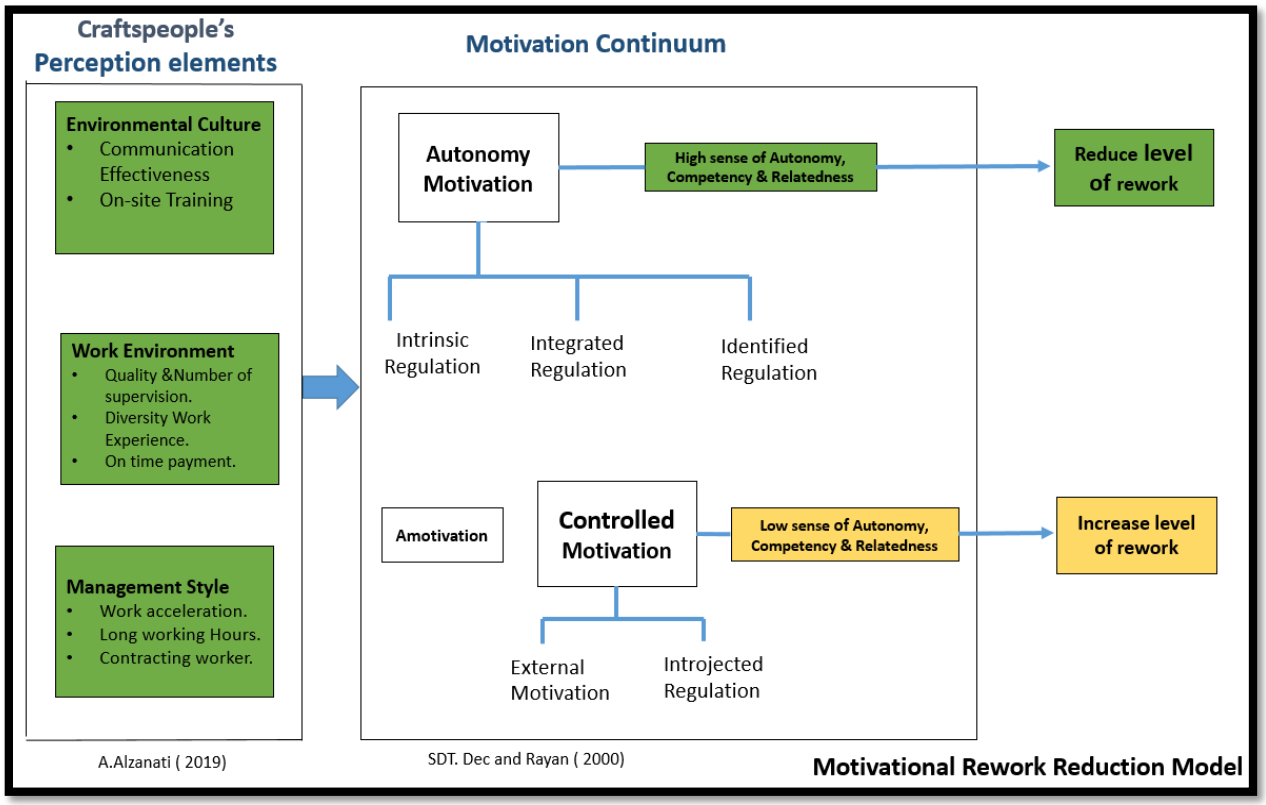


Figure 6. 1 Motivational Rework Reduction Model developed to Address Rework Occurrence in UAE Building Construction Projects (Built on SDT Continuum by Deci and Ryan 2000).

6.3.1 Craftspeople's Perception Elements (Stage I)

The findings on the issue of rework in UAE building construction projects revealed eight main variables or elements which are pertinent to the local attributes (work environment, culture, and management style) under which the building projects were carried out. As explained in the theoretical framework in Chapter Three, these three attributes have a large influence on the craftspeople's motivation. The findings using case study design within the UAE construction sector have helped to provide a better understanding of the theories (i.e. BNPT and OIT) underpinning SDT that framed this study. The findings draw upon conclusions from areas of

similarity and difference in the literature. The three attributes in relation to SDT are provided as follows.

6.3.1.1 Work Environment

Given the understanding of work environment in the study as the place where workers carry out their daily task under an imposed constraints. Three main variables (elements) emerged as a result of the influence of the work environment on the craftspeople's motivation in relation to the issue of rework and performance. These are quality and number of supervision, diverse worker experience, and on-time payment. These elements were perceived by the craftspeople as factors influencing their behaviour, facilitating either autonomous (i.e. self-determined) motivation or controlled motivation. SDT is associated with motivation that is self-authored and that which is externally controlled. Typically the former, relative to the latter, generates more interest, excitement, and confidence, which in turn is manifest both as performance, persistence and creativity (Ryan and Deci 2000a). SDT argued that social–contextual factors such as feedback conduce toward feelings of competence and can enhance intrinsic motivation. Nevertheless, the craftspeople's perception of their supervisors in terms of lack of good feedback, unskillfulness, and timely inspection affects the craftspeople's motivation, and these were some of the reasons given for rework. Among notable factors causing delay in UAE construction, poor supervision is a major contributor (Faridi and El-Sayegh 2006). According to Ogundipe et al. (2018) quality supervision is a basic necessity across all phases in the construction life-cycle, and it influences the service delivery of workmen. Participants confirmed that lack of inspection resulting from shortage of supervisors, and sometimes their lack of experience, resulted in concrete defects.

Earlier studies, e.g. Deci (1975) showed that adequate feedback enhances intrinsic motivation, where it was reported that this is mediated as a result of perceived competence (Vallerand and Reid 1984). This study found that craftspeople's behaviour was not intrinsically motivated, since intrinsic motivation deals with engagement in an activity out of interest in the activity itself, and the spontaneous satisfaction derived from it. As such, intrinsic and extrinsic motivation in SDT is differentiated on the basis of autonomous and controlled motivation. A high sense of the psychological needs (competence, autonomy and relatedness) was characterised as autonomous

motivation, and a low sense of psychological needs (competence, autonomy and relatedness) was characterised as controlled motivation (Visser 2010). As revealed by the result, participants possessed a low sense of competence, autonomy and relatedness, which resulted in their introjected regulated behaviour (i.e. controlled motivation) as found within this study. Similarly, diverse worker experience lowered the autonomy and relatedness of the craftspeople, thereby impacting on their motivation. Participants thought variation on the basis of their skills posed a challenge to work completion.

The findings from this study showed that a multinational workforce needs to be managed effectively to deliver the innovativeness, knowledge and sharing associated with working together. SDT has been able to identify several distinct types of motivation, each having specifiable consequences for learning, performance, personal experience and well-being (Ryan and Deci 2000a). While some participants acknowledged their level of skills and experience, they felt affected by the challenge posed as a result of the diverse worker experience which results in repeating the work that was completed (i.e. rework). This lowers their autonomy. The degree of satisfaction of the need for autonomy plays a particularly important role because it is this which distinguishes whether identification or integration, rather than just introjection, will take place (Gagne and Deci 2005). This study revealed that diverse worker motivation is a controlled motivation, which is mediated as a result of psychological needs (competence, autonomy and relatedness). This agrees with the initial theoretical framework posed in Chapter Three.

In the case of on-time payment, it was found that payment of salary on-time resulted tin an autonomous motivation. Although reward such as salary is a controlling event which was claimed to hurt one's autonomous motivation (Visser 2010), it was found that on-time payment (i.e. salary) increases the sense of competence for the craftspeople, as it meets their basic needs. Participants understand that on-time payment helps them sort out family related issues, which enables them to focus on the job at hand.

Although the UAE construction market is noted in a previous study for late payment (Ailabouni et al. 2009) there has been significant improvement after the advent of the WPS (Wickramasekara 2015). Ryan and Deci (2000a) argued that events such as reward, which conduce toward feelings

of competence during action, can enhance intrinsic motivation. The findings in this study support this argument, but it is understood that craftspeople do not regard the task as interesting, as would be required in the case of intrinsic motivation; rather, the task is accepted only because it is congruent with their personal goals, values and identity, such that the person experiences a greater sense of freedom or choice (Visser 2010), which defines an identified regulation. Identified regulated behaviour increases the need for competence, autonomy and shows relatedness, making it part of an autonomous motivation.

6.3.1.2 Culture

Where culture has been regarded as the "characteristics of the industry, approaches to construction, the competence of craftspeople and people who work in the industry, and the goals, values and strategies of the organizations they work in" (Kivrak et al. 2009, p.43). It was found that two main variables (elements) emerged as a result of the influence of the culture on the craftspeople's motivation in relation to the issue of rework and performance. These are communication difficulties, and on-site training. The craftspeople perceived cultural influence within the UAE construction industry as controlling their motivation. Within the SDT, good communication helps to promote the sense of competence which facilitates intrinsic motivation (Ryan and Deci 2000a). Despite this claim, craftspeople's motivation is viewed in this study on the basis of autonomous and controlled motivation because of the variations as a result of the impact of these variables. Participants explained that communication difficulties hinder the way work is carried out. The lack of good communication between the supervisors and the craftspeople brings about rework. Several indications during the course of the interviews pointed towards problems of miscommunication between supervisors and craftspeople.

The findings in this study support the literature in construction regarding the importance of communication within the construction environment (Long et al. 2004; Hoezen et al. 2006; Renault and Agumba 2016; Galli 2019). Olanrewaju et al. (2017) and Galli (2019) noted that communication facilitates cooperation, but when it is ineffective, it leads to poor performance. The UAE construction industry is faced with several communication challenges that lead to failure among the craftspeople, and their inability to transfer knowledge because of the culturally diverse

environment in which characterises UAE construction in comparison with other countries (Galli 2019). When there is a breakdown in communication between the craftspeople and their supervisors, the craftspeople's level of competence is reduced as a result of not getting adequate instructions. Moreover, their relatedness is limited because barriers will be created and craftspeople tend towards like-minds (i.e. workers that can speak the language they understand). Furthermore, their autonomy is reduced because of these hindrances. In line with the initial theoretical framework, the findings show that the psychological needs mediate the type of motivation that is expected to produce better performance. This stimulates an introjected regulated behaviour among the craftspeople, because work has been partially internalised but not taken in, due to the communication difficulties they have encountered (Deci and Ryan 2002).

The other variable is on-site training. Craftspeople perceived on-site training as controlling, because it depends on the amount of skill they are able to use at a given point in time. Training as noted by Van Wart et al. (1993) is application driven, and aimed at imparting skills that are useful immediately, in particular situations. The findings showed that participation in on-site training was an indication of the urgency of work that needed to be accomplished. Earlier study by Wilkins (2001) showed that UAE companies are very aware of best training practices as implemented by their foreign counterparts, and have adopted similar methods and strategies. It was reported that some types of formal training activity were evenly spread based on their report. Nevertheless, this study's findings revealed that formal training in the UAE construction environment is largely missing, and craftspeople perceived on-site training as the way to learn the job. Participants expressed that they largely get their experiences and acquire sufficient skills through on-site training, with a trial and error approach.

The issue of adequate training needs to be emphasised in the construction industry. Uwakweh (2000) supports this study's findings as regards training, where it is noted that training of construction craftspeople is not very common in developing countries, and even when done, it is not adequate. Construction projects are temporary, meaning that once the projects are completed, many of the craftspeople are laid off. As a result, a short-term view of crafts training is popular, even in developed countries (Uwakweh 2000).

6.3.1.3 Management Style

The management style is taken as an approach to achieve management within an organization and it is a function of behaviour associated with personality (McGuire 2005). In this study, three main variables (elements) emerge as a result of the influence of this attribute. These are long working hours, work acceleration, and contracting by workers. These elements were perceived by the craftspeople as factors influencing their behaviour on the basis that they facilitate either autonomous (i.e. self-determined) motivation or controlled motivation. Long working hours is a variable that influences the crafts people's motivation on the basis that they have no control over this external influence. Despite the fact that craftspeople see long working hours as a way of getting additional money, they also recounted that it causes tiredness and lack of focus on the job.

This finding implies that an action has been taken in but not fully accepted as the person's own responsibility. It displays the characteristics of an introjected regulation, and thus, a relatively controlled form of regulation in which actions are performed to avoid guilt or anxiety (Ryan and Deci 2000a). A usual practice in the UAE construction environment is long working hours, especially for migrants and low-skilled workers. Fargues et al. (2019) reported that workers in the UAE construction industry are subjected to long working hours beyond what is in their contract. The case of work acceleration is more demoralising because it is associated with urgency. This practice is introduced to satisfy an external demand, wherein deadlines are placed on the task to be performed by the craftspeople. For instance, a participant mentioned the difficulties in executing activities in a manner that reflects their true capabilities because of the pressure to get work completed.

This study found that craftspeople's autonomy to perform the job task was constrained by the deadline being imposed on the task. Moreover, the sense of competence was reduced because the work was carried out under intense pressure with a greater possibility of errors occurring. Due to pressure demand, there was less interaction with other craftspeople, because work needed to be completed within a specified time. The psychological needs for competence, autonomy and relatedness were the mediating agents to the craftsperson's behaviour in this situation. During the interviews, a new variable emerged, which is referred to as contracting by worker. This variable creates the choice to complete work within a specified time, with an option that provides the craftspeople with time for relaxation or personal use. It was found that craftspeople perceived this

variable as enhancing their autonomous motivation because it increased their sense of autonomy, competence and relatedness on the job. Competence was enhanced because it enabled the craftspeople to showcase their experience and skills on the job. Autonomy was facilitated because the craftspeople could perform their work free from external pressure. Relatedness was built based on the cordial relationship with the supervisors with respect to completing work assignments.

This approach fell short in the area of proper supervision of work being carried out by this craftspeople, as it was found that lack of timely inspection characterised some of the work completed in this regard. The study found that the craftspeople showed an identified regulation. This involves a situation where the craftspeople accepted the action as personally important because of the value it created, but depended on site managers to follow up to ensure that work was done in the most appropriate and acceptable manner.

6.3.2 Mechanism of Motivation Based on Continuum (Stage II)

The motivation continuum is supported/sustained by the basic psychological needs theory, as proposed by a sub-theory (BNPT) of the self-determination approach. Deci and Ryan (2000) suggested that the origins of self-determined motivation stem from the individual's innate propensity to satisfy the three basic psychological needs (autonomy, competence, and relatedness). The basic psychological needs theory is linked with the organismic integration theory (OIT), because it charts the origins of autonomous or self-determined motivational regulations. The perceived locus of causality is proposed to reflect the degree to which behaviour has become internalised or 'taken in'. As a result, behaviours with the propensity to fulfil personally relevant goals valued by individuals are perceived as efficacious in satisfying psychological needs, as supported by (Hagger and Chatzisarantis 2008). Based on the continuum model, extrinsic motivation can be differentiated into multiple regulation types: external regulation, introjected regulation, and identified regulation, in line with (Gagne et al. 2015; Visser 2010). Another possible result is amotivation, which signifies an absence of motivation or regulation for the behaviour; however, this outcome was not represented in the analysis conducted in this study. As noted by Gagne and Deci (2005), workers' feelings of competence are undermined as their output is picked over for faults, which decreases a subject's sense of autonomy, potentially leading to amotivation. This study's findings noted that external and introjected regulations characterised the

craftspeople's motivation when their psychological needs had been impacted. Thus, there is a need to address the eight new craftspeople's perception elements by the managers so as to shift the locus of causality of the construction workers from controlled to autonomous motivation.

Craftspeople can be impacted by these variables (i.e. driving factors) depending on how well they have internalised their activities. For instance, receiving good feedback enhances the sense of competence which facilitates mastery over one's environment. Nevertheless, competence alone is considered insufficient for craftspeople's behaviour to be perceived as satisfying (Hagger and Chatzisarantis 2008). For an action to be fully integrated and support psychological needs, competence must be accompanied by a perception that the behaviour is performed out of a true sense of self, without external contingency, perceived or real, and out of choice and volition (i.e. autonomously regulated); and that behavioural engagement is supported by others in an autonomous fashion (i.e. relatedness) (Deci and Ryan 2000; Hagger and Chatzisarantis 2008). However, craftspeople are unable to achieve an integrated regulation due to the non-intrinsic nature of the construction environment, particularly as it relates to the migrant status of low skilled construction workers in the UAE. For the project manager to be able to facilitate autonomous regulation, it is necessary to identify those elements of craftspeople's perception that will promote these characteristics in their behaviour. For example, it is perceived by the craftspeople that formal training along with on-site training stimulates the ability of a newly hired worker to perform adequately with volition on an activity (i.e. autonomy). This will need to be balanced in the most efficient and permissible manner among the craftspeople. Together with the ability to develop the delivery of an activity the way it should be performed (i.e. competence) and with the engagement of others (i.e. relatedness), this will enable them to perform an activity free from defects (i.e. rework). An environment where craftspeople are not solely persisting on the basis of incentive or punishment, but are influenced by a variety of factors that increase their sense of competence, autonomy and relatedness, will facilitate autonomous motivation for better project performance.

As noted, Lazear (2000) argued that job performance is more closely related to extrinsic motivation than intrinsic motivation, because most people work to earn a living. Thus, the use of monetary rewards and punishments as a central motivational strategy seems practical and appealing, and is widely integrated into management systems in today's enterprises (Benabou and Jean 2003). Nevertheless, SDT's prediction that satisfaction of basic psychological needs will shift motivation

from controlled to autonomous has been supported by a large body of research (Baumeister and Leary 1995). Specifically, the needs of competence and autonomy have largely been demonstrated to underlie both intrinsic motivation and the process of internalisation (Visser 2010). Moreover, satisfaction of the need for relatedness has been shown to be important for internalisation in this study. Most important is the need for autonomy, which has a particular role to play in distinguishing between whether identification or integration, rather than just introjection, will take place (Gagne and Deci 2005). Therefore, thwarting or frustrating these needs diminishes self-motivation (Ryan 2009). The benefit of the SDT theory of autonomous and controlled motivation is the fact that autonomous motivation has been demonstrated to be associated with important positive outcomes, while controlled motivation is associated with negative outcomes, as supported in the study by (Visser 2010).

6.3.3 Contextual Outcome (Stage III)

An understanding of the eight driving factors affecting craftspeople's motivation, which is influenced by the BPNT concept through its heuristic utility to delineate dimensions of the project environment, is expected to lead to positive, rather than negative, work-related outcomes. As noted in this study, the craftspeople's perception elements were largely controlling the craftspeople's motivation, except in the case of contracting by workers and on-time payment, because the influence of local attributes (work environment, culture, and management style) impacted the satisfaction of the craftspeople's needs for competence, autonomy, and relatedness (Arshadi 2010). A negative impact on the craftspeople's motivation resulted in an increase in the project's level of rework in this study, and this implies a reduction in project performance. Nonetheless, it is possible to build an autonomy supporting environment, in which others such as foreman and site manager engage the craftspeople through non-pressuring aspects of those variables such as effective communication, use of adequate training, reasonable working hours, positive feedback, and regular inspections. This would stimulate the basic psychological needs of the craftspeople by nurturing their sense of competence and freedom, and acknowledging their feelings. Moderate use of work acceleration, to avoid tiredness, stress and burnout, so as to improve the quality level of work done, thereby reducing the project's level of rework, would support better work output (Deci et al. 1994;

Van den Broeck et al. 2010). This will invariably bring about an improvement in project performance.

Based on the initial theoretical framework design by Deci and Ryan (2000), the researcher has been able to identify eight craftspeople's perception elements to develop the theory of SDT in the construction domain. This development brings about a motivational rework reduction model, as shown in Figure 6.1, which will help to reduce the level of rework in building construction projects and improve project performance. The project manager (site manager) would not only expect to satisfy the craftspeople's sense of competence by increasing their mastery of the environment in order to act adequately on the activity, but would strive to ensure that those three basic psychological needs are satisfied. In this way, craftspeople's motivation with respect to their locus of causality can be shifted from controlled motivation to autonomous motivation, which is expected to reduce the level of project's rework and improve project performance. Facilitating this level of understanding of craftspeople's motivation with respect to the project's level of rework will satisfy the conditions for answering research question 2 within this thesis.

Chapter 7.0 – Conclusion and Recommendations

7.1 Conclusions

This thesis makes an important contribution to the understanding of craftspeople's motivation and the issue of rework in building construction projects. The first important aspect was the identification of themes affecting craftspeople within the UAE construction environment, with particular attention to the impact of local attributes (work environment, culture, and management style). These local attributes, as units of analysis, had several interesting characteristics, and some similarities with the outcomes of other studies (Faridi and El-Sayegh 2006; Enshassi 2014; Ye 2014; Bilau et al. 2015; Cardoso et al. 2015; Brooks and Spillane 2016), but some unique elements were found in this study. The UAE's cultural diversity and multinational teams had a large impact on the development of the theory (SDT). In relation to SDT, it was found that certain variables within the UAE's local attributes (work environment, culture, and management style) influenced the craftspeople's motivation in relation to the issue of rework.

