



Engineering Social Networks to Combat Digital Addiction: The Case of Online Peer Groups

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Abstract

Digital Addiction (DA) denotes a problematic relation with the technology described by being compulsive, obsessive, impulsive and hasty. Recent research identified cases where digital usage shows symptoms of the clinical criteria of behavioural addiction. Peer groups approach is one of the strategies to combat addictive behaviours. It can provide a motivational and learning environment, and ambivalence reduction through sharing, counselling and mutual helping.

Hosting peer groups online as a domain-specific social networking service can empower behaviour awareness and change communication including the case of combatting DA. Unlike other behaviours and their change mechanisms, DA as a problematic behaviour, and online peer group share the same space and operational modality. This can empower the online behaviour monitoring and the interaction towards combatting DA in a real-time and transparent style.

However, building online peer groups platforms and customizing their functional and interactive features to fit the needs and characteristics of a specific group is a complex process. Also, this requires a careful theoretical understanding of these systems unique variables and attributes which include interactivity, anonymity, equity, profiling, presence and transparency. An ad-hoc design of such persuasive information systems may not only fail to achieve the desired outcomes but may cause significant harm, e.g. lowering self-esteem and counterproductive upward and downward comparisons, etc. As such, the goal of this thesis is to devise a method towards a better-managed design of this technology so that we increase its chance to combat DA.

To achieve this goal, the thesis first takes an exploratory approach through several empirical studies including qualitative meta-analysis, qualitative user studies and observational investigations. The findings indicate that the design process of such systems should actively involve end-users to accommodate their needs and expectations and that the design shall have a customizable ecology. The findings were used to propose a method that supports the ability to adapt the scope and functionalities of an online peer group platform to fit various peer groups styles and dynamics with the aim of maintaining the validity and quality over the behaviour awareness and change programme. The method proposed in this thesis involves different roles (people with DA, counsellors, software designers), and has a participatory nature which is a natural fit to the spirit and remit of peer groups.

The primary contribution of this thesis is twofold: i) a reference model for designing interactive online peer groups platforms to combat DA, ii) a method inspired by participatory design paradigm to customise the interaction environment for different groups. The method is evaluated in terms of its ease of use, comprehensiveness, appropriateness, and usefulness through a design case study. The results show the potential and applicability of the method in providing an enhanced design process for online peer group platforms to regulate DA in comparison to general purposes development methods which do not cater for the nuances and peculiarities of this particular user group, i.e. people with DA, and the peer group environment. A set of heuristics and guidelines are also derived. One notable recommendation is the recommendation to use the approach when dealing with moderate DA cases in ways that do not interfere with the decision-making about DA, but rather provide tools and platforms to facilitate taking those decisions effectively and in an informed style.

Contents

Copyright	I
Abstract	II
Acknowledgement	XII
1. Chapter 1: Introduction	1
1.1 Thesis aim.....	5
1.2 Thesis questions	5
1.3 Thesis objectives	6
1.4 Thesis assumptions.....	8
1.5 Thesis methodology overview	10
1.6 Thesis structure	11
1.7 Publications arising from this thesis.....	12
1.7.1 Declaration of co-authors contribution.....	13
1.8 Chapter summary	14
2. Chapter 2: Literature review	15
2.1 Digital addiction.....	15
2.1.1 Digital addiction definitions	17
2.1.2 Digital addiction terminologies comparisons.....	18
2.1.3 Risk factors.....	21
2.1.4 Tests and measurements	26
2.1.5 Treatment approaches.....	27
2.1.6 Modalities for delivering prevention and treatment	31
2.2 Behavioural change theories and models.....	34
2.2.1 The theory of planned behaviour	35
2.2.2 Social cognitive theory.....	35
2.2.3 The control theory.....	36
2.2.4 Transtheoretical model.....	36
2.2.5 The health belief model.....	37
2.2.6 Goal setting theory	38
2.2.7 Cialdini's principles	39
2.2.8 Fogg's model	40
2.3 Technology-assisted behavioural change.....	40

2.3.1	The adoption of technology in health care.....	40
2.3.2	The rapid-growth market and risks.....	41
2.3.3	E-health technology and design considerations	42
2.3.4	E-health technology and digital addiction	43
2.3.5	Technology-assisted persuasive techniques.....	44
2.3.6	Captology	45
2.3.7	Gamification.....	45
2.4	Peer Groups	47
2.4.1	Peer groups interaction styles	49
2.4.2	Advantages of peer groups for combating addictive behaviours.....	49
2.4.3	Online support groups	50
2.4.4	Group development.....	51
2.4.5	Group dynamics.....	52
2.5	Digital addiction and technology related topics	54
2.5.1	Requirements engineering and digital addiction	54
2.5.2	Social computing	57
2.5.3	Self-regulation	60
2.5.4	Self-adaptation.....	61
2.5.5	Situational awareness	63
2.5.6	Human-computer interaction aspects	67
2.5.7	Design approaches	68
2.6	Chapter summary	72
3.	Chapter 3: Research methodology	73
3.1	Research philosophies	74
3.1.1	Positivism.....	74
3.1.2	Realism.....	75
3.1.3	Interpretivism.....	75
3.1.4	Pragmatism.....	76
3.2	Research approaches	76
3.3	Research strategy	78
3.3.1	Grounded theory	78

3.3.2	Ethnography.....	79
3.3.3	Case studies.....	80
3.3.4	Experiments.....	81
3.3.5	Action research.....	81
3.3.6	Surveys.....	82
3.4	Research choices.....	84
3.5	Time horizons.....	85
3.6	Adopted methods.....	85
3.6.1	Survey.....	85
3.6.2	Observation.....	86
3.6.3	Document analysis.....	87
3.6.4	Interviews.....	88
3.6.5	Focus groups.....	89
3.6.6	“Expert” member checking.....	90
3.6.7	Diary studies.....	91
3.7	Data analysis techniques.....	92
3.7.1	Qualitative content analysis.....	92
3.8	Ethical considerations.....	93
3.9	The adopted methodology.....	95
3.10	Research design.....	96
3.10.1	Phase one: Orientation.....	99
3.10.2	Phase two: Exploration.....	99
3.10.3	Phase three: Investigation.....	100
3.10.4	Phase four: Confirmation.....	100
3.11	Chapter summary.....	101
4.	Chapter 4: Conceptualisation of digital addiction.....	102
4.1	Towards a definition of digital addiction.....	102
4.1.1	Logical models.....	102
4.2	Reference model for digital addiction.....	106
4.2.1	Research goal.....	106
4.2.2	Research methodology.....	107

4.2.3	Research results	109
4.3	Discussion.....	118
4.4	Chapter Summary.....	119
5.	Chapter 5: Persuasive interactive technology (PIT) to combat digital addiction.....	121
5.1	Research goal.....	122
5.2	Research design.....	122
5.3	Research method.....	122
5.3.1	Sampling.....	125
5.3.2	Phase one: Users' diary study	126
5.3.3	Phase two: Users' interview	126
5.3.4	Phase three: Online forum analysis.....	127
5.3.5	Data analysis.....	128
5.4	Results	128
5.4.1	Design aspects	129
5.5	Discussion.....	145
5.5.1	Designing PIT to combat digital addiction	145
5.5.2	Risk factors and socio-technical issues.....	147
5.6	Chapter summary	148
6.	Chapter 6: Exploring online peer groups for combating digital addiction.....	149
6.1	Research goal.....	149
6.2	Research method.....	150
6.2.1	Study one: User study.....	150
6.2.2	Study two: Focus group.....	150
6.2.3	Data analysis.....	152
6.3	Results	152
6.3.1	Attitudes to the overall concept of online peer groups	153
6.3.2	The moderation role in online peer groups.....	154
6.4	Discussion.....	161
6.4.1	Risk factors.....	161
6.4.2	Reflections on the desingn for persuasion.....	168
6.5	Chapter summary	170

7. Chapter 7: Design principles for online peer groups	172
7.1 Research goal.....	173
7.2 Research design.....	174
7.3 Research method	174
7.4 Study one: Traditional rehab centre.....	174
7.4.1 Selecting a site and a group of interest	175
7.4.2 Face to face groups sessions	176
7.4.3 Face to face observations procedures	182
7.4.4 Therapists interviews.....	184
7.4.5 Document analysis	185
7.4.6 Data analysis.....	186
7.4.7 Results	186
7.5 Study two: Online peer groups.....	204
7.5.1 Selecting a website and online groups of interest.....	204
7.5.2 Online group sessions.....	205
7.5.3 Online observation procedures.....	206
7.5.4 Data analysis.....	206
7.5.5 Results	207
7.5.6 Discussions.....	212
7.6 Chapter summary	220
8. Chapter 8: Customisable online persuasive ecology: A participatory approach method.....	221
8.1 A reference architecture for online peer groups	222
8.2 The COPE.er method artefacts.....	224
8.2.1 Social roles	224
8.2.2 Social objects	228
8.2.3 The COPE.er method building blocks.....	230
8.2.4 Functional features.....	232
8.3 The COPE.er method activities.....	239
8.3.1 Guidelines.....	243
8.4 Chapter summary	252

9.	Chapter 9: COPE.er evaluation	253
9.1	Research study aim.....	253
9.2	Research study strategy	254
9.2.1	Methods stages.....	254
9.2.2	Methods types.....	256
9.2.3	Evaluation types for engineering methods.....	257
9.3	The rationale of the evaluation study design.....	258
9.4	Research study method.....	260
9.4.1	Stage 1: Expert checking	260
9.4.2	Stage 2: Case study	262
9.5	Results	273
9.5.1	Stage one: Expert checking.....	273
9.5.2	Stage two (phase one): Designing without the guide of the COPE.er	274
9.5.3	Stage two (phase two): Designing with the guide of the COPE.er	281
9.6	Discussion.....	302
9.6.1	Understandability	302
9.6.2	Comprehensiveness.....	302
9.6.3	Appropriateness	303
9.6.4	Usefulness	304
9.7	Chapter summary	305
10.	Chapter 10: Conclusions	306
10.1	Objectives revisited.....	307
10.2	Contribution to knowledge	310
10.3	Study limitations	315
10.4	Recommendations and lessons learned.....	316
10.5	Future work.....	319
11.	References.....	324
12.	Appendices.....	344
12.1	Appendix 1	344
12.2	Appendix 2	365
12.3	Appendix 3	369
12.4	Appendix 4	372