In the case of work environment, the main variables influencing craftspeople's motivation were quality and number of supervision, diverse work experience, and on-time payment. Outcomes of these variables supported the theory in that the nature of motivation types (autonomous and controlled) were mediated based on the basic psychological needs. This explained the direct negative impact of lack of quality feedback and scarcity in relation to quality and number of supervision, and impacted also the variation in crafts skills in relation to diverse work experience, which indicated a controlled motivation, and therefore, its associated negative outcomes. On-time payment was found to be associated with promoting an autonomous motivation in the work environment, but the basic psychological needs satisfaction explained the indirect positive impact of on-time payment, which was linked to identified regulation and its associated positive outcomes.

Culture, as viewed in this study, related to the characteristics of the construction organisation. The main variables influencing craftspeople's motivation in relation to the issue of rework were communication difficulties and on-site training. These variables presented outcomes in support of the theory, as it indicated that they promoted controlled motivation, but the basic psychological needs satisfaction explained the direct negative impact of lack of effective communication and

adequate training that facilitated an introjected regulated behaviour and its associated negative outcomes.

Regarding management style, it was found that the main variables influencing craftspeople's motivation in relation to rework were work acceleration, long working hours and contracting by worker. These variables were found to promote both autonomous and controlled motivation. Work acceleration which triggers controlled motivation was understood based on the basic psychological needs to be impacted by deadlines, which promotes an external regulated behaviour that is associated with negative outcomes. Long working hours also led to controlled motivation, but basic psychological need satisfaction explains the direct negative impact on the craftspeople of stress associated with long working hours. The result was an introjected regulated behaviour linked to negative outcomes. Contracting by worker was found to be an emerging variable which promotes autonomous motivation; however, the basic psychological needs satisfaction explains the indirect positive impact that is associated with contracting by worker. In view of this, the study found its characteristics to be promoting an identified regulated behaviour that is linked to positive outcomes.

In the light of these findings, the theory (SDT) with respect to autonomous motivation and controlled motivation produces two different performance outcomes, positive and negative respectively (Amabile et al. 2005; Baard et al. 2004; Koestner and Losier 2002). These findings provided insight into the connection between craftspeople's motivation and the project's level of rework. The craftspeople's perception elements explain the individuals' causal attributions for their motivation types in respect to the project's level of rework. This is supported based on the understanding that the theory (SDT) which supports the distinction of the type, not only the amount, of motivation, predicts differential outcomes: autonomous motivation is associated consistently with more positive outcomes, whereas controlled motivation is not. On the basis of the study findings, it is concluded that SDT does add to our understanding of the occurrence of rework in building construction projects through the introduction of new perception elements to the concept of need satisfaction (BNPT) and the continuum of motivation (OIT).

7.2 Contribution to Knowledge

Addressing the main research questions in this thesis has resulted in a motivational rework reduction model developed from an existing theory (self-determination theory) (SDT). In this study, the researcher has added eight new elements (diverse work experience, quality and numbers of supervision, on-time payment, communication difficulties, on-site training, work acceleration, long working hours, and contracting by workers) to the initial framework designed by (Deci and Ryan 2000). These new elements are responsible for influencing craftspeople's motivation in relation to rework, within the UAE's local attributes (work environment, culture, and management style). They were identified from the particular perspective of building construction projects, and their contribution has significant application in the construction domain. First, the study aimed to address the challenges faced by quality management systems (QMS) with respect to management commitment to addressing the issue of quality to reduce rework and improve performance at the construction site, where craftspeople have the greatest impact. Second, it aimed at stimulating the involvement of craftspeople in addressing the challenges involved with rework reduction models (RRM) in terms of resistance to change, lack of standardisation, and shortage of expertise. The researcher addressed these challenges by identifying factors influencing craftspeople's motivation and understanding their motivational engagement and disengagement in construction activities, to enable a shift from controlled motivation, in which performance is retarded, to autonomous motivation which is associated with positive outcomes (Amabile et al. 2005; Baard et al. 2004; Koestner and Losier 2002).

This thesis makes an important contribution in the construction domain, as it relates rework to the motivation of construction craftspeople. Craftspeople are considered an important element in the execution of construction works, and are responsible for project delivery (Olanrewaju et al. 2017), but it is not widely known that their motivation is central to rework and the enhancement of project performance. The findings from this thesis expatiated on this phenomenon by developing the theory (SDT) within the construction domain to understand the relationship between craftspeople's motivation and rework. The result suggested that motivation types should be conceptualised as autonomous and controlled motivation, to understand the potential range of the motivation continuum of a craftsperson over the duration of a construction project, depending on its social-cultural complexity. Autonomous motivation involves intrinsic, integrated and identified

regulation, whereas controlled motivation involves introjected and external regulation. Using cases from the UAE building construction industry, the researcher considered how the local attributes (work environment, culture and management style) impacted on the craftspeople. It was found that three major variables influenced the craftspeople's motivation in respect of rework within the work environment; two major variables were responsible for the craftspeople's motivation in respect of rework within the culture; and three major variables were associated with the craftspeople's motivation in respect of rework within the management style. These findings in the UAE construction industry will result in an analytical generalisation within this field of study (Yin 2003b).

It was found that identified, introjected and external motivation were prominent in the building construction industry. Identified regulation promotes autonomous motivation, which is associated with positive outcomes, but introjected and external regulation promotes controlled motivation. which is associated with negative outcomes. This finding contributes to the body of knowledge as supported in several other domains (Deci and Ryan 2000; Visser 2010; Parker et al. 2010; Van der Broeck et al. 2010). It is particularly valuable in the building construction industry where projects are fragmented and difficult to manage. The study identified the mediating factors as the need for competence, autonomy and relatedness, which suggested that the study utilised both the micro-theories of SDT (i.e. BNPT and OIT) to assess craftspeople's motivation in relation to the project's level of rework in building construction projects. These findings are relevant to the construction industry since no other study has addressed this phenomenon yet. A significant contribution of this study is its identification of the craftspeople's perception elements. These were considered holistically amongst other variables, and were specified as explicitly and objectively as possible to reduce the influence of subjectivity by the assessor(s).

7.3 Recommendations

The current study found craftspeople's motivation to be integral to the level of rework in building construction projects in the UAE. The study recognised the potential influence of the craftspeople's perception elements within the UAE's local attributes (work environment, culture, and management style) in relation to the issue of rework in the model. The researcher offers

recommendations for practical application as a guide for contractors, and also recommendations for future study.

7.3.1 Practical applications

The three UAE local attributes (work environment, culture, and management style) offer variables for investigation by the contractor before or during execution of a project at the construction site. The main variables within the work environment are quality and number of supervision, diverse work experience, and on-time payment. Cultural factors involve communication difficulties and on-site training. Management style entails work acceleration, long working hours and contracting by workers. These variables essentially determine a shift in the locus of causality of the craftspeople from controlled motivation to autonomous motivation. This will produce a positive outcome by reducing the project's level of rework and enhancing project performance, depending on how well the craftspeople's basic psychological needs have been satisfied. In order to achieve this objective, the following recommendations are proffered.

7.3.1.1 Effective Supervision

The contractor should ensure that quality of supervision is supported by skilled supervisors. This finding supports previous studies on quality of supervision that portrayed a supervisor as the person that has been assigned with authority and responsibility for planning and controlling the work of a group by close contact (Betts 1989; Ogundipe et al. 2018). In construction, supervisors need to be properly selected and, like all personnel on construction sites, they need to be competent. Unlike the manufacturing industry, construction projects require unique attention. Thus, in order to standardise the process, an effective supervisor who is skilled in areas such as leadership and management needs to be selected (Ahuja and Thiruvengadam 2004). It is necessary to provide the supervisors with sufficient training. For example, this training can be conducted by the Construction Industry Training Board (CITB), to cover both technical nature of supervision and other skills such as leadership, communication and team working. Also, it would be absolutely necessary that adequate numbers of supervisors are provided at the construction site to carry out inspection as and when due. This would ensure that smooth and progressive construction activities take place at the construction site.

7.3.1.2 Diverse Work Experience

The contractor should recognise that diverse work experience within a multinational team has many advantages. For instance, multicultural teams outperform monocultural teams (Ochieng and Price 2009). Moreover, evidence has shown that several multinational organisations have continued to implement the use of multicultural teams (Mitchell 2009). The findings within this study support previous work by Popescu et al. (2014), which shows that diverse work experience can be detrimental to a project when the teams are not properly managed. Contractors should ensure that nationalities/culture should not act as a barrier to project performance, but rather should optimise the benefits embedded in the use of a multicultural workforce, such that it will be targeted to promote team actions and problem solving (Draghici and Draghici 2008; Stahl et al. 2010; Ochieng and Prince 2009). It is essentially important that a contractor working with a diverse team should take care to understand their level of work experience, which may be influenced by background, intercultural competence, and emotional intelligence level, for effective managing of the craftspeople's behaviour.

7.3.1.3 Payment

Payment has consistently be an issue of concern in the construction industry, as most contractors face payment delay from their clients. The findings on on-time payment to workers are supported by HRW(2009), where it was reported that appreciable improvement has been made in the payment of construction workers, due to the creation of the electronic system called Wage Protection System (WPS) first adopted in the UAE in 2009 (Wickramasekara 2015). It is advisable that contractors should call for a more secure scheme, such as 'Security of Payment', which has been successfully implemented in Europe, to be deployed in the UAE construction payment system, to ensure that the adverse effect of late payment to contractors does not spread insolvency to their workers and to the subcontractors. In addition, having a good salary structure for the crafts people will further promotes their work engagement.

7.3.1.4 Communication Difficulties

Communication difficulty in the construction industry has impacted negatively on project performance in several studies (Hoezen et al. 2006; Renault and Agumba 2016; Casey et al. 2015; Skitmore et al. 2004). This supports the findings of this study. Thus, it will be expected that

miscommunication arising from misinterpretation as a result of language and cultural differences should be overcome. Practical application would require that craftspeople should be educated in language and cultural differences and learn to adapt and be flexible in their new working environment. It is recommended that work instructions should be translated into three major spoken languages to allow better communication at the construction site. Site managers should understand the emotional and communication barriers among craftspeople and pair them according to the most workable groups in order to reduce conflict and misinterpretation. In addition, it is preferable that each foreman should be selected on the basis of competence to communicate with the team of craftspeople in a common language.

7.3.1.5 On-Site Training

Although training has been acknowledged in most studies as the means for development of capability to promote sustainability (Osei 2000; Dantong et al. 2011), its effective use has not been adequately promoted in the construction industry, especially in developing countries (Uwakweh 2000; Loosemore et al. 2003; Raiden and Andrew 2006; Tabassi and Bakar 2009). Based on the findings, it is recommended that newly hired workers should be incorporated into existing work groups to learn and adapt to the company's procedures and ways of executing construction activities on the site. Also, depending on the craftspeople's background and education level, formal training should be introduced for construction crafts trades to improve their skills and knowledge of the job functions.

7.3.1.6 Work Acceleration

The circumstances in which acceleration might be required are diverse (Whaley 2015). As found within this study, unrealistic schedules characterised the construction activities, and this has dire consequences for the craftspeople who struggled to cope with the deadlines imposed on their job functions. This finding supports the study by McGevna (2012), where unrealistic schedules dominated the construction environment. Thus, it is recommended that construction activities should be adequately planned by a qualified planner, and the site manager should ensure that those planned activities are met as required. In the advent of experiencing delay on the project due to rejected works, increasing the number of staff can be utilised to facilitate work functions rather than utilising limited resources.

7.3.1.7 Long Working Hours

The issue of long working hours has been found in the literature to be based on people's own assessments with regard to their own direct experience, such that long working hours are perceived as a significant departure from their normal working week (Kodz et al. 2003). The study by Kodz and colleagues is in line with the findings in this study. The responses in the interviews were based on the UAE Labour Law of eight hours per day, 48 hours per week; however, it was reported that construction work hours have increased to nine hours (Fargues et al. 2019). Based on the findings of this study, craftspeople reported working beyond the hours specified in their contract, with many craftspeople mentioning three to five hours above their usual working hours, depending on the crafts trade job function. This resulted in complaints like tiredness, loss of concentration and lack of focus. For this reason, it is recommended that a reasonable limit to working hours should be encouraged on the construction site. In addition, construction activities should be planned so that they do not over-stretch the craftspeople to the point of losing concentration, as this usually has adverse effects on the craftspeople.

7.3.1.8 Contracting by workers

This variable is a rather new concept applied in the UAE construction environment by site managers as a way of deriving better productivity from the craftspeople, as found in this study. Usually, it involves assigning job functions to be completed within a specified period, with the option of having the remaining time for relaxation or personal use without leaving the construction site. Although craftspeople derive much satisfaction from this practice, issues relating to rejection of some construction activities due to lack of timely inspection to correct errors or mistakes were reported. Thus, it is recommended that the most competent craftspeople should be allowed to engage in this practice, in order to reduce the amount of rejected work. Also, timely supervision should be available to ensure that the practice is actually producing the desired result in terms of performance improvement.

7.4 Future Research

Several research studies have been conducted on the issue of rework, and the study of craftspeople's motivation has shown a significant improvement to identification of the reasons for rework occurrence at the construction site. The current study has been able to establish factors influencing craftspeople's motivation within the UAE's local attributes. The identification of variables has helped to understand how basic psychological needs impact on the motivation type, which determines the performance outcome as either positive or negative.

It is expected that future research can help determine the combinatory nature of the satisfaction of needs that predicts motivation internalisation. This is required as the findings suggest that the SDT, on the basis that the internalisation of motivation is formed, is beneficial for tasks which are not necessarily inherently interesting but are important, as found in this study in relation to the development of the theory in the construction domain. Understanding the process which promotes satisfaction of needs would help to provide more insight on the antecedents which could encourage internalisation to take place.

Furthermore, it is expected that the outcome of this study can be extended to cover the design stage, which is also a critical component for rework occurrence. Study at the design stage would provide insight into variables affecting motivation and its influence on the issue of rework in building construction projects. In this case, it would be conducted with professionals such as architects, engineers, and quantity surveyors, and would synchronise the two important stages in the construction process with respect to the project's level of rework.

7.5 Research Limitation

An important aspect of this study concerns its generalisation. The use of case study as a research approach resulted in an analytical generalisation, as defined by (Yin 2003a). The development of the theory (SDT) into a motivational rework reduction model within the construction domain using an exploratory study will demand evaluation of its outcome over a period of time. Despite the fact that three case studies were used in this study, a greater number of case studies could have been selected in order to identify more influencing factors within the UAE's local attributes. This would

be useful both within case and cross-case synthesis to explore other factors influencing craftspeople's motivation causing rework.

As a reminder, this study explored reducing rework through facilitation of craftspeople's motivation in the United Arab Emirates (UAE). Its findings are limited to a number of elements such as craftspeople, and the UAE context, and the findings reflect the experiences and perceptions of craftspeople working within the UAE. Building construction projects were selected during the case selections because of the fragmented and complex nature of the building sector. Furthermore, the study did not deal with the design stage; it addressed aspects of rework that concerned the construction phase, and dealt with both contractors and subcontractors.

It is well-known that rework can result from multi-dimensional factors such as non-conformance, quality deviation, errors, defects and change order. However, change order was not considered in this study's assessment of the project's level of rework. Further, the study was conducted on building construction projects, and its findings cannot be extended to other civil infrastructure projects such as road, railways, and energy construction projects. It will be appropriate to consider the findings of this study within these stipulated considerations.

References

Abdel Khalek, H., Aziz, R. and Sharabash, E., 2016. Applications and Assessment of Quality Management in Construction Projects. *International Journal of Innovative Research in Engineering and Management (IJIREM)*, 3(5), 391-402.

Abdelhamid, T. and Everett, J., 2002. Physiological demands during construction work. *Journal of Construction Engineering and Management*, 128(5), 427-437.

AbdelRahman, A., Elamin, A. and Aboelmaged, M., 2012. Job satisfaction among expatriate and national employees in an Arabian Gulf context. *International Journal of Business Research and Development*, 1(1), 1-16.

Abdelsalam, H. and Gad, M., 2009. Cost of quality in Dubai: an analytical case study of residential construction projects. *International Journal of Project Management*, 27, 501-511.

Abdel-Wahab, M., Dainty, A., Ison, S., Bowen, P. and Hazlehurst, G., 2008. Trends of Skills and Productivity in the UK Construction Industry. *Engineering, Construction and Architectural Management*, 15(4), 372-382.

Abdul-Rahman, H., 1993. *The management and cost of quality for civil engineering projects*. Thesis (PhD). Univ. of Manchester Institute of Science and Technology, UMIST, Manchester, U.K.

Abdul-Rahman, H., 1995. The cost of non-conformance during a highway project: A case study, *Journal of Construction Management and Economics*, 13(1), 23-32.

Abdul-Rahman, H., 1997. Some observations on the issues of quality cost in construction. *International Journal of Quality and Reliability Management*, 1495, 464-481.

Abeysekera, V., 2002. Understanding "Culture" in an International Construction Context, In: Fellows, R. and Seymour, D. E. (Eds.) *Perspectives on culture in construction*, CIB Report, 275.

Abiodun, O. and Segbenu, N., 2017. 'An Investigation into the use and Construction Professionals' Preference for Migrant Craftsmen in Construction Project Delivery in Ondo State', *American Journal of Engineering Research (AJER)*, e-ISSN: 2320-0847 p-ISSN: 2320-0936, 6(2), 90-99.

Abu Zaiter, M., 2014. *Causes and effects of rework on construction project in Gaza strip*. Thesis (Master). The Islamic University of Gaza Faculty of Engineering Civil Engineering Department Engineering Project Management.

Adler, N. and Gunderson, A., 2008. *International Dimensions of Organizational Behaviour*. Cengage Learning International student edition.

Afolabi, A., Emeghe, I., Oyeyipo, O. and Ojelabi, R., 2016. Professionals' preference for migrant craftsmen in Lagos State. *Mediterranean Journal of Social Sciences*, 7(1), 501-501.

Aftab, M., Ehsan, R., Naseer, S. and Awan, T., 2012. The effect of corporate strategy and capital structure on performance of banking sector of Pakistan. *Global Journal of Management and Business Research*, 12(17), 1-3.

Ahmed, H. and Yusuff, R., 2016. Factors affecting quality during the construction phase in Iraqi government companies. *International Journal of Applied Engineering Research*, 11(3), 7974-7981.

Ahmed, S., Aoieong, R., Tang, S. and Zheng, D., 2005. A comparison of quality management systems in the construction industries of Hong Kongand the USA. *International Journal of Quality & Reliability Management*, 22(2), 149-161.

Ahuja, V. and Thiruvengadam, V., 2004. Project scheduling and monitoring: current research status. *Construction Innovation: Information, Process, Management*, 4(1), 19-31.

Ahyari, A., 2004. *Manajemen Produktivitas*, Jakarta, Universitas Terbuka.

Aibinu, A. and Jagboro, G., 2002. The effects of construction delays on project delivery in Nigerian construction industry. *International Journal of Project Management*, 20(1), 593-599.

Ailabouni, N., Painting, N. and Ashton, P., 2009. Factors Affecting Employee Productivity in the UAE Construction Industry, In: Dainty, A. (Ed) Procs 25th Annual ARCOM Conference, 7-9 September 2009, Nottingham, UK, *Association of Researchers in Construction Management*, 555-64.

Aina, O., 2014. Application of motivation theories in the construction industry. *Journal of Business and Management*, 16(7), 1-16.

Aiyetan, A. and Olotuah, A., 2006. Impact of Motivation on workers productivity in the Nigeria Construction Industry, In D. Boyd (Ed.), Proceedings 22nd Annual ARCOM Conference, 4-6 September 2006, Birmingham (UK), *Association of Researchers in Construction Management* (pp. 239-248). From: http://www.arcom.ac.uk/-docs/proceedings/ar2006-0239-0248 Aiyetan and Olotuah.pdf [Accessed 25 July 2018].

Aiyetan, A., 2013. Causes of rework on building construction projects in Nigeria. *Journal of Construction Project Management and Innovation*, 12(3), 1-15.

Ajayi, O. and Oyeyipo, O., 2015. Effect of Rework on Project Performance in Building Project in Nigeria. *International Journal of Engineering Research and Technology*, 4(2), 294-300.

Aje, I., 2012. The impact of contractors' prequalification on construction project delivery in Nigeria, Engineering. *Construction and Architectural Management*, 19(2), 159-172.

Akanni, P., Oke, A. and Akpomiemie, O., 2015. Impact of environmental factors on building project performance in Delta State, Nigeria. *HBRC Journal*, 11 (1), 91-97.

Al Hasani, M., 2018. Cultural and Economic Risks Factors in UAE Construction Projects, *International Journal of Academic Research in Business and Social Sciences*, 8(12), 449-471.

Al Mousli, M. and El-Sayegh, S., 2016. Assessment of the design-consstruction interface problems in the UAE. *Architectural Engineering and Design Management*, 12(5), 353-366.

Alarcón, L. and Mesa, H., 2012. A modeling approach to understand performance of lean project delivery system, *Proceedings of the 20th Annual Conference of the International Group for lean Construction* (Vol. 20). San Diego, USA.

Al-Bayati, A., Abudayyeh, O., Fredericks, T. and Butt, S., 2016b. Reducing Fatality Rates of the Hispanic Workforce in the U.S. Construction Industry: Challenges and Strategies. *Journal Construction Engineering Management*, 143 (3), 04016105.

Al-Emad, N. and Nagapan, S., 2015. Identification of Delay Factors from Mecca's Construction Experts Perspective. *International Journal of Sustainable Construction Engineering and Technology*, 6(2), 1-4.

Ali, A. and Rahmat, I., 2010. The performance measurement of construction projects managed by ISO-certied contractors in Malaysia. *Journal of Retail and Leisure Property*, 9(1), 25-35.

Ali, H., Al-Sulaihi, I. and Al-Gahtani, K., 2015. Indicators for measuring performance of building construction companies in Kingdom of Saudi Arabia. *Journal of King Saudi University – Engineering Sciences,* 25(2), 125-134.

Ali, M. and Beheiry, S., 2015. The Applicability of Just-In-Time In United Arab Emirates Construction Projects. *Journal of Emerging Trends in Engineering and Applied Sciences,* 6(2), 120-128.

Aljassmi, H. and Han, S., 2013. Analysis of Causes of Construction Defects Using Fault Trees and Risk Importance Measures. *Journal of Construction Engineering and Management*, 139 (7), 870-880.

Aljassmi, H. and Han, S., 2014. Classification and Occurrence of Defective Acts in Residential Construction Projects. *Journal of Civil Engineering Management,* 20(2), 175-185.

Al-Kharashi, A. and Skitmore, M., 2009. Causes of delays in Saudi Arabia public sector construction projects. *Construction Management and Economics*, 27(1), 3-23.

Allmon, E., Haas, C., Borcherding, J. and Goodrum, P., 2000. U.S. Construction Labor Productivity Trends, 1970-1998. *Journal Construction Engineering and Management,* 126, 97-104.

Al-Sabek, F., 2015. Critical Factors Affecting the Implementation of Total Quality Management in the Construction Industry in UAE. *International Journal of Social, Behavioural, Educational, Economic, Business and Industrial Engineering*, 9(5), 1504-1508.

Alvesson, M., 2002. *Understanding Organizational Culture*. London: Sage.

Alwi, S., Hampson, K. and Mohamed, S., 1999. Investigation into the relationship between rework and site supervision in high rise building construction in Indonesia. *Proceedings of the 2nd International Conference on Construction Process Reengineering*, Sydney, Australia, 189-195.

Alwi, S., Keith, H. and Mohamed, S., 2001. Effect of quality supervision on rework in the Indonesian context. *Asia Pacific Building and Construction Management Journal,* 6, 2-6.

Alzahrani, J. and Emsley, M., 2013. The impact of contractors attributes on construction project success: A post construction evaluation, *International Journal of Project Management*, 31(2), 313-322.

Al-Zamany, Y., Hoddell, S. and Savage, B., 2002. Understanding the difficulties of implementing quality management in Yemen, *The TQM Magazine*, 14(4), 240-247.

Amabile, T., Barsade, S., Mueller, J. and Staw, B., 2005. Affect and Creativity at Work. *Administrative Science Quarterly*, 50, 367-403.

Aminudin, B., 2006. *Exploitation of contract documents for construction project planning and controlling*. Unpublished Thesis (Master of Science). Faculty of Civil Engineering, Universiti Teknologi, Malaysia.

Andersen, S., Andersen, R. and Olesen, B., 2016. Influence of heat cost allocation on occupants' control of indoor environment in 56 apartments: Studied with measurements, interviews and questionnaires, 101, 1-8.

Andrieu, J., Ucla, A. and Lee, M., 2016. Addressing Workers' Rights in the Engineering and Construction Sector – Opportunities for Collaborations Working Paper. BSR, San Francisco: Business for Social Responsibility.

Ankil, R. and Palliam, R., 2012. Enabling a motivated workforce: exploring the sources of motivation. *Development and Learning in Organization*, 26(2), 7-11.

Ankrah, N., 2007. *An investigation into the impact of culture on construction project performance*. Thesis (PhD). University of Wolverhampton, UK.

Ankrah, N., Proverbs, D. and Debrah, Y., 2009. Factors influencing the culture of a construction project organization. *Engineering Construction and Architectural Management*, 16(1), 26-47.

Anthony, B., 2011. *How to improve motivation*. Available from: Bookboon.com [Accessed 29 May 2018].

Antoniadis, D., Edum-Fotwe, F. and Thorpe, A., 2012. Structuring of Project Teams and Complexity, *Project Perspectives*, pp. 78-85.

Arafat, H. and Skaik, S., 2016. How can Contractors Warrant Timely Payments in the UAE Construction Industry?. *The Construction, Building and Real Estate Research Conference of the Royal Institution of Chartered Surveyors*, London. United Kingdom.

Architecture, Engineering, Consulting, Operations, and Maintenance (AECOM), 2016. *Middle East Handbook: Property and Construction Handbook 2016 Edition*. Retrieved 13/06/2019 from:

http://www.aecom.com/ae/wp-content/uploads/2015/08/Handbook-2016-Final_Lowers-spreads.pdf [Accessed 13 June 2017].

Architecture, Engineering, Consulting, Operations, and Maintenance (AECOM), 2017. *Middle East handbook*. Property and Construction handbook, 2017 Edition AECOM Middle East.

Architecture, Engineering, Consulting, Operations, and Maintenance (AECOM), 2018. Middle East Handbook: Property and Construction Handbook. Edition. from: http://www.aecom.com/ae/wp-content/uploads/2015/08/Handbook-2016-Final_Lowers-spreads.pdf [Accessed 20 August 2018].

Arditi, D. and Chotibhongs, R., 2005. Issues in subcontracting practice, *Journal of Construction Engineering and Management*. ASCE, 131(8), 866-878.

Arditi, D., Nayak, S. and Damci, A., 2017. Effect of organizational culture on delay in construction. *International Journal of Project Management*, 35, 136-147.

Arshadi, N., 2010. Basic need satisfaction, work motivation, and job performance in an industrial company in Iran. *Procedia Social and Behavioural Sciences*, 5, 1267-1272.

Ashokkumar, D., 2014. Study of quality management in construction industry. *International Journal of Innovation Research in Science, Engineering and Technology*, 3(1).

Association for Project Management (APM), 2012. *Body of Knowledge*. 6th Edition by Association for Project Management (APM).

Assor, A, Vansteenkiste, M. and Kaplan, A., 2009. Identified versus Introjected Approach and Introjected Avoidance Motivations in School and in Sports: The Limited Benefits of Self-Worth Strivings. *Journal of Educational Psychology*, 101(2), 482-497.

Atkinson, A., 1998. Human error in the management of building projects. *Construction Management and Economics*, 16(3), 339-349.

Atkinson, A., 2002. The Pathology of Defects: A human Error Approach. *Engineering, Construction and Architectural Management*, 9(1), 53-61.

Aycan, Z., Kanungo, R. and Sinha, J., 1999. Organizational Culture and Human Resource Management Practices The Model of Culture Fit. *Journal of Cross-Cultural Psychology*, 30(4), 501-526.

Azim, S., Gale, A., Lawlor-Wright, T., Kirkham, R. and Khan, A., 2010. The importance of Soft Skills in Complex Projects. *International Journal of Managing Projects in Business*, 3, 387-401.

Baard, P., Deci, E. and Ryan, R., 2004. The relation of intrinsic need satisfaction to performance and well-being in two work settings. *Journal of Applied Social Psychology*, 34, 2045 -2068.

Babbie, E., 2005. *The basics of social research*. 3rd edition. Thomson: Wadsworth.

Baccarini, D. and Love, P., 2014. Statistical characteristics of congingency in water infrastructure projects. *ASCE Journal of Construction Engineering and Management*, 140(3), 04013063.

Baccarini, D., 1996. The Concept of Project Complexity – A Review. *International Journal of Project Management*, 14 (4), 201.

Baiche, B., Walliman, N. and Ogden, R., 2006. Compliance with building regulations in England and Wales. *Structural Survey*, 24(4), 279-299.

Bakhshi, J., Ireland, V. and Gorod, A., 2016. Clarifying the project complexity construct: Past, present and future. *International Journal of Project Management*, 34(7), 1199-1213.

Ballard, G. and Howell, G. 1998. Shielding production: essential step in production control. *ASCE, Journal of Construction Engineering and Management*, 124(1), 11-17.

Bank for International Settlements (BIS), 2018. Annual Economic Report 2018, 26th Edition [online]. UAE: Available from: https://www.bis.org/publ/arpdf/ar2018e.htm [Accessed 16 June 2018].

Barber, P., Sheath, D., Tomkins, C. and Graves, A., 2000. The Cost of Quality Failures in Major Civil Engineering Projects. *International Journal of Quality Reliability Management*, 17(4/5), 479-492.

Barg, J., Ruparathna, R., Mendis, D. and Hewage, K., 2014. Motivating Workers in Construction, *Journal of Construction Engineering*, 1-11.

Barlas, Y., 2002. System Dynamics: Systemic Feedback Modeling For Policy Analysis In Knowledge For Sustainable Development - *An Insight Into The Encyclopedia Of Life Support Systems*. UNESCO Publishing- Eolss.

Barrett, P., 2000. Systems and relationships for construction quality. *International Journal of Quality and Reliability Management*, 17(4/5), 377-392.

Baumeister, R. and Leary, M., 1995. The need to belong: desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117, 497–529.

Baxter, J. and Eyles, J., 1997. Evaluating qualitative research in social geography: Establishing 'rigour' in interview analysis. *Transactions of the Institute of British Geographers*, 22(4), 505-525.

Benabou, R. and Jean, T., 2003. Intrinsic and extrinsic motivation. *The Review of Economic Studies Limited*, 70(3), 489-520.

Benbasat, I., Goldstein, D. and Mead, M., 1987. The Case Research Strategy in Studies of Information Systems Case Research. *MIS quarterly*, 11(3), 369-386.

Berg, B., 2007. *Qualitative Research Methods for the social science*. 6th edition. USA: Pearson Educational Inc.

Bertelsen, S., 2003. Construction as a complex system, *Proceedings for the 11th annual conference of the International Group for Lean Construction* (pp. 11-23). Blacksburg, Virginia, USA.

Betts, P., 1989. *Supervisory Studies*. Pitman Publishing, London.

Bhatti, I., Abdullah, A., Nagapan, S., Sohu, S., Lohar, M. and Bhatti, N., 2018. Delay in High-rise Building Construction Projects of Dubai: A Review. *Engineering Science and Technology International Research Journal*, 2(2), 7-15.

Bilau, A., Ajagbe, M., Kigbu, H. and Sholanke, A., 2015. Review of Shortage of Skilled Craftsmen in Small and Medium Construction Firms in Nigeria. *Journal of Environment and Earth Science*, 5(15), 98-110.

Biruk, S., Jaskowski, P. and Czarnigowska, A., 2017. Minimizing Project Cost by Integrating Subcontractor Selection Decisions with Scheduling, IOP Conference Series. *Materials Science and Engineering*, 245, 1-7.

Bitsch, V., 2005. Qualitative research: A grounded theory example and evaluation criteria. *Journal of Agribusiness*, 23(1), 75-91.

Blayse, A. and Manley, K., 2004. Key Influences on Construction Innovation. *Construction Innovation*, 4(3), 143-153.

Block, J. and Pickl, S., 2014. The mystery of job performance: a system dynamics model of human behavior, *Proceedings of the 32nd international conference of the System Dynamics Society, Delft, Netherlands, July* (pp. 20-24).

Bol, J. and Smith, S., 2011. Spillover Effects in Subjective Performance Evaluation: Bias and the Asymmetric Influence of Controllability. *The Accounting Review*, 86(4), 1213-1230.

Bommer, W., Johnson, J., Rich, G., Podsakoff, P. and Mackenzie, S., 1995. On the Interchangeability of Objective and Subjective Measures of Employee Performance – a meta-analysis. *Personnel Pyschology*, 48(3), 587-605.

Bosch, G. and Philips, P., 2003. Building Chaos: an international comparison of deregulation in the construction industry. Routledge.

Bosch-Rekveldt, M., 2011. Managing project complexity: A study into adapting early project phases to improve project performance in large engineering projects: The TOE (Technical, Organizational and Environmental) framework. *International Journal of Project Management*, 29(6), 728.

Bowen, G., 2009. Document Analysis as a Qualitative Research Method. *Qualitative Research Journal*, 9(2), 27-40.

Boyatzis, R., 1998. *Transforming Qualitative Information: Thematic Analysis and Code Development*. Thousand Oaks, CA: Sage.

Braun, V. and Clarke, V., 2006. Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101.

Brockmann, C. and Girmscheid, G., 2007. Complexity of Megaprojects. *CIB World Building Congress*, 219-230.

Brockmann, C. and Kahkonen, K., 2014. Evaluating Construction Project Complexity. T Niraj (ed.), Management of Construction: Research to Practice (MCRP).

Brockmann, C., 2009. Using cognitive maps for better success in post-disaster relief situations, in: *Proceedings of the Symposium on Post-disaster Reconstruction*, Surabaya, Indonesia.

Brooks, T. and Spillane, J., 2016. Does Inappropriate Quality Control Demotivate Workers? A critical review. In: P. W. Chan and C.J. Neilson (Eds.) Proceedings of the 32nd Annual ARCOM

Conference, 5-7 September 2016, Manchester, UK, *Association of Researchers in Construction Management*, 2, 823-832.

Bryan, C., Walton, G., Rogers, T. and Dweck, C., 2011. Motivating Voter Turnout by Invoking the Self. P*sychological and cognitive sciences*, 108(31), 12653-12656.

Bryman, A., 2006. Integrating quantitative and qualitative research: how is it done? *Qualitative Research*, SAGE Publications , London, 6(1), 97-113.

Bryman, C. and Bell, L., 2011. Job Satisfaction, Work Environment, and Rewards: Motivational Theory Revisited. *Labour*, 25(1), 1-23.

Bubshait, A. and Al-Atiq, T., 1999. ISO 9000 Quality Standards in Construction. *Journal of Management in Engineering*, 15(6), 41-46.

Buckley, M. Zendel, A. Biggar, J., Frederiksen, L. and Wells, J., 2016. Migrant Work and Employment in the Construction Sector, *International Labour Office, Sectoral Policies Department*, Conditions of Work and Equality Department, - Geneva: International Labour Organization.

Burati, J., Farrington, J. and Ledbetter, W., 1992. Causes of quality deviations in design and construction. *ASCE Journal Construction Engineering Management*, 118(1), 34-49.

Busby, J. and Hughes, E., 2004. Projects, pathogens and incubation periods. *International Journal of Project Management*, 22, 425-434.

Campell, J., McCloy, R., Oppler, S. and Sager, C., 1993. A theory of performance personnel selection in organizations, 3570.

Canadian Owners Association of Alberta (COAA), 2006. Project rework reduction tool, Construction Owners Association of Alberta. Available at: http://www.coaa.ab.ca/BESTPRACTICES/Rework/ProjectReworkReductionTool/tabid/92/Default.aspx [Accessed 30 March 2019].

Cardinal, J. and Marle, F., 2006. Project: The Just Necessary Structure to Reach Your Goals. *International Journal of Project Management*, 24, 226-233.

Cardoso, P., Dominguez, C. and Paiva, A., 2015. Hints to Improve Motivation in Construction Companies, *Procedia Computer Science*, 64, 1200-1207.

Carson, D., Gilmore, A., Gronhaug, K. and Perry, C., 2001. *Qualitative Research in Marketing*. Sage, London.

Casey, T., Riseborough, K. and Krauss, A., 2015. Do you see what I see? Effects of National Culture on Employees' Safety-Related Perceptions and Behaviour. *Accident Analysis and Prevention*, 78, 173-184.

Centre to Protect Workers' Rights (CPWR), 2007. The Construction Chart Book, The U.S. Construction Industry and its Workers.

Cerasoli, C., Nicklin, J. and Ford, M., 2014. Intrinsic Motivation and Extrinsic Incentives Jointly Predict Performance: A 40 Year Meta-Analysis. *Psychological Bulletin*, 140(4), 980-1008.

Chan, D. and Kumaraswamy, M., 1997. A comparative study of causes of time overruns in Hong Kong construction projects. *International Journal of Project Management*, 15(1), 55-63.

Chase, G., 1998. Improving construction methods: A story about quality. *Journal of Management in Engineering*, 14(3), 30–33.

Chell, E., 2004. *Critical incident technique. Qualitative methods and analysis in organizational research*, (p. 45-60). London: Sage.

Cheng, E. W., Li, H., Fang, D. and Xie, F. J. C. I., 2004. Construction safety management: an exploratory study from China. *Construction Innovation*, 4 (4), 229-241.

Chetty, S., 1996. The case study method for research in small and medium sized firms revised. *International Small Business Journal*, 15(1), 73-85.

Cheung, S., Suen, H. and Cheung, K., 2004, PPMS: a Web-based construction project performance monitoring system. *Automation in Construction*, 13, 361-376.

Cheung, S., Wong, P. and Wu. A., 2011. Towards an organizational culture framework in construction. *International Journal of Project Management*, 29(1), 33-44.

Chileshe, N. and Hayat, Y., 2010. The antecedents of TQM deployment within the UAE Construction sector, *The 5th Built Environment Conference, Association of Schools of Construction of Southern Africa (ASOCSA)*, Durban, South Africa, 1, 1-16.

Chinyio, E. and Olomolaiye, P., 2010. *Risk and construction stakeholders*. Construction Stakeholder Management, (p. 75-98). Wiley-Blackwell Publishing.

Choi, J., Gad, G., Shane, J. and Strong, K., 2015. Culture and Organizational Culture in the Construction Industry: A Literature Review, 5th *International Construction Specialty Conference*, British Columbia, Canada.

Christ, M., Emett, S., Summers, S. and Wood, D., 2012. The Effects of Preventive and Detective Controls on Employee Performance and Motivation. *Contemporary Accounting Research*, 29(2), 432-452.

Clegg, S., Pitsis, T., Rura-Polley, T. and Marosszeky, M., 2002. Governmentality Matters: Designing an Alliance Culture of Inter-Organizational Collaboration for Managing Projects, *Organization Studies*, 23(3), 317-337.

Clough, P. and Nutbrown, C., 2007. A student's guide to methodology, 2nd edition. London: Sage.

Cnuddle, M., 1991. Lack of quality in construction-economic losses. *Proceedings of 1991 European Symposium on Management, Quality and Economics in Housing and other Building Sectors*, Lisbon, Portugal, 508-15.

Coffey, V., Willar, D. and Trigunarsyah, B., 2011. Profiles of organizational cultural culture in Indonesian construction companies in Cheung, S.O. (Ed.), *Proceedings of the Sixth International Structural Engineering and Construction Conference (ISEC-6)*, ETH Zurich, Switzerland.

Cohen, L., Manion, L. and Morrison, K., 2007. *Research methods in education*. 6th edition. London: Routledge.

Construction Industry Development Authority (CIDA), 1993. A Report on the Time and Cost Performance of Australian Building Projects Completed 1988-1993, Construction Industry Development Agency (CIDA) in conjunction with the Australian Institute of Quantity Surveyors, Sydney, NSW, Australia.

Construction Industry Development Authority (CIDA), 1995. Measuring up or muddling through: Best Practice in the Australian Non-Residential Construction Industry. Construction Industry Development Agency, Sydney Australia, 59-63.

Construction Industry Development Board (CIDB), 2013 Subcontracting in the SA Construction Industry; Opportunities for Development. Available from: www.Cidb.org.za [Accessed 1 July 2018].

Construction Industry Institute (CII) 2014. Managing a portfolio of projects, metrics for improvement, *CII Annual Conference*, Indianapolis, USA.

Construction Industry Institute (CII), 2001. The field rework index: early warning for filed rework and cost growth, Austin, TX: The University of Texas at Austin. Report No. RS 153-1, May.