12.5	Appendix 5	385
12.6	Appendix 6	413

List of figures

Figure 1: Mapping the research questions to the thesis aim	5
Figure 2: Research context and focus.....	12
Figure 3: The hook model (Eyal 2014)	24
Figure 4: The five stages to execute an action (Wendel 2013)	43
Figure 5: Tuckman’s model of small groups development (Tuckman and Mac Jensen 1977)	52
Figure 6: A concern-based taxonomy of requirements (Glinz 2007)	56
Figure 7: Social media functional blocks (Kietzmann et al. 2011)	59
Figure 8: Model of situation awareness (Endsley 1995).....	64
Figure 9: Kofod-Petersen and Cassens’ Context Model (2006).....	66
Figure 10: Research onion (Saunders et al. 2009).....	74
Figure 11: Research approaches loop. Adapted from (Gill and Johnson 2010).....	76
Figure 12: Typology of participant observation researcher roles (Saunders et al. 2009).....	87
Figure 13: Research design of the thesis	97
Figure 14: The landscape of user research methods. Adopted from (Rohrer 2008).....	98
Figure 15: Logical model of the problematic internet use definition	103
Figure 16: Logical model of the generalised pathological internet use definition.....	104
Figure 17: logical model of the internet addiction definition.....	104
Figure 18: Logical model of the technological addiction definition.....	104
Figure 19: Summary of the four logical models	105
Figure 20: The logical model of DA definition from software prespective	106
Figure 21: Digital addiction mind map.....	111
Figure 22: DA reference model (part one).....	116
Figure 23: DA reference model (part two)	117
Figure 24: The basic demographic characteristics of participants.....	129
Figure 25: Online peer groups for combating digital addiction	152
Figure 26: Risk factors of PIT intervention to combat digital addiction	161
Figure 27: Individual participation in group work over time.....	197

Figure 28: Group evolvment over time.....	199
Figure 29: Online gambling system interface	210
Figure 30: Online peer groups is as tunnelling-based technology.....	219
Figure 31: Online peer groups reference architecture	223
Figure 32: The COPE.er model building blocks	230
Figure 33: The COPE.er method workflow	239
Figure 34: Mock-up interfaces.....	270
Figure 35: The overview of the evaluation activities without specifying permissions	271
Figure 36: Phase one protocol	271
Figure 37: The overview of the evaluation activities with specifying the permissions	272
Figure 38: Phase two protocol	272
Figure 39: The COPE.er method workflow (pre-evaluation).....	282
Figure 40: the cope.er reference architecture and future work.....	321

List of tables

Table 1: Mapping the research questions to the objectives and chapters.....	8
Table 2: Digital addiction tests	26
Table 3: The background of the participants	108
Table 4: The participants' familiarity with relevant topics	108
Table 5: Analysed resources.....	109
Table 6: Concepts extraction and definition	112
Table 7: The provided documents during the focus group	113
Table 8: Focus group structure	113
Table 9: The features and design principles of the selected applications	124
Table 10: Descriptions of the extra E-health intervention features	124
Table 11: The basic demographic characteristics of the participants	126
Table 12: Design concerns and their potential sources in PIT to combat DA.....	147
Table 13: The basic demographic characteristics of participants.....	151
Table 14: Stages of recovery (Gorski, 2009; 2013).....	176
Table 15: Observations of study one (rehab center).....	177
Table 16: Warning signs of relapse developed by Terence T. Gorski (2013).....	179

Table 17: Roles to be supported within online peer groups.....	202
Table 18: Potential situations of negative roles effects	204
Table 19: Types of groups observed in the online therapy system.....	205
Table 20: Observations of study two (online rehab system).....	206
Table 21: Help provided in different groups.....	208
Table 22: The COPE.er method acronym.....	221
Table 23: Social roles organised into four classes.....	225
Table 24: Social objects for online peer groups.....	229
Table 25: Example to demonstrate how social objects should be used	230
Table 26: COPE.er customisation factors.....	231
Table 27: Descriptions for the COPE.ER model building blocks	231
Table 28: Implications on the COPE.er building blocks	232
Table 29: Interaction environment customisation table.....	233
Table 30: EXAMPLES for specifying frequency and duration	237
Table 31: An example for specifying informational limitations	238
Table 32: Examples for specifying time frames.....	238
Table 33: Clients' description card	240
Table 34: Network of trade-offs.....	243
Table 35: Sources of side effects	246
Table 36: Persuasive techniques adopted from (Oinas-Kukkonen and Harjumaa 2009).....	248
Table 37: Heuristic principles for inspecting online peer groups designs.....	250
Table 38: The background of the participants.....	263
Table 39: The participants' familiarity with relevant topics	263
Table 40: The participants' analysis results.....	274
Table 41: The selected clients and analysis outputs	283
Table 42: The model answers.....	284
Table 43: Specifying social objects.....	287
Table 44: The revisions made based on the analysing the potential risks document.....	299

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1. CHAPTER 1: INTRODUCTION

Despite the obvious benefits of digital technologies such as social networking and video gaming, their emergence has led to negative consequences on modern societies. The increasingly notable cases in which people feel addicted to their use have also led to increasing interest to explore this behavioural phenomenon. The patterns of use of these technological advances seem to match the criterion of Diagnostic and Statistical Manual of Mental Disorders (DSM) (Block 2008).

A recent meta-analysis study covered 80 empirical reports from 1996 to 2012 and concluded that Internet Addiction, which is a form of digital addiction, affects 6% of people worldwide (Cheng and Li 2014). In 2013, 3.2% of British students were considered to be addicted (Kuss, Griffiths, et al. 2013). In South Korea, over 140 Internet Addiction treatment recovery centres opened by 2011 (Young and de Abreu 2011). According to the recent statistics from the China Youth Association for Network Development, the number of Chinese teenage addicts increased to 24 million (14.1%) by 2009 (China Youth Association for Network Development 2010). This is over double the number in 2005, which was around 10 million (13.2%). It is worth noting that these studies followed different criteria on assessing addictive usage.

Digital addiction (hereafter DA) is still seen as a problem on the users' side more than a responsibility of the software and the design of user interactions. Hence, the problem of DA is typically articulated in a way that makes the solution entirely within the domain of other disciplines, such as psychology, sociology and health-related care. For example, Beard (2008) highlighted different factors related to the uniqueness of the content, style of use and activity in the "Internet culture". Widyanto and Griffiths (2006) emphasised the addiction 'on' rather than 'to' the Internet. As such, the Internet is treated as a medium, i.e. single entity, without studying the applications' features, their designs, the goals they help to achieve or the users' motivations, values and emotions they should satisfy as primary causes of DA.

The relatively limited research literature on DA has focused mainly on users' psychology and the role of software design, e.g. (Hammersley 1995, Griffiths 2000a). These studies mainly

focus on the attractive features of the Internet itself as a medium. There is a paucity of research that positions software and its developers as primary actors in the development of DA; two notable exceptions are (Alrobai et al. 2014, Ali et al. 2015). Consequently, software features and how their interactions might influence human behaviour need to be investigated.

The current practices and interventions to this condition are limited to access restriction policies, such as fatigue system in China (Block 2008), rehabilitation programmes and Cognitive Behavioural Therapy (CBT) techniques (Young and de Abreu 2011). Educational programmes, such as SafetyNet (R) Community programme run by the Centre for Internet and Technology Addiction (2013), also used to educate parents, teachers and community members about the risks of internet abuses including the overuse and how to set boundaries.

Another promising approach is utilising mutual support in peer groups. Peer groups have been recognised as an effective treatment approach in rehabilitation programmes for addictive behaviours (Bassuk et al. 2016). Individuals are gathered with peers who share similar experience and conditions to engage in activities that involve mutual help, social interaction and emotional support to improve psycho-social well-being and to re-integrate them into their communities (Sarrami-Foroushani et al. 2014). These groups revolve around social participation and interactions under the supervision of addiction counsellors, e.g. trained ex-addicts, to eliminate any deviant behaviours that may arise, such as introducing other addictive behaviours by peers or minimising the perceived risk of others. Also, “Digital Detox” programmes have started to appear and are mainly based on relatively expensive and heavyweight in-patient care utilising traditional solutions such as motivational interviews and cognitive behavioural therapies.

Thus, for moderate addiction, the persuasive technology could have potential, as a brief intervention, to assist users to regulate their usage. The introduction of software-based solutions to health interventions has provided a potential template to promote effective management of digital life. Some studies and initiatives, such as (Lee, Ahn, et al. 2014, Ko, Choi, et al. 2015, Ko, Yang, et al. 2015), have made an attempt to generate technological opportunities to shift from

traditional web-mediated interventions to more intelligent systems utilising recent innovations such as gamification and persuasive technology.

This thesis proposes utilising such interactive systems to mediate peers' support (i.e. online peer groups). These systems can put together people who share a common interest in combating their DA or in helping others to do so. Also, it can react intelligently to any negative side-effects that may appear in group communication, such as social loafing and compensation (Simms and Nichols 2014). Yet, it is still ambiguous how to translate what works in face-to-face social groups to virtual environments that mediate positive behavioural change. This is due to the unique aspects of online social structures and associated dynamics, e.g. the online disinhibition effect and its factors which include anonymity, asynchronicity, solipsistic introjection, dissociative imagination, and minimisation of authority (Suler 2004). Also, despite improvements in the technology and the understanding of the psychological processes that promote behavioural change, there is still need for shifting the emphasis towards the group process and dynamics in the analysis of the system. This is because a wide range of the software-based facilitated activities is offered under the remit of peer support environments. Yet, satisfying collective group values does not exempt the system from considering individual differences, needs and preferences. While such complexity at the individual level is left to moderators' group facilitation skills then in a series of complementary approaches such as one-to-one counselling, this thesis argues that software systems can still complement these efforts.

More important issue is the effectiveness of such technology to mediate behavioural change in general. While interactive, real-time, and intelligent interventions can be delivered, there is still a stark lack of credible knowledge of such solutions. For instance, software-based mental health interventions, such as the ones in NHS library (NHS 2015), are argued to fail in providing clinical evidence of a long-term change (Leigh and Flatt 2015). One of the reasons for this failure could be the lack of robust integration of these technologies with traditional healthcare systems, coupled with the poor application of psychological theories such as self-regulation (Leigh and Flatt 2015). Also, E-health intervention systems need to be enhanced in terms of evaluating their target

audience in order to offer the right treatment options. For example, gamifying systems could be risky for individuals with Attention Deficit Hyperactivity Disorder (ADHD). ADHD, which is a group of behavioural symptoms that include inattentiveness, hyperactivity, impulsiveness, short attention span, restlessness or constant fidgeting and being easily distracted (NHS 2014), is a symptom of having DA (Ko et al. 2009). Those with such behaviours are vulnerable to developing dependence behaviour or addiction in severe cases to gaming (Bioulac et al. 2008). Such undesirable consequences not only exist in the software-based interventions but also in other types of interventions that lack scientific credibility such as E-Cigarettes which is argued to be another alternative addiction (Cox 2016).

Utilising the technology advances to engineer online peer groups can be a promising approach to intervene with addicts. Reviewing the literature shows a lack of systematic approaches to engineer online peer groups in general. This thesis argues that online peer monitoring, i.e. surveillance, can provide effective and sustainable change. These aspects motivate this thesis to investigate the potentiality, challenges and concerns that need to be addressed when developing online peer group to regulate DA. Also, the above discussions present a variety of models and debates to understand addiction. The solutions cannot regulate or prevent addiction independently from the other stakeholders including users and business managers. Users' requirements are the natural place where this should be first planned. That is, certain requirements should be elicited from the stakeholders on what and how they would like to be aware of and, also, what decisions to be taken by software and what other decisions to be taken by them when the software is running.

1.1 THESIS AIM

The aim of this thesis is to provide engineering principles for online platforms that host peer groups and intervention to combat problematic behaviours associated with the use of technology. This deals with users who are willing to adjust their usage style and still at the stage of moderate addiction. This usage style includes the time spent and also the type of actions that users undertake online. The thesis will study the case of the social network as a representative example of an addictive cyber-space. By social network, the thesis means any software-based platform for social interaction outside a business environment.

1.2 THESIS QUESTIONS

Based on the research aim, the following questions were formulated to focus the study and its boundaries, determine the appropriate research design, and inform the stages of inquiry:

- **RQ1:** What is the reference model that characterises DA and its various facets?
- **RQ2:** What are the potentials and concerns related to technology-assisted behaviour change and peer groups?
- **RQ3:** How to model, formalise and regulate peer groups and peers' interactions as a mechanism to combat DA?
- **RQ4:** How to translate the findings of RQ3 into a design method which aid the construction of an online platform for peer support group to combat DA?

Figure 1 presents a mapping of the research questions to the thesis aim.

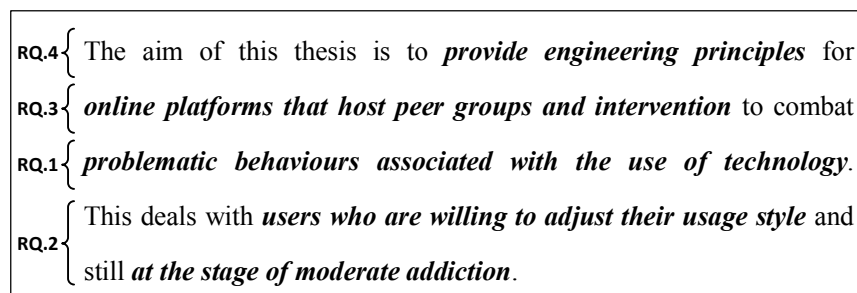


FIGURE 1: MAPPING THE RESEARCH QUESTIONS TO THE THESIS AIM

To answer the research questions, the following objectives were set forth:

Objective one: Conducting a literature review on the DA and its related topics

The research will review the literature in the field of DA from psychology and computing perspectives. This will include a thorough analysis of behavioural change theories and the technology that utilise them to deliver interventions. The literature on peer groups in traditional addiction will also be reviewed to inform the following exploratory studies and to provide foundations to the thesis solution.

Objective two: Building a reference model for digital addiction

This objective will build on top of the results achieved in objective one and build a conceptualisation, in the form of upper ontology for the various aspects of DA. This is meant to help researchers on the topic to have a holistic view of the concept still in a formal and precise representation as well as to support additional domain-specific ontologies. While the ontology will be based on the results obtained from objective one, further materials related following objectives will be reviewed to improve the coverage of the reference model. This objective will create a foundation for this field to facilitate subject-matter discussions, collaboration and knowledge sharing.

Objective three: Exploring the behavioural change technology and the online peer groups as a mediated intervention

The research will explore and model usage styles and preferences with regard to the persuasive intervention technology as well as online peer group as a mechanism to combat DA. Self-monitoring and surveillance are powerful techniques for behaviour change. When facilitating that via software, several engineering challenges emerge. This relates to common mechanisms in peer groups including goal set-up, moderator role, compensation mechanisms, etc.

As an outcome, the research will produce a set of rules and patterns to form the peers' groups and regulate their interactions. The risks of mediating peer groups via software systems will also be explored. The mechanisms to combat DA will be modelled in a way that considers the requirements users are expecting to achieve through the use of a social network. The thesis will be defining families of those requirements such as social recognition, exploring, time passing, competition, etc. It will also define how the mechanisms will affect some quality requirements such as usability and privacy. The mechanisms to combat DA could require hiding or deactivating certain parts or features of the social network, which means a sort of adaptation as a response to the group choices.

In this objective, the research expects to have different preferences and expectations. The insights that will be provided will not be limited to represent only different configurations of coercive and persuasive techniques as well as interaction styles, but also to consider the important social aspects such as relation types, social status and group dynamics.

Objective four: Devising a novel method for managing the design process of the online peer groups platforms to overcome digital addiction

The research will devise a process-method, supported with guidelines to facilitate a systematic designing online peer groups in a participatory style. This method will recognise group's choices to ensure that members have the adequate design. Also, the method will consider the conflicting requirements. The moderation of the method, the involved stakeholders, and their roles are also to be investigated. The method will utilise the outcomes obtained in the previous objectives.

Objective five: Evaluating the proposed method

A case study will be utilised to put the method into practice to evaluate and refine its artefacts. The evaluation will also consider the practicality of the method in managing the design process. To achieve this, a set of qualities will be assessed, mainly focussing on the understandability, comprehensiveness, appropriateness, and usefulness of the method. These qualities will be assessed from the stakeholders' point of view (i.e. their reactions, concerns, and expectations).

Table 1 provides an overview of the objectives and linking them to research questions and the related thesis chapters.

TABLE 1: MAPPING THE RESEARCH QUESTIONS TO THE OBJECTIVES AND CHAPTERS

Research questions	Research objectives	Chapters
RQ1: What is the reference model that characterises DA and its various facets?	Obj.1: Conducting a literature review on the DA and its related topics Obj.2: Building a reference model for DA	Chapters (2,4)
RQ2: What are the potentials and concerns related to technology-assisted behaviour change and peer groups?	Obj.3: Exploring the behavioural change technology and the online peer groups as a mediated intervention.	Chapters (5,6)
RQ3: How to model, formalise and regulate peer groups and peers' interactions as a mechanism to combat DA?	Obj.3 and Obj.4: Devising a novel engineering method to build online peer groups platforms	Chapters (5,6,7,8)
RQ4: How to translate the findings of RQ3 into a design method which aid the construction of an online platform for peer support group to combat DA?	Obj.4 and Obj.5: Evaluating the proposed method	Chapters (7,8,9)

1.4 THESIS ASSUMPTIONS

DA has not been recognised formally as a psychological disorder yet, and the thesis uses the term mainly metaphorically. Although some research has demonstrated how DA exhibits similar symptoms to behaviour addiction (Kuss, van Rooij, et al. 2013), the thesis emphasises that it would be hard to measure DA and judge its existence in a person due to the complexity of the issue and the difficulty to diagnose the relation between the problematic online usage and the online space design and online content on one hand, and the usage and more profound personal and contextual factors on the other. The thesis is not meant to confirm or reject the existence of DA but rather to provide ways for managing what people perceive to be a problematic or addictive online usage. Hence, the assumptions for the validity of the research and proposed approach were made. This is to avoid confirmations from the psychological point of view and to make it more realistic and feasible from the management perspective of online peer support groups and their engineering method.

- According to Ng and Leong (2009), there are three main stages of addiction: early, intermediate and advance. Each stage represents a different level of self-control and distinct attitudes and behaviours. Regardless of the extent to which the object of addiction dominates decision-making processes, individuals can be guided through the levels of change according to the Transtheoretical Model (Prochaska 2013) which articulates six levels to progress to healthier behaviour.

While the online peer groups' intervention aims at supporting individuals in all severity levels, those in the *transition to addiction* stage (i.e. intermediate stage) will be the main targeted audience. The reason is that tailoring the system to support those in the severe *addiction stage* seems to be very challenging and risky especially that the thesis solution is meant to be run in a blended modality involving counsellors direction and, also, individuals' autonomous self-regulation and interaction with peers.

- Video games have special elements such as unique visualisation aspects, the flow experience, competitions, flexibility characteristics and rewarding mechanisms, fun, storyline, continuity and aesthetics (Callele et al. 2005, Kim et al. 2009, Weinstein 2010). On the other hand, online games also have some social features such as Leaderboard and exchange of credit and points. Other games are based on forming teams and social interactions between players. Therefore, while the result of this thesis can be in part applicable there, this thesis will not be extended to cover game addiction in order to scope the research literature and to reduce the complexity of the studies design.
- The study will target social computing, e.g. social network sites (SNS), as an example of addictive cyberspace. Social computing has also become the dominant theme of people communication over the Internet. A criterion has been adopted to determine what types of social computing are considered in this thesis. Ultimately, they should include the following functional building blocks introduced in the Honeycomb

framework (Kietzmann et al. 2011): identity, conversations, sharing, presence, relationships, reputation, and groups.

- Specific Pathological Internet Use (PIU) proposed by Davis (2001) is the condition when the pathological use is “content-specific” (e.g. online chatting, online pornography and online gambling). Users with this condition tend to find alternative ways to consume that ‘specific’ content if cannot be accessed online. This thesis addresses the impulsive and obsessive usage of digital technology without being particularly attached to specific content.
- The behavioural addictions and substance addiction have inherent similarities in terms of the symptoms and consequences. From the perspective of cognitive behavioural therapy, both types of addictions share similar diagnoses and intervention strategies (Alavi et al. 2012). This suggests that many principles, recourses, and practices in substance addiction can be adopted and applied to behavioural addiction, such as DA. Some studies, such as (Fisoun et al. 2012), found that Internet Addiction can be used as an important predictor for early stages of substance abuse and vice versa. This is because both addictions follow similar behavioural patterns and individuals share personality attributes (Lee et al. 2013). Nevertheless, the variables of change, i.e. influences that could inspire individuals to change, maybe different from a type of addiction to another (Nisbet and Gick 2008).