Construction Industry Institute (CII), 2005. Causes and Effects of Field Rework Research Team, The University of Texas at Austin, USA. Available at: http://www.cii.co.uk/ [Accessed 25 May 2018].

Construction Industry Institute (CII), 2013. SP3-3 Constructability concepts file. Available from: https://www.construction-institute.org/scriptcontent/more/sp3_3_more.cfm [Accessed 29 May 2017].

Construction Owners Association of Alberta (COAA), 2001. "Meeting Minutes." Edmonton, Alberta, 1-200.

Cooper, K. and Lee, G., 2009. Managing the Dynamics of Projects and Changes at Fluor. *Proceedings of the International System Dynamics Conference*. Albuquerque, USA, 1-27.

Cooper, K., 1993. The rework cycle: Benchmarking for the project manager. *Project Management Journal*, 24(1), 17–22.

Corbin, J. and Strauss, A., 2008. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. 3rd edition. Thousand Oaks, CA: Sage, *Organizational Research Methods*, 12(3), 614-617.

Cornford, T. and Smithson, S., 1996. *Project Research in Information System*. London: Macmillian.

Courtice, C. and Herrero, J., 1991. Development and results of a quality management program for an EPC project, *Proceedings of the 1991 PMI annual seminar/symposium*, Dallas, USA.

Cox, R., Issa, R. and Frey, A., 2006. Proposed Subcontractor-based employee motivational model. *Journal of Construction Engineering and Management*, 132(2), 152-163.

Coyle, G. and Exelby, D., 2000. The Validation of Commercial System Dynamics Models. *System Dynamics Review*, 16(1), 27-41.

Coyle, R. and Alexander, M., 1997. Two approached to qualitative modeling of a nation's drug trade. *System Dynamics Review*, 13(3), 205-222.

Coyle, R., 1977. *Management System Dynamics*. London: John Wiley.

Creswell, J. and Miller, D., 2002. Determining validity in qualitative inquiry. *Theory into practice*, 39(3), 124-130.

Creswell, J., 1998. *Qualitative Inquiry and Research Design: Choosing among Five Traditions*. Thousand Oaks, CA: Sage.

Creswell, J., 2003. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Sage Publications, Thousand Oaks, CA.

Creswell, J., 2009. *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*, 3rd Edition. California, SAGE Publications, INC.

Crosby, P. 1984. *Quality Without Tears: The Art of Hassle Free Management*. New York: McGraw-Hill.

Cusack, D., 1992. Implementation of ISO 9000 in construction, *ISO 9000 Forum Symposium*, the International Group for Lean Construction, Gold Coast, Australia, 157-167.

Custovic, E., 2015. Engineering management: old story, new demands. *IEEE Engineering Management Review*, 43(2), 21-23.

Dantong, J., Lekjeb, R. and Dessah, E., 2011. Investigating the most effective training for construction craftsmen that will optimize productivity in the Nigerian construction industry.

Davies, A. and Mackenzie, I., 2012. Project Complexity and System Integration: Constructing the London 2012 Olympics and Paralympics Games, *International Journal of Project Management*, 32, 773-790.

Davis, K., Ledbetter, W. and Burati, J., 1989. Measuring design and construction quality costs, *Journal of Construction Engineering and Management*, 115(3), 389-400.

De Araujo, M., Alencar, L. & de Miranda Mota, C., 2017. Project procurement management: A structured literature review. *International Journal of Project Management*, 35(3), 353-377.

De Bakker, K., Boonstra, A. and Wortmann, H., 2010. Does risk management contribute to IT project success? A meta-analysis of empirical evidence. *International Journal of Project Management*, 28(5), 493-503.

Deci, E, Olafsen, A. and Ryan, R., 2017. Self-Determination Theory in Work Organizations: The State of a Science. *The Annual Review of Organizational Psychology and Organizational Behaviour*, 4, 19-43.

Deci, E. and Ryan, R., 2000. The 'what' and 'why' of goal pursuits: Human needs and the self-determination of behviour. *Psychological Inquiry*, 11, 227-268.

Deci, E. and Ryan, R., 2002. *Handbook of Self-determination Research*, Soft Cover edition, University of Rochester Press.

Deci, E. and Ryan, R., 2011. Levels of analysis, regnant causes of behavior, and well-being: The role of psychological needs. *Psychological Inquiry*, 22, 17-22.

Deci, E., 1971. Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology*, 18, 105-115.

Deci, E., 1975. *Intrinsic motivation. Plenum Press*. New York, USA.

Deci, E., and Ryan, R., 1987. The support of autonomy and the control of behavior. *Journal of Personality and Social Psychology*, 53(6), 1024-1037.

Deci, E., and Ryan, R., 2008. Self-determination theory: A macrotheory on human motivation, development, and health. *Canadian Psychology*, 49, 182-185.

Deci, E., Connell, J. and Ryan, R., 1989. Self-Determination in a work organization. *Journal of Applied Psychological*, 74, 580-90.

Deci, E., Eghrari, H., Patrick, B. and Leone, D., 1994. Facilitating Internalization: The self-determination theory perspective. *Journal of Personality*, 62(1), 119-142.

Deci, E., Koestner, R. and Ryan, R., 2001. Extrinsic Rewards and Intrinsic Motivation in Education: Reconsidered Once Again. *Review of Education Research*, 71(1), 1-27.

Deci, E., Koestner, R., and Ryan, R., 1999. A meta-analytic review of experiements examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin*, 125(6), 627.

Deci. E. and Cascio, W., 1972. Changes in Intrinsic Motivation as A Function of Negative Feedback and Threats, *Paper presented at Eastern Psychological Association Meeting*, Boston, Mass, USA.

Deloitte. 2016. Deloitte GCC Powers of Construction 2016: The Funding Equation. Available from: https://www2.deloitte.com/xe/en/pages/real-estate/articles/gcc-powers-of-construction-2016.html [Accessed 17 June 2018].

Denzin, N. and Lincoln, Y., 2000. *The Displine and Practice of Qualitative Research. Handbook of Qualitative Research*. Sage, Thousand Oaks, 1-32.

Dick, G., Heras, I. and Casadesus, M., 2008. Shedding light on causation between ISO 9001 and improved business performance. *International Journal of Operations and Production Management*, 28(7), 687-708.

Din, S., Abd-Hamid, Z. and Bryde, D. 2011. ISO 9000 certification and construction project performance: The Malaysian experience. *International Journal of Project Management*, 29(8), 1044-1056.

Dolage, D. and Rathnamali, D., 2013. Causes of time overrun in construction phase of building projects: a case study on Department of Engineering Services of Sabaragamuwa Provincial Council. Engineer: *Journal of the Institution of Engineers*, Sri Lanka, 46(3), 9–18.

Dowling, M., 2006. Approaches to reflexivity in qualitative research. *Nurse Researcher*, 13 (3), 7-21.

Dozzi, S. and AbouRizk, S., 1993. Productivity in Construction, National Research Council Canada.

Draghici, A. and Draghici, G., 2008. Building a Knowledge Share Culture in a Virtual Organization. Case Study for VRL-KCiP NoE. *Methods and Tools for Effective Knowledge Life-Cycle Management*, 45-60.

Dubai Chamber of Commerce and Industry (DCCI), 2018. Annual Report 2018-Dubai- June 2019[online]. Dubai. Available from: http://www.dubaided.ae/StudiesAndResearchDocument/Dubai-Economic-Report-2018-Full-Report.pdf [Accessed 24 February 2019].

Dudwick, N., Kuehnast, K., Jones, V. and Woolcock, M., 2006. Analysing Social Capital in Context: A Guide to using Qualitative Methods and Data. *World Bank Institute*, Washington.

Easterby-Smith, M., Thorpe, R. and Lowe, A., 2002. *Management Research: An Introduction*, 2nd edition. London, Sage Publication.

Eden, C., Ackermann, F. and Willams, T., 2005. The Amoebic Growth of Project Costs. *Project Management Institute*, 36(1), 15-27.

Egan, J., 1998. Rethinking Construction. Norwich: Her Majesty's Stationery Office.

Ehsan, N., Alam, M., Mirza, E. and Ishaque, A., 2010. Risk management in construction industry. *International Journal of Project Management*, 61(2), 173-193.

Eisner, E., 1991. *The enlightened eye: Qualitative Inquiry and the enhancement of educational practice*. New York, NY: Macmillan Publishing Company.

El Mallakh, R., 2014. *The Economic Development of the Yemen Arab Republic (RLE Economy of Middle East)*. Routledge: Abingdon, UK.

Elfaki, A., Alatawi, S. and Abushandi, E., 2014. Using intelligent techniques in construction project cost estimation: 10 year survey. *Advance Civil Engineering*.

El-Sayegh, S., 2014. Project risk management practices in the UAE construction industry. *International Journal of Project Organization and Management*, 6(1-2), 121-137.

Enhassi, A., 2014. Constraints to Palestinian Construction Craftsmen Productivity, *Proceedings IGLC-22*, Oslo, Norway, 1507-1517.

Enhassi, A., Sundermeier, M. and Zeiter, M., 2017. Factors Contributing to Rework and their Impact on Construction Projects Performance, *International Journal of Sustainable Construction Engineering and Technology*, 8(1), 12-33.

Eom, C., Yun, S. and Paek, J., 2008. Subcontractor Evaluation and Management Framework for Strategic Partnering. *Journal of Construction Engineering and Management*, 134-11, 842-851.

Eriksson, P., 2007. Efficient Governance of Construction Projects through Cooperative Procurement Procedures. *Business Administration and Management*, Lulea University of Technology, Lulea, Sweden.

Fargues, P., Shah, N. and Brouwer, I., 2019. Working and Living Conditions of Low-Income Migrant Workers in the Hospitality and Construction Sectors in the United Arab Emirates, Gulf Labour Markets, Migration and Population. 1-80.

Faridi, A. and El-Sayegh, S., 2006. Significant factors causing delay in the UAE construction industry. *Construction Management and Economics*, 24, 1167-1176.

Farooqui, R. and Ahmed, S., 2009. ISO 9000: A Stepping Stone to Total Quality Management for Construction Companies? *In Proceedings of the Seventh Latin American and Caribbean Conference for Engineering and Technology*, 1–9. Retrieved from: http://laccei.org/LACCEI2009-Venezuela/p249.pdf [Accessed in February 24, 2019].

Farrington, J., 1987. A Methodology to Identify and Categorize Costs of Quality Deviations in Design and Construction, USA.

Fayek, A., Dissanayake, M. and Campero, O., 2004. Developing a standard methodology for measuring and classifying construction field rework. *Canadian Journal of Civil Engineering*, 31(6), 1077-1089.

Fayek, R., Dissanayake, M. and Campero, O., 2003. Measuring and classifying construction field rework: a pilot study. Department of Civil and Environmental Engineering, University of Alberta. Presented to the Construction Field Rework Committee, Construction Owners Association of Alberta.

Fédération Internationale des Ingénieurs-Conseils (FIDIC), 2001. Quality of Construction: Policy, International Federation of Consulting Engineers, Geneva.

Feldman, R., 2011. *Understanding Psychology*. McGraw-Hill, New York.

Fellows, R., Langford, D., Newcombe, R. and Urry, S., 2002. *Construction Management in Practice*. Oxford: Blackwell Science.

Flanders, 2016. UAE Construction Sector: overview and outlook. *Flanders investment & trade*, 1(1), 3-15.

Flyvbjerg, B., and Stewart, A., 2012. Olympic proportions: Cost and cost overrun at the Olympics 1960-2012, [pdf]. University of Oxford. Available at: http://ssm.com/abstract=2238053 [Accessed 12 March 2018].

Flyvbjerg, B., Skamris Holm, M. and Buhl, S., 2003. How common and how large are cost overruns in transport infrastructure projects? *Transport Reviews*, 23(1), 71-88.

Fonseca, L., 2015. ISO 9001 Quality Management through the lens of organizational culture. *Quality Management*, 16(148), 54-59.

Foss, N., Minbaeva, D., Pederson, T. and Reinholt, M., 2009. Encouraging knowledge sharing among employees: how job design matters. *Human Resources Management*, 48(6), 871-893.

Frey, B., Homberg, F. and Osterloh, M., 2013. Organizational Control Systems and Pay-for-Performance in the Public Service. *Organization Studies*, 34(7), 949-972.

Frimpong, Y., Oluwoye, J. Crawford, L., 2003. Causes of delay and cost overruns in construction of groundwater projects in developing countries: Ghana as a case study. *International Journal of Project Management*, 21(5), 321-326.

Fryer, B., Egbu, C., Ellis, R. and Gorse, C., 2004. *The practice of construction management: people and business performance*. Wiley-Blackwell.

Gagne, M. and Deci, E., 2005. Self-determination theory and work motivation. *Journal of Organizational Behavior*. 26, 331-362.

Gagne, M. and Forest, J., 2008. The study of compensation through the lens of self-determination theory: Reconciling 35 years of debate. *Canadian Psychology*, 49(3), 225-232.

Gagne, M., Forest, J., Vansteenkiste, M., Crevier-Braud, L., Van den Broeck, A., Aspeli, A. and Westbye, C., 2015. The multidimensional work motivation scale: Validation evidence in seven languages and nine countries. *European Journal of work and Organizational Psychology*, 24(2), 178-196.

Galli, B., 2019. Effect of Cultural Diversity in Communication on Project Success Within Multinational Construction Companies in the United Arab Emirates. *International Journal of Risk and Contingency Management*, 8 (4), 39-40.

Gardner, A., 2012. "Why Do They Keep Coming? Labor Migrants in the Gulf States" In Migrant labour in the Persian Gulf, eds. Mehran Kamrava and Zahra Babar. New York: Columbia University Press, 41-58.

Gentles, S., Charles, C., Ploeg, J. and McKibbon, K., 2015. Sampling in Qualitative Research: Insights from an Overview of the Methods Literature. *The Qualitative Report*, 20(11), 1772-1789.

Gephart, R., 1999. Paradigms and Research Methods. Academy of Management Research Methods Division. Research Methods forum, vol. 4. Retrieved from: http://division.aomonline.org/rm/1999_RMD_Forum_Paradigms_and_Research_Methods.htm [Accessed 23 June 2018].

Ghahramanzadeh, M., 2013. *Managing risk of construction projects: A case study of Iran*. Thesis (PhD). University of East London, UK. Retrieved from: http://hdl.handle.net/10552/3502 [Accessed 10 December 2018].

Ghoneim, A., 2018. Main Contractors may not be liable for the Nominated Subcontractors' Delay. Available at: https://www.mondaq.com/saudiarabia/Real-Estate-and-Construction/712812/Main-Contractors-May-Not-Be-Liable-For-The-Nominated-Subcontractors39-Delay [Accessed 15 February 2018].

Gidado, K., 1996. Project Complexity: The Focal Point of Construction Production Planning. *Construction Management and Economics*, 14, 213-225.

Girmscheid, G. and Brockmann, C., 2008. The inherent Complexity of Large Scale Engineering Projects. *International Project Management Association*, 29, 22-26.

Global Market Information Databases (GMID), 2015. Global Market Information Databases. Retrieved from: http://www.portal.euromonitor.com/Portal/Pages/Magazine/WelcomePage.aspx [Accessed 16 February 2018].

Godlewski, E., Lee, G. and Cooper, K., 2012. System Dynamics Transforms Fluor Project and Change Management. *Interfaces*, 42(1), 17-32.

Gopaldas, A., 2016. A Front-to-back Guide to Writing a Qualitative Research Article. *Qualitative Market Research: An international Journal,* 19(1), 115-121.

Gransberg, D., 1999. Quantitative analysis of partnered project performance. *Journal of Construction Engineering and Management,* 125(3), 161–166.

Greguras, G. and Diefendorff, J., 2009. Different Fits Satisfy Different Needs: Linking Person-Environment Fit to Employee Commitment and Performance Using Self-Determination Theory. *Journal of Applied Psychology*, 94(2), 465-477.

Greguras, G. and Diefendorff, J., 2010. Why does proactive personality predict employee life satisfaction and work behaviours? A field investigation of the mediating role of the self-concordance model. *Personnel Psychology*, 63, 539-560.

Griffith, A. and Watson, P., 2004. *Construction Management – Principles and Practice*. Palgrave MacMillan.

Grossman, G. and Helpman, E., 1989. Quality Ladders in the Theory of Growth, NBER Working Papers 3099, National Bureau of Economic Research, Inc.

Guba, E. and Lincoln, Y., 1981. Effective evaluation. San Francisco: Jossey-Bass.

Gunhan, S. and Arditi, D., 2007. Budgeting owner's construction contingency. *Journal of Construction Engineering and Management*, 133(7), 492-497.

Habibi, M., Kermanshachi, S. and Rouhanizadeh, B., 2019. Identifying and Measuring Engineering, Procurement, and Construction (EPC) Key Performance Indicators and Management Strategies. *Infrastructures*, 4(20), 1-19.

Habibi, M., Kermanshachi, S. and Safapour, E., 2018. Engineering, procurement, and construction cost and schedule performance leading indicators: State-of-the-art-review. *Proceedings of Construction Research Congress*, New Orleans, Louisiana, USA.

Hackman, J. and Oldham, G., 1976. Motivation through design of work: Test of a theory. *Organizational Behaviour and Human Performance*, 16, 250-279.

Hagger, M. and Chatzisarantis, N., 2008. Self-determination Theory and the psychology of exercise. *International Review of Sport and Exercise, Psychology*, 1(1), 79-103.

Hambrick, D., 1994. Top management groups: A conceptual integration and reconsideration of the 'team' Label. *Research in organizational behaviour*, 16, 171-214. Greenwich, Connecticut: JAI Press.

Hammarlund, Y. and Josephson, P., 1991. Sources of quality failures in building. *Proceedings of the European Symposium on Management, Quality and Economics in Housing and other Building Sectors*, Lisbon, Portugal, 671-9.

Hamza, S., 2015. Migrant labor in the Arabian Gulf: A Case Study of Dubai, UAE. *Pursuit – The Journal of Undergraduate Research at the University of Tennessee*, 6(1), 10.

Hancock, B., Ockleford, E. and Windridge, K., 2009. *An Introduction to Qualitative Research*, National Institute for Health Research (NIHR). The NIHR RDS EM/YH.

Hancock, D., 2006. What value does money play in the motivation of 'knowledge workers' such as project managers? *Proceedings of the IEEE International Engineering Management Conference Engineering Management*: the Human Technology Interface (IEMC '06), 127–131.

Hanna, A., Thomas, G. and Swanson, J., 2013. Construction risk identification and allocation: Cooperative approach. *Journal of Construction Engineering and Management*. 139(9), 1098-1107.

Hannah, W. and Gidado, K., 2008. Project Complexity in Construction, 1-13.

Harrington, H., and Voehl, F. and Wiggin, H., 2012. Applying TQM to the construction industry. *The TQM Journal*, 24(4), 352-362.

Hartzell, D., 2006. *Dictinary of Management*. New Delhi: Academic Publishers.

Hasani, M., Tularam, G. and Regan, M., 2017. Impacts of cultural risk factors on project success in the UAE construction industry. *22nd International Congress on Modelling and Simulation*, Hobart, Tasmania, Australia, 3 to 8 December 2017. Available from: Mssanz.org.au/modsim2017 [Accessed 20 January 2019].

Haupt, T. and Whiteman, D., 2004. Inhibiting factors of implementing total quality management on construction sites. *The TQM Magazine*, 16(3), 166-173.

Haupt, T., 2002. Total Quality Management in Bankwesen: Umsetzung des TQM in Universalbanken aufgrund des EFQM-Modells, vol. 338 of Bank und finanzwirtschaftliche Forschungen, 262.

Hayes, N., 1997. Theory-led thematic analysis. In N. Hayes (Ed.), Doing qualitative analysis in psychology (93-114). Hove, UK: Psychology Press.

Hazeltine, C., 1976. Motivation of construction workers. *ASCE Journal of the Construction Division,* 102(3), 497–509.

Helbing, D., 2013. Globally networked risks and how to respond. *Nature*, 497(7447), 51-9.

Helmreich, R., 2000. On error management: Lessons from aviation. *British Medical Journal*, 320, 781-785.

Heravi, G. and Mohammadin, M., 2017. Cost Overruns and Delay in Municipal Construction Projects in Developing Countries. *AUT Journal of Civil Engineering*, 1(1), 31-38.

Heravitorbati, A., 2011. Examination of process to develop a framework for better implementation of quality practices in building projects, 16-18.

Herzberg, F., 1959. *The Motivation to Work*. New York: John Wiley and Sons.

Hewage, K. and Ruwanpura, J., 2006. Carpentry workers issues and efficiencies related to construction productivity in commercial construction projects in Alberta. *Canadian Journal of Civil Engineering*, 33(8), 1075-1089.

Hickson, B. and Ellis, L., 2014. Factors Affecting Construction Labour Productivity in Trinidad and Tobago. *The Journal of the Association of Professional Engineers of Trinidad and Tobago*, 42(1), 4-11.

Hittleman, D. and Simon, A., 1997. *Interpreting Educational Research: An Introduction for Consumers of Research*. New Jersey: Prentice Hall Inc.

Hoezen, M., Reymen, I. and Dewulf, G., 2006. *The Problem of communication in construction*. University of Twente, Enscheda, The Netherlands.

Hofstede, G., 2001. *Culture's Consequences: Comparing Values, Behaviours, Institutions, and Organizations across Nations*. Sage: Thousand Oaks, CA.

Holloway, I. and Todres, L., 2003. The status of method: Flexibility, consistency and coherence. *Qualitative Research*, 3, 345-357.

Honnakker, P., Carayon, P. and Loushine, T., 2010. Barriers and Benefits of Quality Management in the Construction Industry: An Empirical Study. *Total Quality Management*, 21(9), 953-969.

Hopkin, T., Lu, S., Roger, P. and Sexton, M., 2014. Placing defects at the heart of high quality new homes: the learning perspective. *30th ARCOM Conference Association of Researchers in Construction Management*, 1-3 September 2014, University of Portsmouth, UK, 1153-1162.

Horta, H., Meoli, M. and Vismara, S., 2013. Skilled Unemployment and the creation of Academic spin-offs: A recession push hypothesis. *Journal of Technology Transfer*, 41, 798-817.

Houle, C., 1961. *The inquiring mind. Madison*. WI: University of Wisconsin Press.

House, R., Hanges, P., Javidan, M., Dorfman, P. and Gupta, V., 2004. *Leadership, culture, and organizations: The GLOBE study of 62 countries*. Thousand Oaks, CA: Sage Publications.

Hughes, C., 2006. *Quantitative and Qualitative Approaches to Social Research*. University of Warwick, UK.

Human Resources and Skills Development Canada (HRSDC), 2009. Construction Craft Worker: Occupational Analyses Series, Catalogue no. HS42-1/25-2009E, [S.I.], 97.

Human Rights Watch (HRW), 2006. *Building Towers, Cheating Workers: Exploitation of Migrant Construction Workers in the United Arab Emirates*. New York: Human Rights Watch, Special Report, Middle East and North Africa Section.

Human Rights Watch (HRW), 2009. *The Island of Happiness: Exploitation of Migrant Workers on Saadiyat Island, Abu Dhabi*. New York, N.Y.: Human Rights Watch.

Human Rights Watch (HRW), 2012. *Building a better World Cup: Protecting Migrant Workers in Qatar Ahead of FIFA 2022*. New York, N.Y.: Human Rights Watch.

Human Rights Watch (HRW), 2015. *Migrant Workers' Rights on Saadiyat Island in the United Arab Emirates*, New York, N.Y.: Human Rights Watch.

Hwang, B. and Zhao, X., 2014. Investigating the client-related rework in building projects: The case of Singapore. *International Journal of Project Management*, 32(4), 698-708.

Hwang, B., Zhao, X. and Chin, E., 2017. International Construction Joint Ventures between Singapore and developing countries: Risk assessment and allocation preferences. *Engineering Construction and Architectural Management*, 24(2), 209-228.

Hwang, B., Zhao, X. and Toh, L., 2014. Risk Management in Small Construction Projects in Singapore: Status, barriers and impact. *International Journal of Project Management*, 32(1), 116-124.

Hwang, G., Thomas, R., Hass, T. and Caldas, H., 2009. Measuring the Impact of Rework on Construction Cost Performance. *Journal Construction Engineering Management*, 135(5), 187-198.

Ibironke, O., Adedokun, O. and Hungbo, A., 2011. Drivers and Challenges of Motivation for Casual Workers on Construction Sites. *Journal of Emerging Trends in Economics and Management Sciences (JETEMS)*, 2 (5), 413-417.

Iqbal, S., Choudhry, R, Holschemacher, K., Ali, A., and Tamošaitienė, J., 2015. Risk management in construction projects. *Technological and Economic Development of Economy*, 21(1), 65-78.

Ireland, V., 1985. The Role of Managerial Actions in the Cost, Time and Quality Performance of High Rise Commercial Buildings. *Construction Management and Economics*, 3(1), 59-87.

Ireland, V., 2013. Exploration of complex system types. *Procedia computer science*, 20, 248-255.

Jamaludin, S., Mohammad, M. and Ahma, K., 2014. Enhancing the Quality of Construction Environment by Minimizing the Cost Variance. *Procedia – Social and Behavioral Sciences*, 153, 70-78.

Jarkas, A. and Radosavljevic, M., 2013. Motivational factors impacting the productivity of construction master craftsmen in Kuwait. *Journal of management in engineering, ASCE*, 29, 446-454.

Jarkas, A., 2013. Primary factors influencing bid mark-up size decisions of general contractors in Kuwait. *Journal of Financial Management of Property and Construction*, 18(1), 53-75.

Jarkas, A., 2015a. Reworking in building construction: principle culprits and underlying causes. *International Journal of Forensic Engineering*, 2(4), 265-285.

Jarkas, A., 2015b. Factors influencing labour productivity in Bahrain's construction industry. *International Journal Construction Management*, 15(1), 94-108.

Jin, Z., Deng, F., Li, H. and Skitmore, M., 2013. Practical Framework for Measuring Performance of International Construction Firms. *Journal of Construction Engineering and Management*, 139(9), 1154-1167.

Jingmond, M. and Agren, R., 2015. Unravelling Causes of Defects in Construction. *Construction Innovation*, 15, 198-218.

Johanson, R., 2009. *A Review of national training funds. World Bank*. Washington.

Johnson, R. and Babu, R., 2018. Time and Cost Overrun in the UAE Construction Industry: A Critical Analysis. *International Journal of Construction Management*, 14, 1-11.

Johnston, J., Leach, M. and Liu, A., 1999. Theory testing using case studies in business-to-business research. *Industrial Marketing Management*, 28(3), 201-213.

Josephson, P. and Hammarlund, Y., 1999. The causes and costs of defects in construction. A study of seven building projects. *Automation in Construction*, 8(6), 681-687.

Josephson, P., 2000. What we know and know about poor quality costs in building projects: some experiences. *Proceedings of International Conference CIB TG36 Implementation of Construction Quality and related Systems*, Lisbon, 18-21, June, 281-90.

Josephson, P., Larsson, B. and Li, H., 2002. Illustrative benchmarking rework and rework costs in Swedish construction industry. *Journal of Management in Engineering*, 18 (2), 76-83.

Ju, D., Li, M. and Zhang, Y., 2019. Empowered to Break the Silence: Applying Self-Determination Theory to Employee Silence. *Front Psychology*, 10, 485.

Kahkonen, K., 2008. Monitoring degree of complexity in multicultural construction. *Proceedings of the Joint 2008 CIB W065/W075 Symposium*, Heriot Watt University: Edinburgh, UK.

Kakitahi, J., Landin, A. and Alinaitwe, H., 2013. An exploratory study of rework causality in Uganda. *Construction Innovation*, 13(3), 266-280.

Kanji, G. and Wong, A., 1998. Total quality culture in the construction industry. *Total Quality Management*, 9(4/5), 133-140.

Kath, L., Marksa, K. and Ranneyb, J., 2010. Safety Climate Dimensions, Leader-Member Exchange, and Organizational Support as Predictors of Upward Safety Communication In A Sample of Rail Industry Workers. *Safety Science*, 48(5), 643-650.

Kazaz, A. and Ulubeyli, S., 2006. Organizational factors influencing construction manpower productivity in Turkey. In: Boyd D (Ed.), *22nd Annual ARCOM Conference*, 4-6 September 2006, Birmingham, UK, 1, 39-48.

Kazaz, A. and Ulubeyli, S., 2007. Drivers of Productivity among Construction Workers: A Study in a Developing Country. *Building and Environment*, 42(5), 2132-2140.

Kazaz, A., Manisali, E. and Ulubeyli, S., 2008. Effect of basic motivational factors on construction workforce productivity in Turkey. *Journal of civil engineering and management*, 14(2), 95-106.

Kelle, U., 2004. *Computer-assisted qualitative data analysis. In C. Seale, G. Gobo, J.F. Gubrium and D. Silverman (Eds.), Qualitative Research Practice*, (p. 473-489). London: Sage Publications.

Kennedy, D., McComb, S. and Vozdolska, R., 2011. An Investigation of Project Complexity's Influence on Team Communication using Monte Carlo Simulation. *Journal of Engineering Technology Management*, 28, 109-127.

Kernis, M., 1995. Efficacy, agency, and self-esteem. *Efficacy, Agency, and Self-Esteem.* Springer, 237-253.

Khaled, M. and Remon, F., 2013. 'Factors Influencing Construction Labor Productivity in Egypt', *Journal of Management in Engineering*, 30(1), 1-9.

Khan, A., 2014. *Improving Performance of Construction Projects in the UAE, Multicultural and Decent work perspectives*. University of Oulu Graduate School, Acta University Ouluensis, Amsterdam, Netherlands.

Kim, S., Kim, J., Cho, H., Shin, Y. and Kim, G., 2015. Finding Cultural Differences and Motivation Factors of Foreign Construction Workers. *Journal of Building Construction and Planning Research*, 3, 35-46.

Kincheloe, J. and McLaren, P., 1994. Rethinking Critical Theory and Qualitative Research Handbook of Qualitative Research, London: Sage, 138-157.

King, D. and DeMarie, S., 2014. Tuning up organizational culture. *Industrial Engineer*: *IE*, 46(11), 26-30.

King, N., 2004. Using templates in the thematic analysis of text. In C. Cassell & G. Symon (Eds.), Essential guide to qualitative methods in organizational research (257-270). London, UK: Sage.

Kivrak, S., Ross, A., Arslan, G., Tuncan, M. and Dainty, A., 2009. September. Impacts of cultural differences on project success in construction. *Proceedings of 25th Annual ARCOM Conference, Association of Researchers in Construction Management*, 7-9 September 2009, Nottingham, 53-61.

Kiwus, C. and Williams, T., 2001. Application of TQM to environmental construction, *Journal of Management in Engineering*, 17(3), 176–184.

Knocke, J., 1992. *Post Construction Liability and Insurance*. London: E & FN Spon.

Kodz, J., Davis, S., Lain, D., Strebler, M., Rick, J., Bates, P., Cummings, J., Meager, N., Anxo, D., Gineste, S., Trinczek, R. and Pamer, S., 2003. Working long hours: a review of the evidence. *Employment Relations Research Series*, 1(16), 1-260.

Koestner, R. and Losier, G., 2002. Distinguishing three ways of being highly motivated: A Closer look at introjection, Identification, and intrinsic motivation. In E. L. Deci & R. M. Ryan (Eds), Handbook of Self-determination research, (p. 101-121). University of Rochester Press.

Krygier, A., 1993. TQM: A world view. *Journal of Management Development*, 12(7), 30-47.

Kuo, T. and Kuo, Y., 2010. The effect of corporate culture and total quality management on construction project performance in Taiwan. *Total Quality Management & Business Excellence*, 21(6), 617-632.

Lam, C. and Gurland, S., 2008. Self-determined work motivation predicts job outcomes, but what predicts self-determined work motivation? *Journal of Research in Personality*, 42, 1109-1115.

Lam, S. and Tang, C., 2003. Motivation of survey employees in construction projects. *Journal of Geospatial Engineering*, 5(1), 61-66.

Langford, D., Fellows, R., Hancock, M. and Gale, A., 1995. Human Resources Management in Construction. Longman, Essex.

Lazear, E., 2000. The power of incentives. *The American Economic Review*, 90(2), 410-414.

Legault, L. 2016. Intrinsic and Extrinsic Motivation. In V. Zeigier-Hill and T. Shackelford (Eds.), Encylopedia of Personality and Individual Differences.

Leonard-Barton, D., 1992. Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal*, 13(1), 111-125.

Leong, T., Zakuan, N. and Saman, M., 2014. Review of quality management system research in construction industry. *International Journal of Productivity and Quality Management*, 13(1), 105-123.

Lepper, M., Greene, D. and Nisbett, R., 1973. Undermining children's intrinsic interest with extrinsic reward: A test of the "over justification" hypothesis. *Journal of Personality and Social Psychology*, 28(1), 129-137.

Leung, M., NG, S. and Cheung, S., 2004. Measuring Construction Project Participant Satisfaction. *Construction Management and Economics*, (3), 319.

Levitt, H., Motulsky, S., Wertz, F., Morrow, S. and Ponterotto, J., 2017. Recommendations for designing and reviewing qualitative research in psychology: Promoting methodological integrity. *Qualitative Psychology*, 4, 2-22.

Li, J., Taylor, T.R. and Ford, D.N., 2011. Impacts of Project Controls on Tipping Point Dynamics in Construction Projects. *Proceedings of the 29th Annual International Conference of the System Dynamics Society*, 1-12.

Lill, I., 2008. Sustainable Management of Construction Labour. *The 25th International Symposium on Automation and Robotics in Construction*, June 26-29, 2008, Vilnius, Lithuania.

Lim, L. and Ling, F., 2012. Human resource practices of contractors that lead to job satisfaction of professional staff. *Engineering, Construction and Architectural Management*, 19(1), 101-118.

Lincoln, Y. and Guba, E., 1985. *Naturalistic Inquiry*, Beverly Hills, CA: Sage.

Liu, A., 1999. A Research Model of Project Complexity and Goal Commitment Effects on Project Outcome. *Engineering, Construction and Architectural Management*, 6(2), 105-111.

Liu, J., Han, S., Kim, H. and Park, H., 2016. Risk paths in international construction projects: Case study from Chinese contractors. *Journal of Construction Engineering and Management*, 142(6), 1-16.

Lloyd-Walker, B. and Walker, D., 2011. Authentic leadership for 21st century project delivery. *International Journal of Project Management*, 1-31.

Locatelli, G., Mancini, M. and Todeschini, N., 2013. Generation IV nuclear reactors: Current status and future prospects. *Energy Policy*, 61, 1503-1520.

Lomas, L., 1996. ‘An evaluations of early developments in higher education’s quality management. *Journal of Further and Higher Education*, 20(3), 60-69.

Long, N., Ogunlana, S., Quang, T. and Lam, K., 2004. Large construction projects in developing countries: a case study from Vietnam. *International Journal of Project Management*, 22, 553-561.

Loosemore, M. and Al Muslmani, H., 1999. Construction project management in the Persian Gulf: intercultural communication. *International Journal of Project Management*, 17(2), 95-100.

Loosemore, M., Dainty, A. and Lingard, H., 2003. *HRM in Construction Projects: Strategic and Operational Appraoches*. E&FN Spon Press, London.

Love, E., Edwards, D. and Smith, J., 2016b. Rework causation: emergent theoretical insights and implications for research. ASCE *Journal Construction Engineering Management*, 142(6).

Love, P. and Edward, D., 2004b. Forensic Project Management: the underlying causes of rework in Construction Projects. *Civil Engineering and Environmental Systems*, 21(3), 207-228.

Love, P. and Edwards, D., 2004a. Determinants of rework in building construction projects. *Journal of Engineering, Construction and Architectural Management*, 11(4), 259-274.

Love, P. and Heng, L., 2000. Total Quality Management and the Learning Organization: A Dialogue for Change in Construction. *Construction Management and Economics*, 18(3), 321-331.

Love, P. and Li, H., 2000a. Overcoming the Problems Associated with Quality Certification. *Construction Management and Economics*, 18, 139-149.

Love, P. and Li, H., 2000b. Quantifying the causes and costs of rework in construction. *Construction Management and Economics Journal*, 18(4), 479-490.

Love, P. and Smith, J., 2019. Unpacking the ambiguity of rework in construction: making sense of the literature. *Civil Engineering and Environmental systems*, 35(1-4), 180-203.

Love, P., 2000. Auditing the indirect consequences of rework in construction: a case based approach. *Managerial Auditing Journal*, 17(3), 138-146.

Love, P., 2002. Influence of Project Type and Procurement Method on Rework Costs in Building Construction Projects. *Journal of Construction Engineering and Management*, 128(1), 18-29.

Love, P., Ackermann, F., Carey, B., Morrison, J., Ward, M. and Park, A., 2016a. Praxis of Rework Mitigation in Construction. *Journal of Management in Engineering*, 32(5), 05016010-10.

Love, P., Davis, P. and Chevis, R., 2011. Risk/reward compensation models in alliances for the delivery of civil engineering infrastructure Projects. *Journal Construction Engineering Management*, 137(2), 127-136.

Love, P., Edwards, D. and Han, S., 2010. Design error reduction: toward the effective utilization of building information modeling. *Research in Engineering Design*, 22(3), 173-187.

Love, P., Edwards, D. and Irani, Z., 2008. Forensic project management: An exploratory examination of the causal behaviour of design-induced rework, *IEEE Trans. Engineering Management*, 55(2), 234-247.

Love, P., Edwards, D. and Smith, J., 2016b. Rework Causation: Emergent Insights and Implications for research. *ASEC Journal of Construction Engineering and Management*, 142(6), 04016010.

Love, P., Frani, Z. and Edwards, D., 2004. A rework reduction model for construction projects. *IEEE Trans. Engineering Management*, 51 (4), 426-440.

Love, P., Holt, G., Shen, L., Li, H. and Irani, Z., 2002. Using Systems Dynamics To Better Understand Change and Rework in Construction Project Management Systems. *International Journal of Project Management*, 20(6), 425-436.

Love, P., Mandal, P. and Li, H., 1999. Determining the causal structure of rework in construction projects, *Construction Management Economics*, 17(4), 505-517.

Love, P., Mandal, P., Smith, J. and Georgiou, J., 2000. DECOREM: A design and construction rework minimization model. *1st International Conference on System Thinking in Management*, Geelong, Australia, 377-382.

Love, P., Skitmore, R. and Earl, G., 1998b. Selecting a suitable procurement method for a building project. *Journal of Construction Management and Economics*, 17(4), 505-517.

Love, P., Smith, J. and Li, H., 1998. Benchmarking the costs of poor quality in construction: A case study. *Proceedings of the Second International and Fifth National Conference on Quality Management*, 9-11 February, Monash University, Australia, 114-24.

Love, P., Smith, J. and Walker, D., 2009. Congruence or divergence? A path model of rework in building and civil engineering projects, *Journal of Performance of Constructed Facilities*, 23(6), 480-488.

Love, P., Smith, J., Ackermann, F. and Irani, Z., 2019. Making sense of rework and its unintended consequence in projects: The emergence of uncomfortable knowledge. *International Journal of Project Management*, 37, 501-516.

Love, P., Smith, J., Regan, M., Irani, Z. and Liu, J., 2017. Cost Performance of Public Infrastructure Projects: The Nemesis and Nirvana of Change-Orders. *Production Planning and Control*, 28(13), 1081-1092.

Love, P., Teo, P., Ackermann, F., Smith, J., Alexander, J., Palaneeswaran, E. and Morrison, J., 2018. Reduce rework, improve safety: an empirical inquiry into the precursors to an error in construction. *Production Planning Control*, 29(5), 353-366.

Love, P., Wyatt, A. and Mohammed, S., 1997. Understanding rework in construction. *International Conference on Construction Process Re-engineering*, Gold Coast, Australia, 269-278.

Love, P.; Edwards, D. and Smith, J. 2005. A rework reduction model for construction. *IEEE Transport Engineering Management*, 51(4), 426-440.

Low, S. and Teo, J., 2004. Implementing Total Quality Management in Construction firms. *Journal Management Engineering*, 16(5), 67-70.

Lückmann, P. and Färber, K., 2016. The impact of cultural differences on project stakeholder engagement: a review of case study research in international project management. *Procedia Computer Science*, 100(100), 85-94.

Lynch, R., 2012. *Strategic Management*, 6th edition, Pearson Prentice Hall.

Lyubomirsky, S., Tkach, C. and Yelverton, J., 2003. Pursuing sustained happiness through random acts of kindness and counting one's blessings: Tests of two six-week interventions. Unpublished data, Department of Psychology, University of California, Riverside, USA.

Mack, L. 2010. The Philosophical Underpinnings of Educational Research. *Polyglossia*, 19, 5 – 11.

Maheswari, J., Charlesraj, V., Kumar, G. and Padala, S., 2016. A Study on Assessment of Non-conformances using Multiple Domain Matrix: A Case Study from Metro Projects, *International Conference on Sustainable Design, Engineering and Construction*, Procedia Engineering, 145, 622-629.