1.5 THESIS METHODOLOGY OVERVIEW

The methodology design seeks to define the research processes to collect the primary and secondary data. As the research problem is concerned with the users’ personal and collective experience and perceptions towards their goals and activities, the methodological approach underpinning this thesis is interpretivism. This philosophical paradigm extends the emphasis on defining the research reality to include not only the descriptions of the facts but also the evaluative concerns of the social actors’ interpretations (Rabinow and Sullivan 1987). This influenced the practical considerations, methods and techniques choices adopted to help to collect users’ thick

descriptions. As a result, several empirical studies were performed. Different techniques including diary studies, interviews, focus groups, questionnaires, and documents analysis were adopted to collect data. The inductive approach was mainly used to analyse the data and answer the research questions. The case study strategy was used to provide more focus to evaluate the thesis findings.

1.6 THESIS STRUCTURE

An overview of the thesis structure is depicted in **Figure 2**. It also shows the context and the focus of the research. This thesis is structured as follows. **Chapter 2** presents a multidisciplinary literature review of the topics related to the context of this thesis. In **chapter 3**, the methodology of the thesis is presented. **Chapter 4** presents a reference model for DA. **Chapter 5** shed light on a range of design aspects and risks when building and validating persuasive intervention technology. **Chapter 6** explores online peer groups as a motivational approach to regulate digital usage. **Chapter 7** reports the results of the face-to-face and online peer groups. Then, it presents a set of considerations about the design and management of online platforms meant to facilitate and regulate peers' interactions. **Chapter 8** presents the evaluated version of the design method proposed by this thesis. **Chapter 9** discusses the methodology adopted to evaluate the proposed method followed by the evaluation processes and results. **Chapter 10** provides a summary of the thesis conclusions, lessons learned and future work.

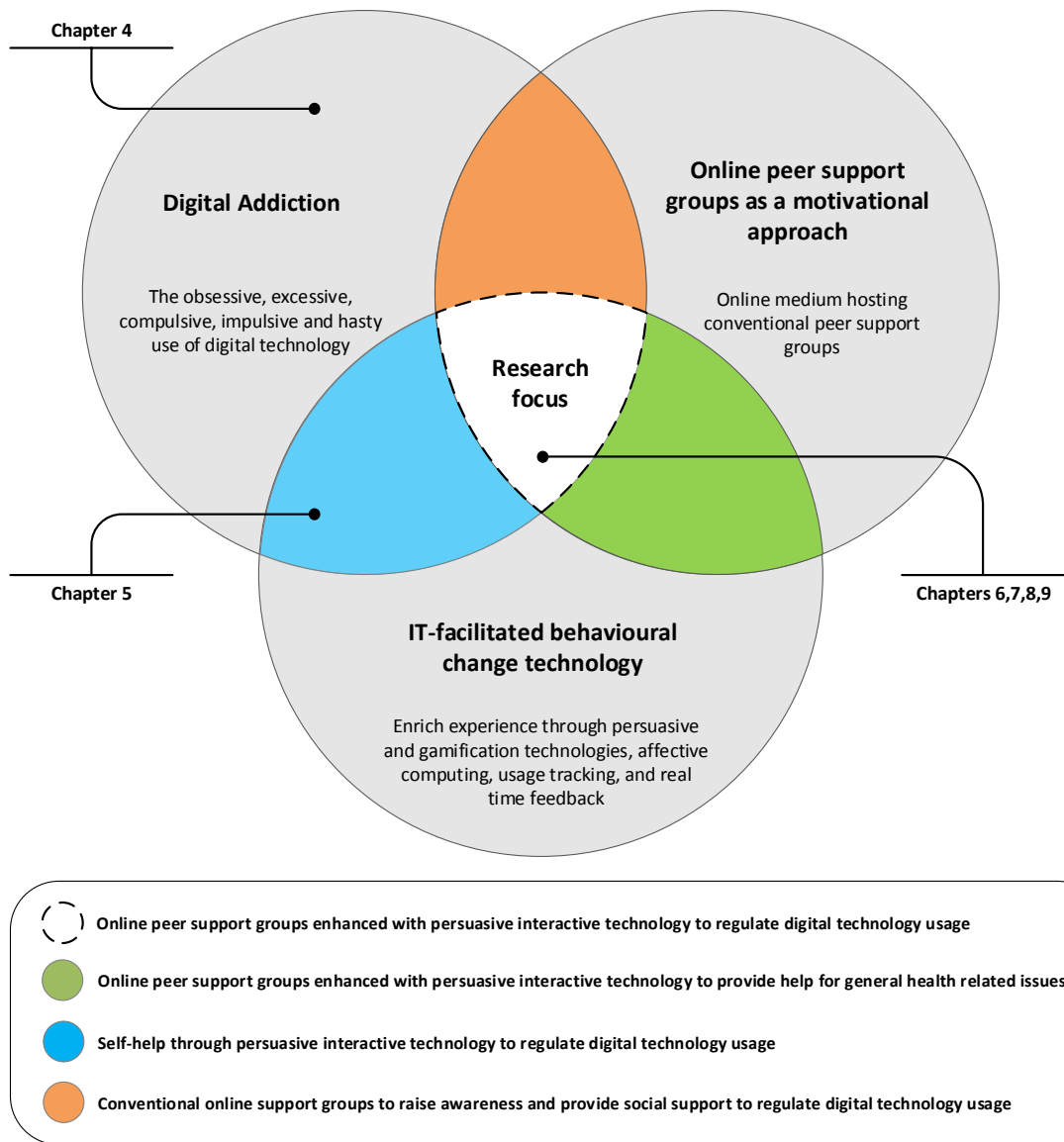


FIGURE 2: RESEARCH CONTEXT AND FOCUS

1.7 PUBLICATIONS ARISING FROM THIS THESIS

- 1- Alrobai, A., Phalp, K. and Ali, R., 2014, April. Digital addiction: A Requirements Engineering Perspective. In International Working Conference on Requirements Engineering: Foundation for Software Quality (pp. 112-118). Springer International Publishing.
- 2- Alrobai, A. and Dogan, H., 2014. Requirements Engineering for ADDICTION-Aware Software (E-ADDICT). In REFSQ Workshops (pp. 46-52).
- 3- Alrobai, A. and Dogan, H., 2014, November. Digital Addiction Ontology for Social Networking Systems. In International Conference on Social Informatics (pp. 167-175).

Springer International Publishing.

- 4- Alrobai, A., McAlaney, J., Phalp, K. and Ali, R., 2016, April. Online Peer Groups as a Persuasive Tool to Combat Digital Addiction. In International Conference on Persuasive Technology (pp. 288-300). Springer International Publishing.
- 5- Alrobai, A., McAlaney, J., Dogan, H., Phalp, K. and Ali, R., 2016. Exploring the Requirements and Design of Persuasive Intervention Technology to Combat Digital Addiction. In International Conference on Human-Centred Software Engineering (pp. 130-150). Springer International Publishing.
- 6- Alrobai, A., McAlaney, J., Phalp, K.T. and Ali, R., 2016. Exploring the Risk Factors of Interactive E-Health Interventions for Digital Addiction. International Journal of Sociotechnology and Knowledge Development, 8(2), pp.1-15.
- 7- Alrobai, A., Dogan, H., Phalp, K., Ali, R., 2018. Building Online Platforms for Peer Support Groups as a Persuasive Behaviour Change Technique. In the 13th International Conference on Persuasive Technology, Waterloo, pp. 1–13.
- 8- COPE.ER: A novel method for engineering social networking to combat digital addiction. (Journal paper – in progress)

1.7.1 DECLARATION OF CO-AUTHORS CONTRIBUTION

The author of this thesis was the first author of all the resulted publications. The contribution of the first author was as follows:

- Forming and articulating the idea and the aim of each paper.
- Deciding upon the appropriate methodology to be adopted in each paper (e.g., following a qualitative approach).
- Designing and implementing the empirical studies presented in each paper (e.g., developing interview scripts, recruiting participants, and collecting the data).
- Analysing and interpreting the collected data and drawing the conclusions (e.g. qualitative analyses).
- Reporting the findings and fully writing each paper.

The co-authors contributed to the published papers in terms of verifying and validating the studies' findings by comparing them against the actual responses from the participants. They also provided guidance and feedback on the structure and overall articulation of the papers' message. In addition, they gave insights on the methodologies and also checked the quality of the papers and suggested modifications on some parts of the text. Furthermore, the co-authors enriched the papers with the appropriate terminologies in certain places, especially those related to the venue where the papers were published.

- The publication number four consists of two studies. The author of this thesis shared the responsibilities with Yasmeen Abdalla to design and collect the data of the first study. This data collected was analysed by the author of this thesis for its purpose. The same data was also used in the publication number five. Hence, the author of this thesis would like to thank Yasmeen Abdalla for her effort.
- Asad Khan contributed in designing and collecting the data of the second study that was used in the publication number four. This data collected was analysed by the author of this thesis for its purpose. Hence, the author of this thesis would also like to thank Asad Khan for his effort.

1.8 CHAPTER SUMMARY

This chapter provided an overview of the thesis context. Also, the thesis aim, research questions, motivation and assumptions were presented. The chapter also provided an overview of the methodology and the thesis structure. The next chapter will provide a review of the up to data research topics related to DA, online peer support groups and other relevant topics considering the multidisciplinary nature of the research.

2. CHAPTER 2: LITERATURE REVIEW

Addictive behaviours can be defined as any behaviour that features the core components of addiction; salience, mood modification, tolerance, withdrawal, conflict and relapse (Griffiths 2000b). They are also “*highly motivated, in that they persist against an accumulating tide of aversive consequences*”. In the “war context”, the overriding of common sense is described as bravery that is driven by moral values. In the “*pleasure context*”, it is described as addiction driven by impulsivity (Miller and Heather 2013).

Unlike substance addiction, several factors need to be carefully considered to draw the line between the benefits of digital technology and their adverse effects. This chapter, therefore, aims at providing an overview of DA as an emergent behavioural condition. Due to the multidisciplinary nature of the topic, the literature review will, also, cover aspects related to the technology adoption as a solution, with a particular emphasis on the design of self-regulation systems.

This chapter will attempt to achieve **objective 1** by reviewing the literature on DA and its related topics from psychology and computing perspectives.

2.1 DIGITAL ADDICTION

Digital Addiction (DA) denotes a problematic usage of digital devices characterised by properties such as being compulsive, impulsive, excessive and hasty. DA is associated with negative behaviours such as anxiety, depression, distraction, lack of sleep and reduced social skills. It emphasises the heavy degree of uncontrollable engagement in certain interactions facilitated by some software products. These products can provide pleasure and compensate a lack of some social skills, but in a way that might harm a person socially and psychologically (Ha et al. 2006).

While there is still no authoritative definition for this condition, DA has been argued to include various sub-types such as internet addiction, gaming addiction, cyber-relationships

addiction, and information overload (Young and de Abreu 2011). Although DA is not yet formally classified as a mental disorder in the 5th and most recent edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM) (American Psychiatric Association 2013), it does acknowledge pathological internet gaming as an emergent phenomena and possible disorder which requires additional research. This somewhat ambiguous status within the DSM is a reflection of ongoing debate on whether extensive internet use is an issue for concern (Yellowlees and Marks 2007) or just a new lifestyle, i.e. “highly promoted tool” (Young and Rodgers 1998). However, regardless of clinical status the phenomenon is becoming a recognised global concern with a growing need to provide effective and accessible health interventions for users to at least re-gain control (Montag and Reuter 2015).

The wealth of information and digital connectivity is a characteristic of modern society but its excessive and obsessive use, i.e. DA, may result in a less sustainable society and create serious social and mental well-being problems. The consequences of DA, on individuals and collectively, include poor academic performance, reduced social and recreational activities, relationships breakups, low involvement in real-life communities, poor parenting, depression and lack of sleep (Young 1999, Echeburúa and de Corral 2009, Kuss and Griffiths 2011). DA manifests psychological characteristics and along with dependency the user can experience withdrawal symptoms (e.g. depression, cravings, insomnia, and irritability). Estimates of DA vary according to the country and according to the definition of DA being studied. Estimates of internet addiction suggest 6%-15% of the general population test positive on signs of addiction; this figure rises to 13-18% among university students who have been identified as most at risk for DA (Young and de Abreu 2011); at 18.3% UK has a relatively high prevalence of DA amongst university students (Kuss, Griffiths, et al. 2013).

Addiction to social networking sites (SNS), such as Facebook, is considered a specific form of DA (Andreassen et al. 2012, Cheak et al. 2012). SNS has become an essential platform for social interaction, and their usage has grown exponentially in the past decade (Hughes et al. 2012, Ryan et al. 2014). This is evident as recent statistics by Facebook reported that as of December

2014, there were 1.39 billion active users who use their platform on a monthly basis (Facebook 2015). Twitter, another major SNS global player, reported that 500 million short messages called “Tweets” are sent per day (Twitter 2015). Despite SNS’ benefits, they have also caused the emergence of a potential online disorder termed as “SNS addiction”. SNS addiction is defined as a failure in controlling SNS usage that leads to negative personal effects and outcomes (LaRose et al. 2010).

A review of addiction to SNS (i.e. Facebook addiction) by Ryan et al. (2014) concluded that this behaviour could cause negative effects such as the development of deficient self-regulation (S Z et al. 2011), task avoidance and procrastination (Sheldon 2008), as well as mood alteration such as depression and anxiety. In other studies, Cam and Isbulan (2012) concluded that male students were more likely to have SNS addiction as compared to female students, while Hong et al. (2014) found out that SNS addiction can be associated with usage level and depressive character. A cross-sectional study found out that SNS addiction is related to a set of aspects including social interaction, passing time, entertainment, companionship, and communication motives (S Z et al. 2011).

2.1.1 DIGITAL ADDICTION DEFINITIONS

There are four DA definitions identified in the literature. *Problematic Internet Use* (Caplan 2005); *Generalised Pathological Internet Use* (Davis 2001); *Internet Addiction* (Ha et al. 2006) and *Technological Addiction* (Griffiths 1996). Different terms are, also, used to describe the object of addiction, e.g. Internet and technology, in the definitions. In addition, different terms are used to describe the behaviour, e.g. addiction, generalised pathological use, problematic and compulsive. They are used either interchangeably or based on the focus and emphasis of the studies.

- Definition one: “*Problematic Internet Use is a multidimensional syndrome consisting of cognitive and behavioural symptoms that result in negative social, academic, or professional consequences*” (Caplan 2005).

- Definition two: **Generalised Pathological Internet Use** is conceptualised as a multidimensional overuse of the Internet itself that results in negative personal and professional consequences (Davis 2001).
- Definition three: “**Internet Addiction** is the inability of individuals to control their Internet use, resulting in marked distress and/or functional impairment in daily life” (Ha et al. 2006).
- Definition four: **Technological Addiction** is operationally defined as non-chemical (behavioural) addictions that involve human–machine interaction (Griffiths 2000a).

2.1.2 DIGITAL ADDICTION TERMINOLOGIES COMPARISONS

The first part explores the terminologies used to label the *condition*. Fundamentally, the condition indicates a heavy degree of uncontrollable involvement in a certain behaviour that leads to both pleasure and relief of discomfort but, unfortunately, in a way that can harm a person socially, physically and psychologically. The second part is related to the peculiarities of the *object* itself, e.g. the Internet, digital, online and software-mediated communications.

2.1.2.1 THE CONDITION

There exists a wide range of arguments on the concept of addiction. One is whether addiction is a compulsive or no more than a personal choice (Heather 1998). The author explained why using the term “compulsive” to define behaviour would not positively contribute to the foundations of solutions. In respect to addicts, this would convey the notion of being compelled to that behaviour and can claim that it is not their fault. On its own, this would likely cause socio-legal implications. The development companies, on the other hand, can claim that their products are addictive-free as addiction is a property of the users, not the products. The use of the notion “compulsive” has led to a wrong interpretation of the addiction. The association between addiction and compulsiveness expresses the idea of being completely unable, physically and mentally, to stop the behaviour. In spite of that, treating addiction as a complete voluntary engagement is also debatable (Heather 1998).

Behavioural “dependency” is another notion used as a key aspect of the addictive behaviours. This term has also fuelled further debates. In fact, introducing this term was initially to label the addiction as a mental disorder. Surprisingly, in the 80s, this term gained wider acceptance to define the phenomenon than the word addiction itself. However, in terms of the withdrawal symptoms, dependency as a pharmacological response is very distinct from dependency as drug-seeking behaviour, i.e. addiction (Fainsinger et al. 2006). The authors also explained that this pharmacological response is a physical dependency rather than a mental disorder. In other words, behavioural dependency is not a term that would objectively express the crux of the addiction since it is only used to express the pharmacological effect side of it.

The term “Pathological” Internet Use has been adopted from pathological gambling (Davis 2001), which is viewed as “most akin” to Internet addiction according to Young and de Abreu (2011). This term is used to label the usage when it is not at the degree of addiction, e.g. psychological dependence. According to Spitzer et al. (1994), dependency is more associated with substances, while pathological with behaviours, e.g. gambling.

The terms “Problematic” and “Excessive” Internet use are interchangeable terms used to describe the over involvement with Internet applications. However, those terms do not convey the meaning of addiction, as excessive Internet use may and may not be pathological and addictive (Widyanto and Griffiths 2006).

However, Widyanto and Griffiths (2006) highlighted that using different terms to label the behaviour is normal as more studies still needed to explore various dimensions of the condition. Also, different studies are concluding new and sometimes conflicting results. These discussions present various perspectives and debates to understand this condition.

Also, some models have been proposed for better understanding and define the condition. Young and de Abreu (2011) provided extensive discussion which can be summarised as follows:

- **Cognitive behavioural model:** within this model, two patterns were identified. Specific pathological Internet Use (PIU) in which the addiction is driven by specific

content, e.g. pornography and addicts would likely try to find an alternative way to consume that particular content if they cannot access it online. The second pattern is the General PIU, which is basically “multidimensional overuse” in that satisfaction is linked to being online (i.e. not content-driven), so online communication is preferred over face-to-face format.

- **Neuropsychological model:** theories in this model suggest that the brain can develop a dependency on Internet similar to that in substance addiction.
- **Compensation theory:** it suggests that addiction is a form of compensation for what individuals lack in real-life.
- **Situational factors:** the Internet is utilised to cope with situational difficulties (e.g. divorce and disability), as it is believed to be safer, legal and even cheap in comparison to substance-based addiction.

While there are several theories proposed to formulate a deep understanding of such problematic behaviour, Davies (2001) stated that addiction is still seen as a myth. The author argued that using some empirical methods (e.g. self-reports) to investigate the phenomenon led to confusion in that the results are very vulnerable to the context of the study. In other words, addicts use different forms of language to describe their behaviour based on the person who investigates the phenomenon. This is because of several reasons such as they tend to express compelled behaviour to seek forgiveness and help when talking to police and health workers, but express a preference and personal choice when talking to peers.

2.1.2.2 THE OBJECT

In the literature, various terminologies were associated with this condition and describing the object of the addiction, e.g. the Internet, digital, online and software-mediated communications. These terms are characterising the medium in which this behaviour emerge.

“Internet” Addiction as a terminology is widely used to describe this form of behaviours.

Young and de Abreu (2011) claimed that the Internet Addiction covers various behaviours such

as cyber-sexual addiction, cyber-relationship addiction, net compulsions including online gambling, shopping or day-trading, information overload and computer addiction.

“Technological” addiction, on the other hand, described by Griffiths (1996) as a “generic label” in which Internet addiction is a subclass. Many addictive technological devices can be included, such as the computer, mobile, TV, video gaming.

“Online” addiction is also used in some other works, e.g. Douglas et al. (2008), to label certain addictive activities, services or functions that are available on or performed over the Internet or other networks. These activities include online gaming, e-mailing, social networking, instant messaging, and chat rooms. This term seems to be preferable as these online communications proved to drive more compulsive usage in comparison to other technological applications, e.g. offline video gaming.

However, Young and de Abreu (2011) pointed out that Internet-enabled compulsive behaviour or digital media compulsion probably the most accurate terminologies for labelling this condition. They explained that this is because many addictive behaviours are associated only with the Internet have now been observed in the new digital devices such as personal digital assistants (PDAs), MP3 players, Internet-enabled gaming devices and smartphones, to name a few.

2.1.3 RISK FACTORS

There are several factors that contribute to DA. Through the reviewing of the literature, factors were clustered into three dimensions: individual, software and contextual.