Malka, A. and Chatman, J., 2003. Intrinsic and Extrinsic Work Orietations as Moderators of the Effect of Annual Income on Subjective Well-Being: A Longitudinal Study. *Personality and Social Psychology Bulletin*, 29(6), 737-46.

Mallawaarachchi, H. and Senaratne, S., 2015. Importance of Quality for Construction Project Success. *6th International Conference on Structural Engineering and Construction Management*, Kandy, Sri Lanka, 11– 13.

Maloney, W. and McFillen, J., 1986. Motivational implications of construction work. *Journal of Construction Engineering and Management*, 112(1), 137-151.

Maloney, W. and McFillen, J., 1987. Motivational impact of work crews. *Journal of Construction Engineering and Management*, 113(2), 208–221.

Maloney, W., 1981. Motivation in construction: a review. *ASCE Journal of the Construction Division*, 107(4), 641-647.

Maloney, W., 1986. Understanding motivation. *Journal of Management in Engineering*, 2(4), 231-245.

Mansfield, N. and Odeh, N., 1989. Motivational factor in Construction project: a review of empirical motivation studied from US construction industry. *Proceeding of the Institution of Civil Engineers*, 86(3), 461-470.

Marasini, R. and Quinnell, P., 2010. Investigation of quality management practices in building construction sites in the UK. *26th Annual ARCOM Conference, Association of Researchers in Construction Management*, 6-8, September 2010, Leeds, UK.

Martin, J., 2009. BCIS eTendering Survey Report. Retrieved from: http://www.bcis.co.uk/downloads/2009_BCIS_eTendering_Survey_Report_pdf_2_pdf [Accessed 28 January 2017].

Maslow, A., 1943. A theory of human motivation. *Psychology Review*, 50, 370-396.

Mason, J., 2002. *Qualitative Researching*. 2nd edition. London, Sage.

Mastenbroek, Y., 2010. *Reducing rework costs in construction projects*. Thesis (Published Bachelor's Degree). University of Twente, the Netherlands.

Maxwell, J., 1996. *Applied social research methods series, 41. Qualitative research design: An interactive approach*. Sage Publications, Inc.

Maxwell, S., 2002. Rule-Based Price Fairness and its Effects on Willingness to Purchase. *Journal Economic Psychology*, 23(2), 191-212.

Maylor, H., Vidgen, R. and Carver, S., 2008. Managerial Complexity in Project-based Operations: a Grounded Model and its Implications for Practice. *Project Management Journal*, 39, 15-26.

Mbachu, J., 2008. Conceptual framework for the assessment of subcontractors' eligibility and performance in the construction industry. *Construction Management and Economics*, 26, 471-484.

McDonald, R., 2013. Root causes and consequential cost of rework, XL Group Insurance, North America Construction, available at: http://xlgroup.com/~/media/ 1048e70923e549b49905d503c19abf14.pdf [Accessed 30 March 2018].

McGevna, V., 2012. The Importance of a Realistic Schedule. [Online]. Available at: http://www.pmsuccess.com/Articles/Importance_of_Realistic_Schedule.pdf [Accessed 25 April 2019].

McGregor, D., 1960. *The human side of enterprise*. USA: McGraw-Hill.

McGuire, R., 2005. 'Which Management Style to Use' London. *The Pharmaceutical Journal*, 275(9).

Mcintyre, C. and Kirschenman, M., 2000. Survey of TQM in construction industry in upper Midwest. *Journal of Management in Engineering*, 16, 67-70.

McKenzie, K and Harris, F., 1984. Money the only motivator? *Building Technology and Management*, 25-29.

McKim, R. and Kiani, H., 1995. Applying total quality management to the North American construction. *Cost Engineering*, 37(3), 24–28.

Medugu, N., Rafee, M., Bustani, S., Bala, K., Abdullahi, U. and Mbamali, I., 2011. Craft Skills Availability in the Nigerian Construction Industry: Perception of Contractors and Consultants. *The IUP Journal of Infrastructure*, 9(3), 63-73.

Mehran, D., 2016. Exploring the Adoption of BIM in the UAE Construction Industry for AEC Firms. *Procedia Engineering*, 145, 1110-1118.

Memon, A., Abdul Rahman, I., Abdullah, M. and Azis, A., 2010. Factors affecting construction cost in Mara Large construction project: Perspective of project management consultant. *International Journal of Sustainable Construction Engineering Technology*, 1(2), 41-54.

Meng, X., 2012. The effect of relationship management on project performance in construction. *International Journal of Project Management*, 30(2), 188-198.

Merriam, S., 1998. *Qualitative research and case study applications in education*. San Francisco: Jossey-Bass.

Merriam, S., 2009. *Qualitative research: A guide to design and implementation*. San Francisco, CA: Jossey-Bass.

Meshksarr, S., 2012. *Cost and time impacts of reworks in building a reinforced concrete structure*. Thesis (Master). Eastern Mediterranean University, Gazimağusa, North Cyprus.

Middle East Economic Digest (MEED), 2019. Construction Think Tank – Recommendations for change from the UAE Construction Industry Think Tank, Mashreq Construction Partnership.

Miles, M. and Huberman, A., 1994. Qualitative data analysis: an expanded sourcebook, Sage Publications.

Mills, A., Love, P. and Williams, P., 2009. Defect Costs of Residential Construction. *ASCE Journal of Construction, Engineering and Management*, 135(1), 12-16.

Mir, F. and Pinnington, A., 2014. Exploring the Value of Project Management: Linking Project Management Performance and Project Success. *International Journal of Project Management*, 32(2), 202-217.

Mitchell, M., 2009. *Complexity: A guided tour*. New York, NY: Oxford University Press.

Mitropoulos, P. and Memarian, B., 2012. Task demands in masonry work: Sources, performance implications, and management strategies. *Journal of Construction Engineering and Management*, 139(5), 581-590.

Morgeson, F. and Humphrey, S., 2006. The Work Design Questionnaire (WDQ): Developing and validating a comprehensive measure for assessing job design and the nature of work. *Journal of Applied psychology*, 91, 1321-1339.

Morledge, R. and Smith, A.J., 2013. *Building procurement*. John Wiley & Sons.

Morse, J. 1998. Validity by committee. *Qualitative Health Research*, 8, 443-445.

Mouchi, G., Rotimi, J. and Ramachandra, T., 2011. The Skill Sets Required for Managing Complex Construction Projects. *Business Education & Accreditation*, 3, 89-100.

Mouton, J., 2001. *How to succeed in your Master's and Doctoral Studies: A South African guide and resource book*. Pretoria: Van Schaick Publishers.

Myers, M., 2009. *Qualitative research in business and management*. London, UK: Sage.

Naharuddin, N. and Sadegi, M., 2013. Factors of Workplace Environment that Affect Employees Performance: A Case Study of Miyazu Malaysia. *International Journal of Independence Research and Studies – IJIRS*, 2(2), 66-78.

Nair, G.S. and Riege, A.M., 1995, July. *Using convergent interviewing to develop the research problem of a postgraduate*. Thesis. *Proceedings of Marketing Education and Researchers International Conference*, 2-5 July, Gold Coast, Australia.

Naoum, S. and Egbu, C., 2015. Critical review of procurement method research in construction journals. *Procedia Economics and Finance*, 21, 6-13.

Naoum, S. and Mustapha, F., 1994. Influences of the client, designer and procurement methods on project performance, *Proceedings of CIB W-92 Procurement Systems Symposium*, 4-7 December, East Meets West, Department of Surveying, The University of Hong Kong, Hong Kong, 221-8.

Naoum, S., Alyousif, A. and Atkinson, A., 2015. Impact of national culture on the management practices of construction projects in the United Arab Emirates. *Journal of Management Engineering*, 31(4), 04014057.

Nasirzadeh, F., Mazandaranizah, H. and Rouhparvar, M., 2016. Quantitative risk allocation in construction projects using cooperative bargaining game theory. *International Journal of Civil Engineering*, 14(3), 161-170.

Nepal, M., Park, M. and Son, B., 2006. Effects of schedule pressure on construction performance. *Journal of construction engineering and management*, 132, 182-188.

Neuman, W., 2005. *Social Research Methods: Qualitative and quantitative approaches*, 6th edition). London: Allyn & Bacon.

Ng, K. and Price, A., 2010. Causes Leading to Poor Site Coordination in Building Projects. *Organization, Technology and Management in Construction: An International Journal*, 2(2), 167-172.

Ng, T., Sorensen, K. and Yim, F., 2009. Does the job satisfaction-job performance relationship vary across cultures? *Journal of Cross-Cultural Psychology*, 40(5), 761-796.

Nicholls, J., 1984. Achievement motivation: Conceptions of Ability, Subjective Experience, Task Choice, and Performance. *Psychological Review,* 91, 328-346.

Nwadukwe, C. and Timinepere, C., 2012. Management Style and Organizational Effectiveness: An Appraisal of Private Enterprises in Eastern Nigeria. *America International Journal of Contemporary Research*, 2(9), 198-204.

O'Leary, Z., 2004. *The essential guide to doing research*. Sage: London.

O'Leary, Z., 2007. *The essential guide to doing research*. Sage: London.

Ochieng, E. and Hughes, L., 2013. Managing Project Complexity in Construction Projects: The way Forward. *J Archit Eng Tech*, 2(1), 111.

Ochieng, E. and Price, A., 2009. Framework for managing multicultural project teams. *Engineering, Construction and Architectural Management*, 16(6), 527-543.

Office for National Statistic (ONS), 2018. Construction statistic, pp.1-23, Available at: www.construction.statistics@ons.gov.uk [Accessed 11 November 2018].

Office of Government Commerce (OGC) 2009. Managing Successful Projects with PRINCE2. UK: The Stationary Office. Available at: http://www.tsoshop.co.uk [Accessed 18 June 2017].

Ogundipe, K., Olaniran, H., Ajao, A. and Ogunbayo, B., 2018. Assessing the Impact of Quality Supervision on Construction Operatives Project Delivery in Nigeria. *International Journal of Civil Engineering and Technology (IJCIET)*, 9(9), 426-439.

Ogunlana, S. and Chang, W., 1998. Worker motivation on selected construction sites in Bangkok, Thailand. *Engineering Construction and Architectural Management*, 5(1), 68-81.

Okunlola, O., 2015. The Effect of Contractor-Subcontractor Relationship on Construction Duration in Nigeria, *International Journal of Civil Engineering and Construction Science*, 2(3), 16-23.

Oladinrin, O., Olatunji, S. and Hamza, B., 2013. Effect of selected procurement systems on building project performance in Nigeria. *International Journal of Sustainable Construction Engineering and Technology*, 4(1), 48-62.

Olafsen, A., Deci, E. and Halvari, H., 2018. Basic psychological needs and work motivation: A longitudinal test of directionality. *Motivation Emotion*, 42, 178-189.

Olanrewaju, A., Tan, S.Y. and Kwan, L.F., 2017. Roles of communication on performance of the construction sector. *Procedia engineering*, 196, pp.763-770.

Olatunji, A., 2016. Management Style and Quality of Management During Construction Influences on Project Delivery Time. *9th cibd Postgraduate Conference*, February 2-4 2016, Cape Town, South Africa.

Oppong, S. 2013. Indigenizing Knowledge for Development: Epistemological and Pedagogical Approaches. Africanus: *Journal of Development Studies*, 4 (2), 34 – 50.

Orando, M., 2013. *The Influence of Human Behaviour Factors on Construction Productivity*. Thesis (PhD). Bloemfontein: University of the Free State, South Africa.

Organisation for Economic Cooperation and Development (OECD), 2015. *A Strategic Approach to Education and Skills Policies for the United Arab Emirates*. OECD Publishing, Paris.

Osei, O., 2000. *An Appraised of Staff Training at the National Institute for Policy and Strategic Studies, kuru*. Thesis (MSc). Department of Management, University of Job, Nigeria.

Oyewobi, L, Abiola-Falemu, O. and Ibironke, O., 2016. The impact of rework and organizational culture on project delivery. *Journal of Engineering, Design and Technology*, 14 (2), 214 – 237.

Oyewobi, L. and Ogunsemi, D., 2010. Factors Influencing Reworks Occurrence in Construction: A Study of Selected Building Projects in Nigeria. *Journal of Building Performance*, 1(1), 1-20.

Oyewobi, L., Okel, A., Ganiyu, B., Shittul, A., Isa, R. and Nwokobia, L., 2011. The effect of project types on the occurrence of rework in an expanding economy. *Journal of Civil Engineering and Construction Technology*, 2 (6), 119-124.

Pal. R., Wang, P. and Liang, X., 2017. The critical factors in managing relationships in international engineering, procurement and construction (IEPC) projects of Chinese organizations. *International Journal of Project Management*, 35(7), 1225-1237.

Palaneeswaran, E., 2006. Reducing Rework to enhance project performance levels, *Proceedings of the one day seminar on recent developments in project management in Hong Kong*. Centre for Infrastructure and Construction Industry Development, Hong Kong, 5.1 – 5.10.

Palaneeswaran, E., Ramanathan M. and Tam C., 2007. Rework in Projects: Learning from Errors, *Surveying and Built Environment*, 18(2), 47-58.

Park, S. and Rainey, H., 2012. Work motivation and social communication among public managers. *International Journal of Human Resource Management*, 23(13), 2630-2660.

Parker, S., Bindi, U. and Strauss, K., 2010. Making Things Happen: *A Model of Proactive Motivation, Journal of Management*, 36(4), 827-856.

Parkin, A., Tutesigensi, A. and Buyukalp, A., 2009. Motivation among construction workers in Turkey. *Proceedings of the 25th Annual ARCOM Conference.* Nottingham, UK, 105-114.

Pathack, S., 2005. 'Management Style: Impact on subordinates' Job Satisfaction. *Leadership Quarterly*, 11(2).

Patton, M., 1990. *Qualitative evaluation and research methods,* (p. 169-186). Beverly Hills, CA: Sage.

Patton, M., 2002. *Qualitative evaluation and research methods*. Thousand Oaks, CA: Sage Publications, Inc.

Peckiene, A., Komarovska, A. and Ustinovicius, L., 2013. Overview of Risk Allocation between Construction Parties. *11th International Conference on Modern Building Materials, Structures and Techniques, MBMST, Procedia Engineering*, 57, 889-894.

Peklar, J. and Bostjancic, E., 2012. Motivation and life satisfaction of employees in the public and private sectors. Uprava, 10(3), 57-74. Retrieved from: http://search.proquest.com/docview/1291089822?accountid=14407 [Accessed 15 May 2018].

Pennanen, A. and Koskela, L., 2005. Necessary and Unnecessary Complexity in Construction. *First International Conference on Complexity, Science and the Built Environment*, 11-14 September 2005 in Conjunction with Center for Complexity and Research, University of Liverpool, UK.

Perakyla, A., 1997. *Reliability and validity in research in research based on tapes and transcripts*. *Theory, method and practice* (2nd edition, p. 283-304). London: Sage.

Peteraf, M., 1993. The Cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal*, 14(3), 179-191.

Pheng, L. and Wee, D., 2001. Improving maintenance and reducing building defects through ISO 9000. *Journal of Quality in Maintenance Engineering*, 7(1), 6–24.

Pich, M., Loch, C., and Meyer, A., 2002. On uncertainty, ambiguity, and complexity in project management. *Management Science*, 48(8), 1008-1023.

Pink, D., 2009. *Driver, New York*: Riverhead Books.

Polat, G. and Damci, A., 2014. Subcontracting Practices in International Construction Projects: Evidence from Turkish Contractors. *Creative Construction Conference*, 328-333.

Pole, C. and Lampard, R., 2002. *Practical social investigation: Qualitative and quantitative methods in social research*. London: Pearson Education Limited.

Popescu, A., Borca, C., Fistis, G. and Draghici, A., 2014. Cultural diversity and differences in cross-cultural project teams. *Procedia Technology*, 16, 525-531.

Porteous, W., 1992. Classifying building failure by cause. *Building Research and Information*, 20(6), 350-6.

Prajogo, D. and McDermott, C., 2005. The relationship between total quality management practices and organizational culture. *International Journal of Operation and Production Management*, 25(11), 1101-1122.

Price, A. (1992). Construction operatives' motivation and productivity. *Building Research and Information*, 20(3), 185–189.

Project Management Institute (PMI), 2013. *Project Management Body of Knowledge (PMBOK)*. 5th edition. Newton Square, Pennsylvania, USA: Project Management Institute (PMI), Inc.

Promberger, M, and Marteau, T., 2013. When Do Financial Incentives Reduce Intrinsic Motivation? Comparing Behaviours Studies in Psychological and Economic Literatures. *Health Psychology*, 32(9), 950-957.

Psomas, E., Vouzas, F., and Kafetzopoulos, D., 2014. Quality management benefits through the "soft" and "hard" aspect of TQM in food companies. *The TQM Journal*, 26(5), 431-444.

Punch, K., 2005. *Introduction to social research.* 2nd edition. London: Sage.

Punch, K., 2013. *Introduction to Social Research: Quantitative and Qualitative Approaches*. SAGE Publications.

Quang, T., 2002. Conflict Management in Joint Ventures. *Transitions*, 38 (122).

Rahmandad, H. and Hu, K. 2010. Modeling the Rework Cycle: Capturing Multiple Defects per Task. *System Dynamics Review*, 26(4), 291-315.

Raiden, A. and Andrew, R., 2006. Human Resource Development in Construction Organizations: An example of a "chaordic" learning organization? *The Learning Organisation*, 13 (1), 63-79.

Ramabhadran, M., 2018. An Investigation into Cost Overrun in Construction Projects in United Arab Emirates. *International Journal of Construction Engineering and Management*, 7(1), 1-21.

Ramanathan, C., Narayanan, S. and Idrus, A., 2012. Construction delays causing risks on time and cost – A critical review. *Australasian Journal of Construction Economics and Building*, 12, 37-57.

Randall, T., Terwiesch, C. and Ulrich, K., 2007. User Design of Customized Products. *Marketing Science*, 268-280.

Raoufi, M. and Fayek, A., 2015. Identifying Factors Affecting Motivation of Construction Crew Workers. *5th International Construction Specialty Conference of the Canadian Society for Civil Engineering (ICSC)*, 011- 10.

Ratellee, C., Guay, F., Vallerand, R., Larose, S. and Senecal, C., 2007. Autonomous, Constrolled, and Amotivated Types of Academic Motivation: A Person-Oriented Analysis. *Journal of Educational Psychology*, 99(4), 734-746.

Reason, J., 1990. *Human Error*. Cambridge University Press, Cambridge, MA.

Reason, J., 2002. Combating omission errors through task analysis and good reminder. *Journal of Quality and Safety in Health Care*, 11(1), 40-44.

Reason, J., 2008. *The Human Contribution: Unsafe Acts, Accidents, and Heroic Recoveries*. Ashgate Publishing, Farnham, UK.

Reis, H., Sheldon, K., Gable, S. and Roscoe, J., 2000. Daily Well-Being: The Role of Autonomy, Competence, and Relatedness. *Personality and Social Psychology Bulletin*, 26(4), 419-435.

Remington, K., Zolin, R. and Turner, R., 2009. A model of project complexity: distinguishing dimensions of complexity from severity. *Proceedings of the 9th International Research Network of Project Management Conference*, Berlin, IRNOP.

Ren, Z., Atout, M. and Jones, J., 2008. Root causes of construction project delays in Dubai. Association of Researchers in Construction Management, ARCOM 2008 – *Proceedings of the 24th Annual Conference*, 749-757.

Renault, B. and Agumba, J., 2016. The Issue of Communication in the Construction Industry: A case of South Africa, 21st Century Human Habitat: Issues. *Sustainability and Development*, 1729 – 1738.

Revees, T. and Hedberg, J., 2003. *Interactive learning system evaluation*. Englewood Cliffs, New Jersey: Educational Technology Publications.

Rhodes, C., 2015. Construction industry: statistics and policy, Briefing, 01432.

Richardson, D., 1996. *Insuring to Value*. Los Angeles, CA: Marshall and Swift.

Richardson, G. and Pugh, A., 1981. *Introduction to System Dynamics Modeling with DYNAMO*. Cambridge MA, Productivity Press.

Riketta, M. and Van Dick, R., 2005. Foci of attachment in organizations: A meta-analysis comparison of the strength and correlates of work-group versus organizational commitment and identification. *Journal of Vocational behaviour*, 67, 490-510.

Ritchie, J. and Lewis, J., 2003. *Qualitative Research Practice – A Guide for Social Science Studies and Researchers*. London, Thousand Oaks, CA: Sage Publications Ltd.

Robbins, S., Judge, T. and Campell, T., 2010. *Organizational Behaviour*. Pearson Education, Essex, UK.

Robinson-Fayek, A., Dissanayake, M. and Campero, O., 2004. Developing a standard methodology for measuring and classifying construction field rework. *Construction Journal Civil Engineering*, 31(6), 1077-1089.