2.1.3.1 INDIVIDUAL FACTORS

Mental disorders, such Attention-Deficit, Hyperactivity and social anxiety can also be linked to DA (Ko et al. 2009). Oulasvirta et al. (2011) identified that checking behaviours including “*brief, repetitive inspection of dynamic content quickly accessible on the device*” can become habitual and hence lead to some degree of addiction. This was also emphasised by Cheak et al. (2012). Disinhibition (Suler 2004), self-disclosure (Tamir and Mitchell 2012) and hyperpersonal aspect (Bellamy and Hanewicz 2001) are further examples of associated behaviours.

Personal traits can also influence how people interact with digital technology. Impulsive personality, which has “*tendency to respond impulsively without sufficient forethought*” (Sternberg and Grigorenko 1997), has been shown to have a direct link to DA according to Sarramon et al. (1999). There is also a wide range of emotions linked to DA, such as the anticipation which is an emotional motor of checking habit in that users become worried about what is going on online (Griffiths 2000a). Anticipation is also part of escapism or the desire to change current mood state. Social network features, e.g. news and notification and spontaneous responses, can be argued to be using anticipation to keep users engaged. This is often framed positively as enhancing users’ experience while the potential of facilitating DA experience is often neglected.

DA strongly relates to users’ requirements as well. People use a software as a means to reach certain requirements; such as increasing popularity and connectedness; however, while doing so, they may eventually develop a problematic usage style (Alrobai et al. 2014). These requirements can be classified into three main categories: motivational, value-related and goals. Kujala and Väänänen-Vainio-Mattila (2009) discussed the differences between these requirements and their influence on human-computer interactions. Bumgarner (2007) investigated the tacit nature of such requirements giving further types such as exhibitionism, voyeurism, conformity and social recognition. This thesis suggests that these same features can be also used to aid people to regulate their usage in a social setting. In other words, the motivation, values and goals of our special kind of social network is to reach a usage style which is consciously regulated.

2.1.3.2 SOFTWARE FACTORS

It was noticed that most studies treated the Internet as one entity and ignoring the peculiarity of the applications within this medium. However, Young and de Abreu (2011) argued that “*some applications might serve as triggers for the reinforcement of continuous use. This means that patients should stop navigating particular websites or even certain applications*”. The authors highlighted important questions and gaps in knowledge. First, some applications within the Internet have special triggers built into them. So, it is still needed to answer what are these

applications, why they are so addictive, and also, what are these triggers and addiction-enhancing properties.

Lee et al. (2014) stated that problematic usage behaviours could be triggered by external cues such as updates notifications. Hart et al. (2008) pointed out that *variable discoveries* by “*surprise and serendipity*”, such as suggesting new friends on Facebook, act as a powerful rewarding mechanism. Such discoveries (AKA Variable Ratio Reinforcement Schedule) provide “*variable degree of unpredictable rewards*” (Young and de Abreu 2011). When these rewarding discoveries are learned and personalised, users tend to spend more time online than they initially intend to (Chen et al. 2009). Nielsen (1998) defined personalisation as a feature to tailor content and services actively to individuals based on users’ models and needs. Software privacy settings can also lead to excessive use of social networks. Yogo et al. (2012), for example, designed an incentive-rewarding mechanism specific to SNS. Their mechanism utilises social sites features such counts of page views and likes to motive users to upload content on the public network instead of sharing that with their friends only.

The literature lacks robust and comprehensive studies investigating the roles of the user interface in accelerating addiction. However, as the user interface is the space where all users’ interactions occur, this thesis argues that this dimension is one of the core components of DA. Carr (2011) and Wilkinson (2012) claimed that human beings’ bodies release dopamine every time distractive updates arrive, e.g. a new like or comment. These updates may act as stimuli that bodies want to attain and with time people can become used to getting them and changing mood. User interface’s prosperities such as usability, accessibility, customisation and multitasking might also play important roles in facilitating DA. However, more studies need to be conducted to clarify the extent and significance of this influence.

Eyal (2014) proposed the hook model in **Figure 3**. The model consists of four phases: trigger, action, variable reward and investment. It is articulated to explain how companies develop habitual products. Eyal (2014) explained that users are triggered internally or externally to perform an action, e.g. post a Facebook status. The action is performed due to an anticipated

reward(s). The action phase is designed based on two usability-engineering principles: ease of use and motivation. The online space designs which embrace these two principles increase the chance of users starting to take actions. These actions are then linked carefully to variable rewarding that should not be made predictable. As users invest time, money, or efforts, they are likely to be “hooked” to the software in its action-reward loop.



FIGURE 3: THE HOOK MODEL (EYAL 2014)

2.1.3.3 CONTEXTUAL FACTORS

DA can also strongly relate to contextual factors. Young and de Abreu (2011) argued that people now are expected to be accessible anytime and anywhere which can increase stress and lead to addiction. Also, the influence of *institutional* environment is a known concept inspired by the famous psychological experiment called the Stanford Prison Experiment (SPE) (Zimbardo 2011). The experiment was conducted in 1971 by a psychology research group at Stanford University. The participants were healthy and normal college students who were randomly assigned to play the roles of either prisoners or guards in a small mock-prison at the basement of the Stanford psychology building. While the experiment was designed to last 14 days, it had to be ended on day six due to the unexpected psychological torture that took place. This has been hypothesised to be related to what is called “internalised roles”. Subjects’ behaviours of this experiment were

dramatically transformed into unanticipated form due to the system, i.e. the systematic model as the professor Zimbardo explained (Zimbardo 2011).

Designing for behavioural change, whether to make the cyberspace more engaging and immersive or also to increase conscious and regulated nature of the usage, with neglecting behavioural context can lead to unintentional results. Zimbardo (2011) explained that transformation of human behaviours could be related to 1) dispositional attribution, i.e. “The Bad Apples”, 2) situational factors, i.e. “The Bad Barrel”, or 3) the system, i.e. “The Bad Barrel-Makers”. The latter dimension is one of the main conclusions of the Stanford Prison Experiment which calls for considering the design of the system that made the situation take an undesirable and unpleasant twist. In online peer groups to combat addictive behaviours, members can experience recurring episodes of relapse and denial. This may cause behavioural contagion and reinforcement of behaviour instead of correcting it. Hence, such mechanism can be double-sided sword in both its design and management phases.

Also, in reference to the Stanford Prison Experiment, the normal and mentally stable participants who played the role of prison guards, i.e. the good apples, were put in a “Bad Barrel” and the results were shocking due to the system that did not address the power aspect embedded within the system, the triggers of the diffusion of personal responsibility, “*giving power without oversight*” and moral disengagement (Zimbardo 2008). Thus, the situation was aggravated.

Consequentially, besides the importance of addressing the role of individual pathology to explain the behavioural change, there is the inclination to overlook contextual and systematic perspectives. In other words, to influence behaviour, it is important to check and perhaps influence the situation where that behaviour occurs. Yet, changing the situation would still require changing the bigger system that hosts and maintains that situation. As such, it would be very important to study the ecosystem of peer groups and its external and internal dynamics to achieve a better and more holistic governance of their set up, interactions and maintenance and achieve high acceptance and effectiveness.

2.1.4 TESTS AND MEASUREMENTS

DA tests vary in terms of their validity, targeted audience, cross-cultural reliability and comprehensiveness. **Table 2** outlines these tests and highlights the main differences between them.

TABLE 2: DIGITAL ADDICTION TESTS

Addiction test scale	Description
Internet Addiction Test (Young 1998)	<ul style="list-style-type: none"> • Suitable for adults and adolescents • 20 item self-report • Based on the DSM-IV diagnostic criteria for pathological gambling • Provides cut-off score • Five-points Likert-type scale • Constructs (negative life consequences on daily activities)
Internet Addiction Scale (Nichols and Nicki 2004)	<ul style="list-style-type: none"> • Suitable for adults only • Relatively long (36 item self-report) • Based on (1) DSM-IV criteria for substance dependence (2) salience and mood modification • Five-points Likert-type scale • Provides cut-off score
Internet Related Problem Scale (Armstrong et al. 2000)	<ul style="list-style-type: none"> • Suitable for adults only • 20 item self-report • Based on the DSM-IV substance abuse criteria • Dose not provide cut-off score • Ten-points Likert-type scale • Constructs (tolerance, craving, withdrawal and negative consequences)
Online Cognition Scale (Davis et al. 2002)	<ul style="list-style-type: none"> • Suitable for adults and adolescents • Relatively long (36 item self-report) • Focus on cognitions instead of behaviours • Seven-points Likert-type scale • Dose not provide cut-off score • Construct (Loneliness/depression, diminished impulse control, social comfort, and distraction)
Generalised Problematic Internet Use Scale (Caplan 2002)	<ul style="list-style-type: none"> • Suitable for adults only • Relatively long (29 item self-report) • Dose not provide cut-off score • Five-points Likert-type scale • Constructs (Mood alteration, Social benefits, Negative outcomes, Compulsive use, Excessive time online, Withdrawal and Social control)

<p>Problematic Internet Use Questionnaire (Thatcher and Goolam 2005)</p>	<ul style="list-style-type: none"> • Suitable for adult and adolescents • 18 item self-report • Dose not provide cut-off score • Five-points Likert-type scale • Constructs (Preoccupations, negative consequences and Social interactions)
<p>The Compulsive Internet Use Scale (Meerkerk et al. 2009)</p>	<ul style="list-style-type: none"> • Suitable for adult and adolescents • 14 item self-report • Based on (1) DSM-IV dependence and pathological gambling criteria (2) criteria for behavioural addictions • Five-points Likert-type scale • Dose not provide cut-off score • Constructs (withdrawal symptoms, loss of control, preoccupation, mood modification and conflict)
<p>Problematic Internet Usage Scale (Gürcan 2007)</p>	<ul style="list-style-type: none"> • Suitable for adults only • Relatively long (33 item self-report) • Diagnose level or healthy and unhealthy use of the Internet, but not the addiction • Provides cut-off score • Five-points Likert-type scale • Constructs (negative consequences, social benefit/comfort and excessive usage)

2.1.5 TREATMENT APPROACHES

Wendel (2013) argued that people have the ability to change and moderate their behaviours. As such, treatments strategies should be based on this assumption. Also, treatments should cover various strategies from different perspectives as the addiction caused by wide range of factors.

Treatment approaches for DA are very limited, as this type of addiction is still not listed in the official manuals of psychological disorders, e.g. Diagnostic and Statistical Manual of Mental Disorders (DSM). The reason is that no solid data suggest recognising DA as a mental disorder. However, as addiction-like symptoms started to be very evident, many studies have been conducted to find out suitable treatment applications (AKA psychotherapeutic interventions). In fact, these treatments cannot treat addiction, but offer emotional support for an addict to overcome this problem. The list of techniques presented below is summarised by Young and de Abreu (2011) in which the authors devoted one chapter discussing them in more details.

2.1.5.1 COGNITIVE BEHAVIOURAL THERAPY (CBT)

CBT can be defined as “a structured, directive therapeutic approach that has clear, well-defined goals, is focused on the present time”. It is widely used in treating most of the psychological conditions. The “dysfunctional thought records,” “cognitive restructuring” techniques, “irrational belief identification” process are some of the CBT-based techniques (Young and de Abreu 2011).

CBT can offer very effective treatment to support the Internet Addiction recovery process. The treatment assumes that behaviours can be manipulated and changed by modifying thought processes. CBT main objective is to help patients to change thoughts and beliefs to promote long-lasting healthier behaviours. This is by teaching them how to identify thoughts that trigger addictive feelings. During the treatment, patients are encouraged to learn some coping skills as a relapse prevention strategy (Winkler et al. 2013). Also, CBT proved to provide effective results as an online therapeutic approach (Barak et al. 2008).

Young (2011) proposed Cognitive-Behavioural Therapy for IA (CBT-IA) as a comprehensive treatments approach. It consists of two phases:

- **Computer restructuring** which is focused on behaviour modification. This includes a detailed assessment of current usage to identify and eliminate triggers and then encourage time management skills. All related techniques have some persuasion techniques. For example, *personal inventory* which requires patients to list activities before addiction emerges in order to increase self-awareness. A similar tactic suggests inspecting logging files to recognise the change in the usage style and identify any emerging habits. Time management skills are essential to maximise treatment results. Patients are taught to break the routine by re-organising pattern of use to include other offline activities between online sessions. Structuring usage sessions driven by users’ desired and achievable goals can also be used to encourage addicts to focus on what they actually want to do online. Combining this technique with “external stoppers”, e.g. alarm clock, to avoid “flow experience” and divert

addicts' attention to the planned goals will improve the situation. Finally, time management techniques for better organising the time spent online.

- ***Cognitive restructuring*** which addresses maladaptive thought processes that trigger addictive behaviour. This phase is also labelled as “Harm reduction therapy” in which underline issues that lead to DA are resolved to avoid relapse. This includes the impact on addicts' personal and occupational lives as well as emotional consequences.

2.1.5.2 INPATIENT AND OUTPATIENT CARE

Primarily, treatment for addictive behaviours is delivered in two settings: inpatient, outpatient. In the inpatient care, highly structured short-term residential programmes are offered to clients. In some care centres, the care starts with acute detoxification followed by a rehabilitation programme. Outpatient care setting is for long-term maintenance which typically includes group therapy sessions run on a weekly basis. For homeless people, the community-based facility is typically offered as an alternative to inpatient care. Regardless of the treatment setting, other aspects, such as modality, treatment length, and qualities and actions of therapists, have more influence on the treatment efficiency (Heather and Stockwell 2004).

The first inpatient centre for DA was in Beijing. The Illinois Institute for Addiction Recovery (IIAR) have started offering treatment for clients diagnosed to have DA in 1996 (Young and de Abreu 2011). IIAR provides assessment performed by a certified addictions counsellor who is trained to identify and treat this condition. The assessment is to determine the level of care required. The requirements to obtain admission also include, 18 years old, being a help-seeker, and abstinence from other addictions, e.g. drugs and alcohol (Illinois Institute for Addiction Recover 2017).

2.1.5.3 MOTIVATIONAL INTERVIEWING (MI)

Motivational Interviewing can be defined as “*a method of directive assistance that is centred in the patient being willing to promote an internal motivation to change a behaviour by exploring and troubleshooting the ambivalence that the patient presents with*” (Young and de Abreu 2011).

MI techniques (AKA Motivational-counselling) aim at engaging addicts in constructive and confronting-oriented discussions to help them to realise their own real goals and how that might be impacted by their behaviours. It is described as a collaborative, participatory, and autonomous (Young and de Abreu 2011). This approach targets addicts' self-motivation to trigger a change. Initially, counsellors use some techniques such as empathic listening to minimise resistance followed by discussions to explore clients' values and goals in order to stimulate change (Heather and Stockwell 2004).

Heather and Stockwell (2004) explained that the ultimate aim of this approach is to create a free of conflict atmosphere to elicit motivation rather than impose it. Counsellors' work revolves around three concepts: i) readiness to change, ii) resolving ambivalence, and iii) reduce resistance. Working closely with a client is an important aspect of this approach. The reason is that the counselling journey normally begins with a high level of uncertainty from both parties (i.e. the counsellor and the client) about the goals and a client's capacity to achieve them (Heather and Stockwell 2004). Generally, this approach is goal-directed, motivational-based, patient-centred and highly dependent on the counsellor skills to steer the process (Young and de Abreu 2011). A client is expected to seek help, acknowledge responsibility, seek consistency with personal goals and values, and enhance self-esteem are the core principles of this approach (Miller 1983).

2.1.5.4 OTHER APPROACHES

In addition to the above-mentioned approaches, modification to the environment is suggested to reduce the time spent online. For example, setting usage rules, e.g. specific time to access the Internet, installing monitoring software to track usage, placing the computer in a visible area, to name a few.

Another approach is based on pharmacological interventions. While the results of using this approach suggest that the time spent online and the addiction-related symptoms can be reduced, the studies examining this approach are very limited, and the findings are still preliminary (Winkler et al. 2013).

Zhu et al. (2013) conducted a study to assess the efficiency of treating Internet addiction by combining electro-acupuncture with psychological intervention. The results based on Internet addiction self-rating scale were significant, i.e. scores are lowered. The authors explained that this is due to the improvements in cognitive functions related to the external stimulus. Patients can also be encouraged to develop offline activities in order to balance their online and offline life.

2.1.5.5 *DIGITAL DETOX*

In worst-case scenarios when the above techniques fail, abstinence may be prescribed. It is similar to detoxification programmes offered for alcohol addicts. Smith & Jones BV Mental Health Care in Netherlands was the first video game detox centre in Europe. The clinic successful story emerged from the use of traditional abstinence-based treatment models (Maguire 2008).

In China, military-style boot camps have been opened by the governments to offer treatment for teenagers who suffer from DA. Clients are expected to be engaged in physical training and attend ethical lessons (Gumbrecht 2016). Similar boot camps have also been created in South Korea, such as the Jump Up Internet Rescue School in Mokcheon (Koo et al. 2011).

While this approach might help in the severe cases, Young and de Abreu (2011) pointed out that conventional abstinence in which addicts are completely refrained and restricted from using the Internet is not practical. Instead, addicts need to identify their problematic applications and stop using them for a period of time and replace them with other applications by which they can self-moderate their usage. Reminder cards listing, for example, some consequences caused by being addict might help to continue the abstinence.

2.1.6 MODALITIES FOR DELIVERING PREVENTION AND TREATMENT

There are different modalities for treating addictive behaviours. Modality refers to the setting of delivering treatment or a prevention approach.

2.1.6.1 *SELF HELP*

Self-help aims at assisting individuals to obtain behavioural interventions without attending treatment programmes (Lancaster and Stead 2005). It is mainly focused on enhancing individuals'

belief about their capacity, i.e. self-efficacy, to achieve their own goals (Watkins and Clum 2007). For example, in the area of smoking cessation, most of the smokers quit on their own (Fiore et al. 1990).

Self-help takes different forms, such as multimedia materials for personal access and use. Lancaster and Stead (2005) pointed out that some principles can help to tailor this modality. For example, action-oriented interventions might be less effective for individuals in the pre-contemplation stage according to the Transtheoretical Model (Prochaska 2013).

This modality provides a wide range of advantages, such as targeting wider population, cost-effective, anxiety reduction such as the stigma of seeing therapists, improve confidence, provide coping skills which can help to address other emotions associated with the primary condition. However, interventions based on this approach often lack scientific evaluation (Watkins and Clum 2007).

2.1.6.2 COUNSELLING THERAPY

Therapeutic counselling is a private, often confidential and counsellor-delivered modality where individuals attend counselling sessions to express their issues, feelings and limitations. Typically, a counsellor elicits subjective aspects and descriptions of the clients' experience while taking the role of an active and deep listener to explore their points of view and to highlight the points that need to be clarified further. The aim is to help clients to explore positive alternatives free of biased judgments. The counselling format can follow different approaches, such as Motivational Interviewing and Cognitive-Behavioural Therapy (CBT) (Young and de Abreu 2011).

2.1.6.3 SUPPORT THERAPY

Support therapy focuses on providing social and emotional support. The support can be from two primary sources: *natural* support (e.g. family and friends) and *formal* support (e.g. professional and communal) (Hogan et al. 2002). Peer groups can be classified as formal support if counsellors are involved, while communal if it runs as a peer-to-peer social network. It can also be run in a blended modality where the governance and implementation of the peer support is a shared

responsibility between counsellor and peers. In both sources, there are two primary forms of support outlined by Hogan et al. (2002):

- **Direct support:** support can be i) emotional (e.g. empathy and sense of acceptance), ii) informational (e.g. guidance and advice), and iii) instrumental (e.g. offer services and financial support).
- **Indirect support:** it is concerned with producing “*enduring changes in naturally occurring support*”, such as improving personal skills and providing strategies to help an individual to attain the desirable change. For example, in support therapy for addictive behaviours, providing individuals to self-express their feelings and rehearse that will improve both coping and social skills, as well as help to reduce denial.

Support therapy is more related to the formal support where active engagements in constructive discussions and relevant problem-solving activities are expected. Some formal therapies involve family to rebuild relationships damage (Hogan et al. 2002). Also, some scholars categorise self-help as a formal support where structured help is provided by specialised roles in self-help groups (AKA group intervention (Hogan et al. 2002), and in one-to-one format (Bassuk et al. 2016).

Some of the support therapies adopt the 12-steps model of Alcoholic Anonymous, which provides guiding principles for recovery (VandenBos 2007). Help can also be drawn from the experience of those who successfully recovered (Mead and MacNeil 2006). Mead and MacNeil (2006) list the core principles of this modality:

- **The peer principle** where the help can be obtained from someone who shares similar experience and shortcomings.
- **The helper principle** in which helping other provide self-healing.
- **Empowerment** by finding hope and taking personal responsibility for seeking and applying the change.

- *Advocacy* which includes skill development, reciprocity, support, sense of community, and developing awareness.