Robson, C., 2002. Real World Research: *A Resource for Social Scientists and Practitioner-Researchers*. Oxford: Blackwell.

Rogge, D., Cogliser, C., Alaman, H. and McCormack, S., 2001. An Investigation into Field Rework in Industrial Construction. Report No. RR153-11, *Construction Industry Institute*, Austin, Texas.

Rosen, C., Ferris, D., Brown, D., Chen, Y. and Yan, M., 2014. Perceptions of Organizational Politics: A Need Satisfaction Paradigm. *Organization Science*, 25(4), 1026-1055.

Rumane, A., 2011. *Quality Management in Construction Projects*. Taylor and Francis Group.

Ruthankoon, R. and Ogunlana, S., 2003. Testing Herzberg's two-factor theory in the Thai construction industry. *Engineering, Construction and Architectural Management*, 10(5), 333-341.

Ruuska, I., Aaltonen, K. and Lehtonen, P. 2009. Dimensions of distance in a project network: Exploring Olkiluoto 3 nuclear power plant project. *International Journal of project Management*, 27, 142-153.

Ryan, E. and Connell, J., 1989. Perceived locus of causality and internalization: Examining reasons for acting in two domains. *Journal of personality and Social Psychology*, 57, 749-761.

Ryan, R. and Deci, E., 2000a. Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being. *American Psychological Association*, 55(1), 68-78.

Ryan, R. and Deci, E., 2000b. Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology*, 25, 54-67.

Ryan, R. and Deci, E., 2017. *Self-Determination theory: Basic Psychological needs in Motivation, development, and wellness*. Gullford Press.

Ryan, R. and La Guardia, J., (in press). What is being optimized over development? A self-determination perspective on basic psychological needs across the life span, *Dialogues on psychology and aging*. Washington, DC: American Psychological Association.

Ryan, R., 2009. Self-determination Theory and Wellbeing, Wellbeing in Developing Countries.

Ryan, R., Deci, E., Grolnick, W. and La Guardia, J., 2006. Autonomy, relatedness, and the self: Their relation to development and psychopathology: vol. 1. *Theory and methods*, 618-655, New York: Wiley.

Safa, M., Shahi, A., Haas, C., and Hipel, K., 2017. Construction contract management using value packaging systems. *International Journal of Construction Management*, 17(1), 50-64.

Safapour, E. and Kermanshachi, S., 2019. Investigation and Analaysis of Human, Organizational, and Project Based Rework Indicators in Construction Projects. *ASCE International Conference on Computing in Civil Engineering*, Atlanta, USA, 17-19.

Said, M., 2009. *Improved schedule analysis considering rework impact and optimum delay Mitigationl*. Thesis (Master). Presented to the University of Waterloo in fulfillment of the thesis requirement for the degree of Master of Applied Science in Civil Engineering Waterloo, Ontario, Canada.

Saldana, J., 2011. Fundamentals Qualitative Research, Understanding Qualitative Research. New York, USA: Oxford University Press.

Sambasivan, M., Deepak, T., Salim, A. and Ponniah, V., 2017. Analysis of delays in Tanzanian construction industry: Transaction cost economics (TCE) and structural equation modeling (SEM) approach. *Engineering, Construction and Architectural Management*, 24(2), 308-325.

Sampaio, P., Saraiva, P. and Monteiro, A., 2012. ISO 9001 certification pay-off: myth versus reality. *International Journal of Quality and Reliability Management*, 29(8), 891-914.

San Critobal, J., Carral, L., Diaz, E., Fraguela, J. and Iglesias, G., 2018. Complexity and Project Management: A General Overview. *Hindawi Complexity*, 1-10.

Sargut, G. and McGrath, R., 2011. Learning to live with complexity. *Harvard business review*, 89(9), 68-76.

Saunders, M., Lewis, P. and Thornhill, A., 2007. *Research Methods for Business Students.* 6th edition. London: Pearson Hall.

Saunders, M., Lewis, P. and Thornhill, A., 2009. *Research Methods for Business Students*. 5th edition. London: Prentice Hall.

Saunders, M., Lewis, P. and Thornhill, A., 2012. *Research Methods for Business Students*. London: Prentice Hall.

Schilling, D., 2015. Global Construction Expected to Increase by $4.7 Trillion by 2020. *Industry Tap*, Available at: http://www.industrytap.com/global-construction-expected-to-increase-by-4-8-trillion-by-2020/1483 [Accessed 20 February 2019].

Schutt, R., 2006. *Investigating the Social World: The Process and Practice of Research*. Thousand Oaks, CA: Pine Oaks Press.

Seale, C., 1999. The quality of qualitative research, London: Sage.

Seale, C., 2000. Using Computers to Analyse Qualitative Data. In: Silverman, D. (Ed.), Doing Qualitative Research. Sage Publications, London.

Senge, P., 2006. *The fifth discipline: The art and practice of the learning organization*. Random House LLC.

Serrador, P. and Turner, R., 2015. The Relationship between Project Success and Project Efficiency. *Project Management Journal*, 46(1), 30-39.

Shadish, W., 1995. Philosophy of Science and the Quantitative-Qualitative Debates. *Evaluation and Program Planning*, 18 (1), 63-75.

Shanmugapriya, and Subramanian, K., 2013. Investigation of Significant Factors Affecting Time and Cost Overrun in Indian Construction Projects. *International Journal of Emerging Technology and Advanced Engineering*, 3(10), 734-740.

Sheard, S. and Adviser-Mostashari, A., 2012. *Assessing the impact of complexity attributes on system development project outcomes*. Stevens Institute of Technology.

Sheldon, K., Turban, K., Brown, K., Barrick, M. and Judge, T., 2003. Applying self-determination theory to organizational research. *Research in Personnel and Human Resources Management*, 22, 357-393.

Shenton, A., 2004. Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, 22, 63-75.

Shepherd, D. and Sudday, R., 2017. Theory Building: A Review and Integration. *Journal of Management*, 43(1), 59-86.

Shibani, A., Ganjian, E. and Soetanto, R., 2010. Implementation of Total Quality Management in the Libyan Construction Industry. *International Journal of Project Organization and Management*, 2(4), 382-403.

Shinde, S. and Kulkarni, P., 2016. Impact of Supervision on Rework in Construction Industry. *International Journal on Recent and Innovation Trends in Computing and Communication*, 4(1), 268-270.

Shrestha, P., O'Connor, J. and Gibson, G., 2012. Performance comparison of large design-build and design-bid-build highway projects. *Journal of Construction Engineering and Management*, 138(1), 1-13.

Silverman, D., 2000. *Doing qualitative research: A practical handbook*. Thousand Oaks, CA: Sage.

Simpeh, E., 2012. *An Analysis of the causes and impact of rework in construction projects*. Thesis (Master). A dissertation presented to the Higher Degrees Committee of the Cape, Peninsula University of Technology in fulfillment of the requirements for the degree of Master of Technology: Construction Management, Bellville.

Skitmore, M., Tone, K. and Tran, D., 2004. The Impact of Culture on Project Communications: Two Case Studies from South East Asia. In Ogunlana, S. and Charoenngam, C. and Herabat, P. and Hadikusumo, B.H.W., Eds. Proceedings International Symposium CIB 2004: Globalization and Construction, Bangkok, Thailand.

Smallwood, J. and Rwelamila, P., 1996. The need for the implementation of quality management systems in South African construction. Proceedings of the 1996 CIB W89 Beijing *International Conference - Construction Modernizaton and Education*, Beijing, China.

Smith, M., 2003. Changing an organization's culture: correlates of success and failure. *Leadership and Organization Development Journal*, 24, 249-261.

Smith, J., Love, P. and Li, H. 1998. Benchmarking the Costs of Poor Quality in Construction: A Case Study. In M Terzziovski (ed.), *Proceedings of the Second International and Fifth National Research Conference on Quality Management.* Monash University, Melbourne, pp. 112-124.
Smith, P. and Ragan, T., 2005 *Instructional design* .3rd edition. USA: John Wiley & Sons.

Smithers, G. and Walker, D., 2000. The effect of the workplace on motivation and demotivation of construction professionals. *Construction Management and Economics*, 18(7), 833– 841.

Smithers, G., 2000. The effect of the site environment on motivation and demotivation of construction professionals. *16th Annual ARCOM Conference of ARCOM*, Glasgow, UK.

Soenens, B., Vansteenkiste, M., Lens, W., Luyckx, K., Goossens, L., Beyers, W. and Ryan, R., 2007. Conceptualizing parental autonomy support: Adolescent perceptions of promotion of independence versus promotion of volitional functioning. *Developmental Psychology*, 43, 633-646.

Sommerville, J., 1994. Multivariate barriers to total quality management within the construction industry. *Total Quality Management*, 5(5), 289–298.

Sommerville, J., 2007. Defects and rework in new build: an analysis of the phenomenon and drivers. *Structural Survey*, 25(5), 391-407.

Sommerville, J., Craig, N. and Bowden, S., 2004. The Standardisation of Construction Snagging. *Structural Survey*, 22(5), 251-258.

Sonmez, S., Apostolopoulos, Y, Tran, D. and Rentrope, S., 2011. Human Rights and Health Disparities for Migrant Workers in the UAE/ *Journal of Health and Human Rights*, 13(2), 1-19.

Sonnentag, S. and Frese, M., 2002. Performance concepts and performance theory. *Psychological management of individual performance*, 23(1), 3-25.

Sovacool, B. and Cooper, C., 2013. *The governance of energy megaprojects: politics, hubris and energy security*. Edward Elgar Publishing.

Spreitzer, G., 1995. Psychological empowerment in the workplace: dimensions, measurement, and validation. *Academy of Management Journal*, 38(5), 1442-65.

Stahl, G., Maznevski, M., Voigt, A. and Jonsen, K., 2010. Unraveling the effects of cultural diversity in teams: A meta-analysis of research on multicultural work groups. *Journal of International Business studies*, 41(4), 690-709.

Stainback, S. and Stainback, W., 1988. *Understanding and conducting qualitative research*. Dubuque, IA: Kendall/Hunt.

Stake, R., 2005. Qualitative case studies. In N. K. Denzin & Y. S. Lincoln (Eds.), The Sage handbook of qualitative research (3rd edition, p. 443-466). Thousand Oaks, CA: Sage.

Stasiowski, F. and Burstein, D., 1994. *Total Quality Project Management for the Design Firm*. John Wiley & Sons, New York, NY.

Sterman, J., 2000. *Business Dynamics: systems thinking and dynamics for a complex world*. Irwin McGraw-Hill, Boston.

Steyn, H., 2009. Why are capital projects often late and over-spent? Putting the puzzle together. *Innovate*, 3.

Stumpf, G., 2000. Schedule delay analysis. *Journal of Cost Engineering*, 42 (7), 32-43.

Succar, B., Sher, W. and Williams, A., 2012. Measuring BIM performance: Five metrics. *Architectural Engineering and Design Management*, 8(2), 120-142.

Sunjka, B. and Jacob, U., 2013. Significant causes and effects of project delays in the Niger delta region Nigeria. *SAIIE25 Proceedings: Stellenbosch South Africa*, SAIIE.

Sweis, R., 2009. Some Construction Quality Human-Related Factors in the Jordanian Housing Sector. *Architectural Science Review*, 52(1), 48-53.

Sweis, R., Shanak, R. and Elsamen, A., 2014. Factors affecting quality in the Jordanian housing sector. *International Journal of Housing Markets and Analysis*, 7 (2), 175-188.

Sypsomos, M., 1997. Based project controls - the quality improvement approach. *AACE International Transactions*, 01, 01-07.

Tabassi, A. and Abu Bakar, A., 2009. Training, motivation, and erformance: The case of human resource management in construction projects in Mashhad, Iran. *International Journal of Project Management*, 27, 471-480.

Taggart, M., Koskela, L. and Rooke, J., 2014. The Role of the Supply Chain in the Elimination and Reduction of Construction Rework and Defects: An Action Research Approach. *Construction Management and Economics*, 32(7/8), 829-842.

Talib, F., Rahmn, Z. and Qureshi, M., 2013. An Instrument for Measuring the key Practices of Total Quality Management in ICT Industry: An Empirical Study in India. *Services Business*, 7(2), 275-306.

Taylor W., 2016. Construction and Engineering [online]. UK: Taylor. Available at: https://united-kingdom.taylorwessing.com/documents/get/1226/construction-engineering.pdf [Accessed 14 June 2018].

Taylor, B., 2015. The Hierarchical Model of Motivation: A Lens for viewing the complexities of Motivation. *Performance Improvement*, 54(4), 36-42.

Teddlie, C. and Yu, F., 2007. Mixed methods sampling. A typology with examples. *Journal of Mixed Methods Research*, 1(1), 77-100.

Thomas, D., 2006. A General Inductive Approach for Qualitative Data Analysis. *America Journal of Evaluation*. 27(2), 237-246.

Thomas, J. and Mengel, T., 2008. Preparing Project Managers to Deal with Complexity – Advanced Project Management Education. *International Journal of Project Management*, 26(3), 304-315.

Thomas, H., and Neapolitan, C., 1994. The effects of changes on labour productivity: why and how much?, A Report for the Construction Industry Institute by The Pennsylvania State University, University Park, Pennyslvania, Source Document 94.

Thorpe, B. and Sumner, P., 2004. *Quality Management in Construction*, Hants, England: Gower Publishing, Limited.

Thwala, W. and Monese, L., 2012. Motivators of Construction Workers in the South African Construction Sites: A Case Study. *Journal of Economics and Behavioral Studies*, 4(11), 625-634.

Tijhuris, W. and Fellows, R., 2012. *Culture in international construction*. London: Routledge.

Tilley, P. and McFallan, S., 2000. Design and documentation quality survey comparison of designers' and contractors' perspectives, BCE DOC 00/115, CSIRO Building, *Construction and Engineering*, Melbourne, Australia.

Tobin, G. and Begley, C., 2004. Methodological rigour within a qualitative framework. *Journal of Advanced Nursing*, 48(4), 388-396.

Travers, M., 2001. *Qualitative Research through Case Studies*. London: Sage.

Triandis, H., 1994. *Culture and Social Behaviour*. New York: McGraw-Hill.

Turner, J. and Muller, R., 2003. On the Nature of the Project as a Temporary Organization. *International Journal of Project Management*, 21(1), 1-8.

Turner, J., 2006. Editorial: Towards theory of project management: The nature of the project. *International Journal of Project Management*, 2(24), 1-3.

Tuuli, M. and Rowlinson, S., 2010. Impact of leadership style and team context on psychological empowerment in construction project teams. *Paper presented at the Proceedings of the 26th Annual ARCOM Conference*, Leeds, UK.

Ujene, A., Achuenu, E. and Abakadang, O., 2011. The nature and effects of subcontracting on the performance of building projects in south-south zone of Nigeria. *Journal Architecture, Planning and Construction Management*, 1(2), 13-21.

UK Construction, 2013. An economic analysis of the sector. Retrieved from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/2100 60/bis-13-958-uk-construction-an-economic-analysis-of-sector.pdf [Accessed 9 October 2018].

Ulubeyi, S., Manisali, E. and Kazaz, A., 2010. Subcontractor Selection Practices in International Construction Projects. *Journal of Civil Engineering and Management*, 16(1), 47-56.

Uwakweh, B., 2000. Conceptual framework for motivating construction craftsmen in developing countries. *Proceeding of 2nd International Conference on Construction in Developing Countries*, 15-17 November, Gabarone, Botswana, South Africa.

Vallerand, R. and Reid, G., 1984. On the causal effects of perceived competence on intrinsic motivation: A test of cognitive evaluation theory. *Journal of Sport Psychology*, 6(1), 94-102.

Vallerand, R., 1997. Toward a hierarchical model of intrinsic and extrinsic motivation. *In Advances in experimental social psychology*, 29, 271-360.New York: Academic Press.

Van den Broeck, A, Vansteenkiste, M., De Witte, H., Soenens, B. and Lens, W., 2010. Capturing autonomy, competence, and relatedness at work: Construction and initial validation of the Work-Related Basic Need Satisfactions scale. *Journal of Occupational and Organizational Psychology*, 83(4), 981-1002.

Van den Broeck, A., Ferris, D., Chang, C. and Rosen, C., 2016. A Review of Self-Determination Theory's Basic Psychological Needs at Work. *Journal of Management*, 20(1), 1-35.

Van Den Broeck, A., Vansteenkiste, M., De Witte, H. and Lens, W., 2008. Explaining the relationships between job characteristics, burnout, and engagement: The role of basic psychological need satisfaction. *Work Stress*, 22(3), 277-294.

Van Wart, M., Cayer, N. and Cork, S., 1993. *Handbook of Training and Development for the Public Sector*. Jossey-Bass, San Francisco, USA.

Vansteenkiste, M. and Kaplan, A., 2009. Identified Versus Introjected Approach and Introjected Avoidance Motivations in School and in Sports: The Limited Benefits of Self-Worth Strivings. *Journal of Educational Psychology*, 101(2), 482-497.

Vansteenkiste, M., Simons, J., Lens, W., Soenes, B. and Matos, L., 2005. Examining the motivational impact of intrinsic versus extrinsic goal framing and autonomy-supportive versus internally controlling communication style on early adolescents' academic achievement. *Child Development*, 76(2), 483-501.

Vennix, J., 1996. *Group Model Building: Facilitating Team Learning Using System Dynamics*. Wiley, Chichester.

Ventures Onsite, 2019. Dubai International Convention and Exhibition Centre: GCC Construction Market, Intersec, ventures onsite project intelligence platform. From: www.venturesonsite.com [Accessed 10 March 2018].

Vidal, L. and Marle, F., (2008). Understanding project complexity: Implications on project management. *Kybernetes*, 37(8), 1094-1110.

Visser, C., 2010. Self-Determination Theory Meets Solution-Focused Change: Autonomy, Competence and Relatedness Support in Action, InterAction. *The Journal of Solution Focus in Organizations*, 2(1), 7-26.

Vohra, V., 2014. Using the multiple case study design to decipher contextual leadership behaviours in Indian organizations. *Electronic Journal of Business Research Methods*, 12(1), 54-65.

Vroom, V., 1964. Work and Motivation. Oxford, UK: Wiley.

Walker, D., 1995. An Investigation into Construction Time Performance. *Construction Management and Economics*, 13(3), 263-274.

Wallace, C., Kass, J., and Stanny, J., 2002. The cognitive failures questionnaire revisited. Dimensions and correlates, *Journal of General Psychology*. 129(3), 238-256.

Ward, S., and Chapman, C., 2003. Transforming project risk management into project uncertainty management. *International Journal of Project Management*, 21(2), 97-105.

Wasfy, M., 2010. *Severity and impact of rework, A case study of a residential commercial tower project in the eastern province-KSA*. Thesis (Master). King Fahd University of petroleum and minerals, Dhahran, Saudi Arabia.

Watt, D., 1999. Building Pathology: *Principles and Practice*. Oxford, UK: Blackwell Science.

Whaley, A., 2015. Accelerating construction works: pitfalls and perils in reducing delay. *Construction Law Journal*, 476.

Wickramasekara, P., 2015. Bilateral agreements and memoranda of understanding on migration of low skilled workers: *a review*. Geneva: International Labour Organization.

Wilderom, C., Glunk, U. and Maslowski, R., 2000. Organizational culture as a predictor of organizational performance. In N.M. Ashkanasy, C.P.M. Wilderom, & M. Peterson (Eds.), Handbook of organizational culture and climate, 193-209. Thousand Oaks, CA.

Wilke, H., 2000. *Systemtheorie I: Grundlagen*, Lucius and Lucius. Stuttgart.

Wilkins, S., 2001. International briefing 9: Training and Development in the United Arab Emirates. *International Journal of Training and Development*, 5(2), 153-165.

Williams, B. and Hummelbrunner, R., 2010. *Systems Concepts in Action: A Practitioner's Toolkit*. Stanford, CA: Stanford University Press.

Williams, T., 2002. *Modelling complex projects*. Chichester: John Wiley and Sons.

Willis, T. and Wills, W., 1996. A Quality Performance Measurement System for Industrial Construction Engineering Projects. *International Journal of Quality and Reliability Management*, 13(9), 38-48.

Wolstenholme, E. and Coyle, R., 1983. The development of system dynamics as a methodology for system description and qualitative analysis. *Journal of the Operational Research Society*, 34, 569-581.

Wolstenholme, E., 1999. Qualitative vs. quantitative modeling: the evolving balance. *Journal of the Operational Research Society*, 50(4), 422-428.

Wong, A. and Fung, P., 1999. Total quality management in the construction industry in Hong Kong: A supply chain management perspective. *Total Quality Management*, 10(2), 199-208.

Wong, C., 2007. ICT implementation and evolution: case studies of Intranets and extranets in UK construction enterprises. *Construction Innovation*, 7(3), 254-273.

Woo, C. and Soetanto, R., 2010. Motivating Factors In UK Construction Projects. *Third International World of Construction Project Management Conference*, Coventry University, 20-22 October 2010, 292-300.

Wood, H. and Gidado, K., 2008. An overview of complexity theory and its application to the construction industry. *24th Annual ARCOM Conference, Association of Researchers in Construction Management.*, 1-3 September 2008, Cardiff, UK, 677-686.

Yap, J., Low, P. and Wang, C., 2017. Rework in Malaysian Building Construction: Impacts, causes and Potential Solutions. *Journal of Engineering, Design and Technology*, 15(5), 591-618.

Ye, G., Jin, Z., Xia, B. and Skitmore, M., 2015. Analyzing causes for reworks in construction projects in China. *Journal of Management in Engineering*, 31(6), 04014097.

Yin, R., 2003a. *Case Study Research: Design and Methods*. 3rd edition. Thosuand Oaks, CA: Sage.

Yin, R., 2003b. *Application of Case Study Research, Second Edition, Applied Social Research Methods Series*. vol. 34, Sage Publications, Inc., California.

Yin, R., 2009. *Case Study Research: Design and Methods*. 4th edition. Thousand Oaks, CA: Sage.

Yin, R., 2014. *Case study research design and methods*. Washington, DC: Sage.

Yisa, S., Holt, G. and Zakeri, M., 2000. Factors affecting management motivation in the Iranian construction industry: a Survey of site managers. *16th Annual ARCOM Conference of ARCOM*, September 2000, Glasgow Caledonian University, Scotland, UK, 6, 465-472.

Yoke-Lian, L., Hassim, S., Muniandy, R. and Teik-Hua, L., 2012. Review of Subcontracting Practice in Construction Industry. *IACSIT International Journal of Engineering and Technology*, 4(4), 442-445.

Youha, Froilan, T., Malit, Jr. and Ali, Al., 2013. Labor Migration in the United Arab Emirates: Challenges and Responses. Available at: Migrationpolicy.org [Accessed 18 January 2019].

Young, D., Haas, C., Goodrum, P. and Caldas, C., 2011. Improving construction supply network visibility by using automated materials locating and tracking technology. *Journal of Construction Engineering and Management*, 137(11), 976-984.

Yusof, N., and Iranmanesh, M., 2017. The impacts of environmental practice characteristics on its implementation in construction project. *Procedia Environmental Sciences*, 37, 549-555.

Yusof, N., Zainul Abidin, N., Zailani, S., Govindan, K., and Iranmanesh, M., 2016. Linking the environmental practice of construction firms and the environmental behaviour of practitioners in construction projects. *Journal of Cleaner Production*, 121, 64-71.

Yusof, S. and Aspinwall, E., 2000. TQM implementation issues: Review and case study. *International Journal of Operations and Production Management*, 20(6), 634-655.

Zehir, C., Ertosun, O., Zehir, S. and Muceidili, 2012. Total Quality Management Practices Effects on Quality Performance and Innovative Performance. *Procedia – Social and Behavioural Sciences*, 41, 273-280.

Zhang, D., 2009. *Analysis of a construction small-projects rework reduction program for a capital facility*. Thesis (Master). A thesis presented to the university of Waterloo in fulfillment of the thesis requirement for the degree of Master of Applied Science in Civil Engineering, Waterloo, Ontario, Canada.

Zhang, D., Haas, C., Goodrum, P., Caldas, C. and Granger, R., 2012. Construction Small Projects Rework Reduction for Capital Facilities. *Journal of Construction Engineering and Management*, 138(2), 1377.

Zhang, S. and Liang, X., 2008. Culture Studies in International Construction Contracting: An Overview, *International Conference on Multi-National Construction Projects*, Shanghai, China.

Appendixes

Appendix I: Interview Protocol

Interview Protocol

1) Would you please tell me about the nature of your job and how long you have been working?

   Probe: How do you feel doing the work in this company?

   [Is it in line with what you really wanted to do]? (Can you give example)?

2) Why would you like to work in this company?

   Probe: How does this impact on the job you perform?

   [Does anyone care about you with respect to the work you do]?

3) What has been the challenging part of your job?

   Probe: To what extent can these factors decrease the quality of the work?

   [Do you feel competent to face this challenge]?

4) Could you explain the implications of quality management (QM) and adopted method of reducing rework on your job?

   Probe: What do they mean to the success of the project?

   [Are you good at what you do]? (Why would you think you felt that way)?

5) Could you please describe the impact of your company's method of working on the nature of your job?

   Probe: How do you use this method on your job?

   [Do you feel forced to do things you do not want to do]? (Could you give example)?

6) How do you manage when you're working extended period on the job?

   Probe: How does this affect the way you do your work?

   [In this case, do you feel part of a group]?

7) Can you give any possible ways to improve the quality of your work?

   Probe: How can this suggestion influence your work or that of others? (Could you work with other people to achieve this suggestion)?

8) Would you please tell me about the things that could affect your job activities?

   Probe: Are you able to execute the job properly? Could you give example of tasks done successfully in the last two weeks? (What assisted you to achieve this task)?

9) How are decisions made when you encounter problems on the job?

Probe: If you could choose, would you do things at work differently? Why? (Could you please give example)?

10) How has been the impact of the company's method of development on the job you do during your years in service?

Probe: With this approach do you feel you can accomplish the most difficult task at work? (Could you give example)?

11) Please describe the nature of support received from your team work and supervisor? How satisfied were you?

Probe: Do you really mix with other people at work to get task done? (How do you feel)?

12) Does the weather impacts on your job?

Probe: If it does, how do you perform your duties? [Do you feel free to do your job the way you think it could best be done]?

Developed discussions around the following local attributes considered for this study.

a) Work Environment – An environment where construction activities takes place and employees are made to perform tasks and work to achieve a specific building requirement.
b) Culture – The kind of belief held within a working environment in relation to how things are perceived and carried out.
c) Management Style – The approach to get things done by their superior e.g. foremen, site manager etc.

Appendix II: An Example of NCR's Categorisations

Case III: Analysis of NCRs by Construction Activities Categories

No.	Activities	NCR	NCR Frequency
1	Excavation and foundation	NCR-0001 , NCR-0007 , NCR-0008 ,FCR-0009 , NCR-0014 , NCR-0015 , NCR-0016 , NCR-0017 , NCR-0019 , NCR-0020, NCR-0022 , NCR-0027 , NCR-0028 , NCR-0029 , NCR-0038 , NCR-0041 , NCR-0042 , NCR-045 , NCR-0048 , NCR-0051 , NCR-0071, ncr-0089 , NCR-0093 , NCR-0107 , NCR-0123 , NCR-0127 , NCR-0135 , NCR-0138 , NCR-0139 , NCR-0140 , NCR-0141, NCR-0145 , NCR-0151 , NCR-0152 , NCR-0153 , NCR-0154 , NCR-0155 , NCR-0156 , NCR-0157 ,NCR-0172 , NCR-0180 , NCR-0240 , NCR-0253 , NCR-0281, NCR-0285 , NCR-0301 , NCR-0315 , NCR-0339 ,NCR-0463 , NCR-484	49
2	Concrete work	NCR-0010 , NCR-0011 , NCR-0013 , NCR-0018 , NCR-0021 , NCR-0024 , NCR-0025 , NCR-0026 , NCR-0032 , NCR-0036 , NCR-0037 , NCR-0040 , NCR-0043 , NCR-044 , NCR-0047 , NCR-0049 , NCR-0052 , NCR-0054 , NCR-0055 , NCR-0056 , NCR-0057 , NCR-0058 , NCR-0059 , NCR-0061 , NCR-0063 , NCR-0064 , NCR-0065 , NCR-0066 , NCR-0067 , NCR-0069 , NCR-0070 , NCR-0072 , NCR-0073 , NCR-0076 , NCR-0077 , NCR-0078 , NCR-0079 , NCR-0080 , NCR-0081 , NCR-0082 , NCR-0083 , NCR-0084, NCR-0085 , NCR-0086 , NCR-0087 , NCR-0088 ,NCR-0090 , NCR-0091 , NCR-0092 , NCR-0094 , NCR-0095 , NCR-0096 , NCR-0097 , NCR-0098 , NCR-0099 , NCR-0100 , NCR-0102 , NCR-0104 , NCR-0105 , NCR-106 , NCR-0108 , NCR-0109 , NCR-0110 , NCR-011 , NCR-0112 NCR-0113 , NCR-0114 , NCR-0115 , NCR-0116 , NCR-0117 , NCR-0118 , NCR-0119 , NCR-0120 , NCR-0121 , NCR-0126 , NCR-0128 , NCR-0129 , NCR-0130 , NCR-0131 , NCR-0132 , NCR-0133 , NCR-0134 ,NCR-0316 , NCR-0137 , NCR-0142 , NCR-0143 , NCR-0144 , NCR-0146 , NCR-0147 , NCR-0148 , NCR-0149 ,NCR-0158 ,CR-0159 , NCR-0160 ,NCR-0161 , NCR-0162 , NCR-0163 , NCR-0164 , NCR-0165 ,NCR-0166 , NCR-0167 , NCR-0168 , NCR-0169 , NCR-0170 , NCR-0171 , NCR-0173 , NCR-0174 , NCR-0175 , NCR-0176 , NCR-0177 , NCR-0178 , NCR-0179 , NCR-0181 , NCR-0182 , NCR-0183 , NCR-0184 , NCR-0185 , NCR-0186 , NCR-0187 , , NCR-0188 , NCR0189 , NCR-0190 , NCR-0191 , NCR-0194 , NCR-0195 , NCR-0196 , NCR-0197 , NCR-0198 , NCR-0199 , NCR-0200 , NCR-0201 , NCR-0203 , NCR-0204 , NCR-0205 , NCR-0206 , NCR-0207 , NCR-0208 , NCR-0209 , NCR-02010 , NCR-02011 , NCR-02012 , NCR-02013 , NCR-02015 ,NCR-02016 , NCR-02017 , NCR-02018 , 02019 , NCR-0220 , NCR-0221 , NCR-0222 , NCR-0223 , NCR-0224 , NCR-0225 , NCR-0226 , NCR-0227 , NCR-0228 , NCR-0229 , NCR-0230 , NCR-0231 , NCR-0235 , NCR-0236 , NCR-0238 , NCR-0239 , NCR-0240 , NCR-0243 , NCR-0244 , NCR-0245 , NCR-0246 , NCR-0247 , NCR-0248 , NCR-0249 , NCR-0250 , NCR-0251 , NCR-0252 , NCR-0255 , NCR-0257 , NCR-0259 , NCR-0260 , NCR-0261 , NCR-0264 , NCR-0266 , NCR-0267 , NCR-0268 , NCR-0269 , NCR-0270 , NCR-0273 , NCR-0275 , NCR-0276 , NCR-0277 , NCR-0278 , NCR-0280 , NCR-0284 , NCR-0290 , NCR- 0297 ,NCR-0299 , NCR-0304 , NCR-0306 , NCR-0307 , NCR-0311 , NCR-0312 ,	259

		NCR-0313 , NCR-0317 , NCR-0318 , NCR-0322 , NCR-0323 , ncr-0325 , NCR-0332 , NCR-0341 ,NCR-0343 , NCR-0344 , NCR-0346 , NCR-0350 , NCR-0351 , NCR-0356 , NCR-0357 , NCR-0364 , NCR-0382 , NCR-0383 , NCR-0384 , NCR-0393 , NCR-0395 , NCR-0399 , NCR-0402 , NCR-0404 , NCR-0407 , NCR-0410 , NCR-0412 , NCR-0413 , NCR-0414 , NCR-0415 , NCR-0417 , NCR-0418 , NCR-0419 , NCR-0421 , NCR0422 , NCR-0423 , NCR-0424 , NCR-0425 , NCR-0426 , NCR-0427 , NCR-0428 , NCR-0429 , NCR-0431 , NCR-0435 , NCR-0450 , NCR-0450 , NCR-0452 , NCR-0453 , NCR-0454 , NCR-0473 , NCR-0478 , NCR-0489 , NCR-0490 , NCR-0504	
3	Block work	NCR-0005 , NCR-0030 , NCR02014 , NCR-0237 , NCR-0254 , NCR-0474 , NCR-0475	7
4	Plaster work	NCR-0274 , NCR-0302	2
5	plumping work	NCR-0075 , NCR-0388 , NCR-0433 , NCR-0434 , NCR-0512	5
6	Electric work	NCR-298 , NCR-0305 , NCR-0308 , NCR-0309 , NCR-0314 , NCR-0319 , NCR-0320 , NCR-0321 , NCR-0354 , NCR-0387 , NCR-0430 , NCR-0432 , NCR-0469 , NCR-0471 , NCR-0483 , NCR-0491 , NCR-0493 , NCR-0497 , NCR-0499 , NCR-0503 , NCR-0509 , NCR-0510 , NCR-0511, NCR-0513 , NCR0514	25
7	Paint work	NCR-0232, NCR-0271, NCR-0272, NCR-0283, NCR-0286 , NCR-0287 , NCR-0289 , NCR-0440 , NCR-0496 , NCR-0500 , NCR-0508	11
8	Flooring and wall cladding works	NCR-0258 , NCR-0262 , NCR-0263 , NCR-0279 , NCR-0348 , NCR-349 , NCR-0394 , NCR-0398 , NCR-0403 , NCR-0405 , NCR-0406 , NCR-0420 , NCR-0438 , NCR-0441 , NCR-0442 , NCR-443 , NCR-0444 , NCR-0445 ,NCR-0446 , NCR-0447 , NCR-0455 , NCR-0458 , NCR-0476 , NCR-0498 , NCR-0501 , NCR-0505 , NCR-0507	27
9	Air conditioning works	NCR-0345, NCR-0367, NCR-0378NCR-0379, NCR-0380, NCR-0461, NCR-462	7
10	Wooden and metal works	NCR-0340, NCR-0366, NCR-0372, NCR-0373, NCR-0375, NCR-0390, NCR-0392, NCR-0439, NCR-0467, NCR-0468, NCR-0479 , NCR-0482 , NCR-0494 , NCR-0495	14
11	Suspending Ceiling	NCR-0353, NCR-0355	2
11	Roof installation work	NCR-0300, NCR-0335, NCR-0338, ncr-0342, NCR-0411	5
12	Others	NCR-0456, NCR-0459, NCR-0460, NCR-0464, NCR-0465, NCR-0486, NCR-0496	7
13	Not an issue	NCR-0002 , NCR-0006 , NCR-0012 , NCR-0023 , NCR-0031 , NCR-0039 , NCR-0046 , NCR-0050 , NCR-053 , NCR-0062 , NCR-0068 , NCR-0101 , NCR-0122 , NCR-0124 , NCR-0202 , NCR-0242 , NCR-0256 , NCR-0288 , NCR-0294 ,, NCR-0316 , NCR-0352, NCR-0358 , NCR-0361 , NCR-0370 , NCR-0374 , NCR-0374 , NCR-0381 , NCR-0409 , NCR-0436 , NCR-0437 , NCR-0466 , NCR-0472 , NCR-0477	33
	TOTAL		**453**

Appendix III: Participant's Information Sheet

Participant Information Sheet

Study title: Complex Building Construction Projects: Reducing Rework through Facilitation of Craftspeople's Motivation in United Arab Emirates

Researcher's Identity: Mr. Abdelrahim Alzanati

Region: Middle-East

Ethics committee ref.:

Personal Contact Number:

Invitation to participate in a study

I wish to invite you to take part in a study on "Complex Building Construction Projects: Reducing Rework through Facilitation of Craftspeople's Motivation in United Arab Emirates". Whether or not you take part is your choice. However, before taking part it is important to understand the nature of the study and what it involves. Please take time to read the information provided carefully and understand what it is like to take part in the study. This Participant Information Sheet will help you decide if you'd like to take part. If you do want to take part now, but change your mind later, you can pull out of the study at any time without any consequences.

What is the Purpose of the Study?

The focus of the study is to help understand how rework is often created by human behaviour over time in a complex building construction project. In particular, we wish to examine the motivation and factors inducing rework. This is intended to help facilitate human motivation over time in a complex building construction project. The word "complex" is similar in meaning to "difficult". Understanding human motivation with respect to rework is important in reducing the complexity associated with complex building construction projects when reporting project performance. To achieve this concern, an interview will be conducted, and it is expected to last between 45 to 60 minutes.

Why have I been chosen?

You have been identified as an important participant in the study due to your immersed interaction with the concerned parties relevant to the project. Your willingness to provide the study with honest and sincere information will make the study a success. The study is expected to involve participants across management (site manager and quality manager) and construction workers (including craftspeople) within the current project work.

Do I have to take part?

Participation in this study is entirely voluntary and no penalty is attached from objecting. If you wish to participate, you will be given an information sheet to keep, and be asked to sign a consent form. However, if you decide to withdraw at any time, you are free to do so without any consequence. Moreover, you do not have to give a reason for discontinuing participation of the study. In the case of health and social care, deciding to take part or not will not impact upon, or adversely affect your treatment/care or education, or that of others.

What do I have to do? /what will happen to me if I take part?

The interview will be conducted once per participant and you will be required to answer questions with regard to motivation in relation to rework in a complex building construction project. It is expected that you provide clear and understandable answers to the best of your ability. The study interviews outcome will be revealed with other available information, but you are expected to provide information as it is in reality. The researcher is an experienced practitioner, familiar with the nature of a building construction environment.

What are the possible disadvantages and risks of taking part?

You should be aware that the study is related to motivation. Participants may be shy to provide information about what causes them to make mistakes on job functions, or to provide information as to things they have noticed at work, for fear of retribution. You are assured that information provided in relation to the study will be entirely anonymous and the outcome will be solely used for ways to promote a better situation. You need to be at ease to achieve the focus of the study.

What are the possible benefits of taking part?

There is no immediate benefits attached, but it is believed that this study being the first in-depth regional research on motivation will produce insightful, rational output and key findings to share in building construction seminars/events. This will create awareness on ways to address rework and improve project performance.

Will my taking part in this project be kept confidential? / What will happen to the results of the research project?

You are assured that confidentiality of information within this study. Care and caution are put in place to ensure that your personal information or identity are not shown in any reports or publications. While the results of this research may be published in peer-reviewed journals and presented at conferences, no participant's identity will be revealed. PhD research projects are research-driven focusing on practical solutions for the betterment of understanding and harnessing good practices.

What type of information will be sought from me and why is the collection of this information relevant for achieving the research project's objectives?

You are expected to provide information on matters that personally motivate you at work, or reduce your energy to do a given task or function. You are expected to report under what circumstances those things happen, what promotes them, what can inhibit their occurrence, and ways you feel a better result can be achieved.

Who is organising/funding the research?

Participants will not incur any expenses as a result of participating in the study. The interview will be conducted at the project site at an agreed time.

Will I be recorded, and how will the recorded media be used?

The audio recordings of the interview will be strictly for the purpose of analysis. Third party will not be granted access, except in case to satisfy verification. After completion of the study, the audio recordings will be properly destroyed.

In case of any concerns or complaints, the research supervisors can be contacted:

Name: Dr. Tania Humphries-Smith

Position: PhD Research Supervisor

Email: thumphries@bournemouth.ac.uk

Name: Dr. Clive Hunt

Position: PhD Research Supervisor

Email: CHunt@bournemouth.ac.uk

Note

Copy of consent form and participant sheet will be signed if you agree to take part.

Thank you for your support and contribution.

Appendix IV: Participant's Consent Form

Participant Consent Form

Consent Form

Project Title: Complex Building Construction Projects: Reducing Rework through Facilitation of Craftspeople's Motivation in United Arab Emirates

Identification Code:

Name of the Researcher: Abdelrahim Alzanati

	Please Mark as Appropriate
I confirm that I have read and understood the information sheet provided for the above study. I have had an opportunity to consider the information, ask questions, and have had these answered satisfactorily.	YES NO
I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reasons.	YES NO
I understand that any information given by me may be used in future reports, articles or presentations by the principal investigator.	YES NO
I understand that any data gathered during the research will be stored according to the regulations laid in the Data Protection Act 1998.	YES NO
I understand that in order to protect my identity, the principal investigator will ensure confidentiality of personal data.	YES NO
I give consent to record audio of the interview and to use this data solely for the research project.	YES NO
I agree no immediate benefit is expected from the conduct of the study, and that the outcome of the study is only needed to create awareness and insight as to ways of improving project performance.	YES NO

Declaration by participant:

I agree to participate in the above named study.

Participant's Name: ……

Signature: …….. Date: ……