2.1.6.4 ONLINE-BASED THERAPY

Online therapy is defined as “*the provision of mental health services through the Internet*” (Cook and Doyle 2002). There are concerns about the full reliance on this modality and whether it shall be used in combination with face-to-face sessions, e.g. at least at the start of the therapy. One of the concerns is the impact of the clients being geographically separated from their counsellors (AKA *therapeutic alliance*). In healthcare practices, professionals stress the need for the therapeutic relationship to increase engagement, generate hope, and ensure positive transference. This is to build objective-relationship (Loewald 1960), and working alliance that is conceptualised in three components: task, goal and bond (Bordin 1979).

In recent studies, the results suggested that online modality can also have its advantages, such as making people more comfortable and less intimidated (Riva et al. 2017). The benefits can also be in term of the effectiveness as the online space provide unprecedented features of which are real-time, interactive and even immersive (e.g. virtual reality, gamified systems, role-playing, therapy networking, and online support groups). It also empowers self-regulation by enabling self-monitoring and behaviour tracking and visualization (Barak and Grohol 2011). In relation to DA, the use of online support can be controversial as the online space becomes both the medium for the problem and solution. Hence, research on the systematic design and managed interaction and usage of online peer groups is still needed.

2.2 BEHAVIOURAL CHANGE THEORIES AND MODELS

Behavioural change theories are mainly used to bridge the gap between attitudes and behaviours. These theories aim at reducing discrepancies between these two conceptual constructs such as, for example, the gap between the intention to change a behaviour and the act of actually doing so (Webb et al. 2010). This is achieved by encouraging individuals to create a plan to achieve the targeted behaviour. This section presents eight prominent theories and models to understand the core dynamics of behavioural change. It can be argued that each theory and model focus on

specific aspects, but they can still complement each other to provide a more holistic picture of human behaviours.

2.2.1 THE THEORY OF PLANNED BEHAVIOUR

The Theory of Planned Behaviour (TPB) proposed by Ajzen (1991) is a social cognition model that emphasises the role of the intention to predict actions (Webb et al. 2010). This theory suggests that the intention itself is an outcome of three components: i) personal attitude toward the behaviour which is influenced by expectation and the desired outcomes, ii) social factors (e.g. social pressure and norms) which are determined by expectation of peers and individual motivation to comply with their beliefs, and iii) the perceived capacity to perform the behaviour.

This theory evolved from the Theory of Reasoned Action (Bagozzi 1986) by adding the third component which conveys the same meaning of self-efficacy (Terry and O'Leary 1995). These components can be utilised to build exploratory frameworks aim at predicting individuals' behaviours (Riekert et al. 2013).

This theory is suitable to identify what to change, i.e. factors, but not to offer suggestions for change (Hardeman et al. 2010). Also, the theory constructs can be mapped to some processes of the Transtheoretical Model proposed by Prochaska (2013). These processes are consciousness raising, environmental re-evaluation, dramatic relief, self-liberation. For example, self-liberation is about the belief in the ability to change, i.e. *perceived behavioural control* according to the theory of planned behaviour. Also, it can be utilised to identify what intervention strategies to use. For example, the *normative influence* as a persuasive principle (Torning and Oinas-Kukkonen 2009) may yield better outcomes if the issue stems from wrong perception, e.g. “no one can reduce digital usage”.

2.2.2 SOCIAL COGNITIVE THEORY

The Social Cognitive Theory (SCT) proposed by Bandura (1986) which is also a social cognition model that relays on the individuals' intentions to predict actions. It shares the key principle (i.e. intention) of the Theory of Planned Behaviour but places a greater emphasis on the self-efficacy

(Webb et al. 2010). Also, people would develop positive incentives by seeing others with similar cases performing the action and gaining the desired outcomes which improve the motivation and increases the chances to behavioural change (Mark et al. 2011). This can be mapped with *social learning* principle in the persuasive techniques listed in (Torning and Oinas-Kukkonen 2009). As such, one might conclude that these theories are complementing each other to provide more effective and sustainable behavioural change.

2.2.3 THE CONTROL THEORY

The Control Theory is “*a general approach to understanding the self-regulating systems*” (Carver and Scheier 1982). It requires goal(s) as a “reference value” to compare against the current rate of the behaviour. It can be seen as a class of feedback loop models but rarely used as a baseline for intervention systems for addictive behaviours. However, this concept of behavioural monitoring has been widely used in self-regulating systems. The issue in this theory in relation to addictive behaviour is the difficulty in setting goals (Webb et al. 2010). However, Webb et al. (2010) argue that this theory can be a useful framework to integrate other processes and theories of self-regulation, such as the Health Believe Model and Goal Setting Theory. The use of software-assisted monitoring and feedback provides new potential for this theory for monitoring and combatting DA.

Sayette and Griffin (2004) argue that difficulty in setting “standards” (i.e. goals) may interfere with the behavioural change. The difficulty stems from distorted standards, e.g. smoking improve mood. He also emphasised the conflicting goals, e.g. living healthy and enjoying the moment.

2.2.4 TRANSTHEORETICAL MODEL

Transtheoretical Model (AKA Stages of Change or SoC) proposed by Prochaska (2013) is one of the prominent models in the area of behaviour change research (Nisbet and Gick 2008). It is widely recognised model by many researchers and practitioners (Sutton 2001). This model suggests that the behaviour change goes through five milestones: pre-contemplation, contemplation, preparation, action, and maintenance.

The model is an attempt to integrate 10 core processes of behavioural change (e.g. consciousness-raising, counter-conditioning, and stimulus control) and map them to the stages of the model (Sutton 2001). Some of the processes belong to more than one stage. Some TTM-based scales for addictive behaviours were, also, developed to identify the current stage of change such as the URICA scale (Dozois et al. 2004), SOCRATES scale (Miller 1994), and RCQ scale (Heather and Hönekopp 2009).

This model suggests that individuals who belong to the same stage are expected to have shared problems: *“People within the same stage should face the same types of barriers and be most helped by the same type of intervention”* (Nisbet and Gick 2008). Thus, similar interventions can be applied.

Prochaska and Velicer (1997) pointed out that individuals might be trapped in one of the early stages unless the system applies planned interventions to progress them. However, the lack of standardised methods to assign individuals to different stages of the model can impact the overall outcomes of the TTM-tailored interventions (Adams and White 2005). Thus, more evaluation techniques are needed to help practitioners to assess how individuals progress within the stages.

While this model is widely used in intervention systems, failure is highly expected when there is a lack of standardised mapping methods as highlighted above. Also, some behaviours are very complex as it involves a collection of behaviours that are interrelated and the mapping can be impractical (Adams and White 2005).

2.2.5 THE HEALTH BELIEF MODEL

The Health Belief Model (HBM) was developed in 1950 (Janz and Becker 1984). The main assumption of this model is that individual *“must feel personally vulnerable to a health threat”*, as such protective measures would be perceived necessary and, hence, potentially performed (Nisbet and Gick 2008). Performing a particular behaviour depends on four factors: perceived susceptibility to and severity of disease, perceived benefits, perceived barriers, and perceived self-

efficacy (Glanz et al. 2008). All these factors deal with one's perception of the self and the external risks. Also, this model advocates the self-efficacy concept as theoretical underpinning.

One might argue that the model may not be effective in the field of addiction where individuals may hold a strong belief that they are not addicts regardless the evident symptoms, i.e. denial of reality. Therefore, the model is applied widely to situations require rational protection such as AIDS risks, cancer screening and dental hygiene (Nisbet and Gick 2008). Also, Webb et al. (2010) argue that there is no published work for HBM-based interventions in the field of addiction. However, the authors believe that this model can provide good understanding for DA, yet no scientific work has been done in this field. In their work published in 2016, it was shown that some constructs of the HBM (e.g. *perceived benefits* and *perceived barriers*) are risk factors for the DA (Wang et al. 2016).

2.2.6 GOAL SETTING THEORY

The Goal Setting Theory (Locke and Latham 1990) suggests that goals setting can have a positive impact on the performance. The two pillars of this theory are:

- ***Specificity*** (i.e. by specifying a “reference point”) in which targeting a specific goal(s) is more effective than ‘do-your-best’.
- ***Difficulty*** which revolves around the perceived capability to achieve the goals. The difficulty refers to the self-efficacy concept.

Goal Setting is widely applied to the field of addictive behaviours, where goals difficulty is expected to go beyond the individuals' comfort to overcome addiction (Webb et al. 2010). The decision on setting up the goals is still a research issue, e.g. whether it should be self-set, provider-set, participatory-set, or setup by recommender systems (Strecher et al. 1995). Goal setting is a key element to guide monitoring processes and make it more meaningful. Glanz et al. (2008) outlined three important aspects to define a goal:

- Intention as a core component.

- A goal should be formulated taking into account the proximity of the outcomes (i.e. distal or proximal goals).
- Building goals based on planned and incremental steps to enhance self-efficacy.

The relevance of the collective goals to group's members is one of the main factors that can bind individuals together and then increase sustainability. Suggesting goals that are irrelevant to members could severely affect group sustainability. Therefore, there should be a "S.M.A.R.T" way of setting up goals (Doran 1981).

2.2.7 CIALDINI'S PRINCIPLES

Cialdini (2009) proposed a list of evidence-based persuasive principles to influence behaviour. These principles provide an understanding of the psychology of persuasion. This model consists of six components:

- **Reciprocity**: it can be applied in two different forms: i) the *social obligation* to give back a favour, and ii) the *reject then retreat* in which an individual is given an exaggerated information (e.g. price), then offer an acceptable alternative to enable contrasting and accept the alternative.
- **Consistency and commitment**: it focuses on the individual alignment (i.e. trying to be consistent when committing to an action).
- **Social proof**: individuals are influenced by what other do (e.g. social norms). It can refer to the sense of belonging concept, and it may be a result of trying to avoid punishment as well.
- **Liking**: individuals feel obliged to those they like. Liking can stem from different sources such as trust, similarity, and attractiveness.
- **Authority**: individuals feel obliged to obey those with authoritative roles, such as parents, managers and police.
- **Scarcity**: individuals have more inclination to avoid loss and potential regret.

2.2.8 FOGG'S MODEL

The Fogg's model (2009) provides a framework to guide designers to identify the barriers that may prevent performing a behaviour. This model argues that three factors are required to perform an action:

- Sufficient **motivation**: motivation can be described based on “pleaser vs. pain”, “hope vs. fear”, and “social acceptance vs. rejection”,
- Sufficient **ability**: the design is expected to facilitate a behaviour, so it can be easily performed, rather than teaching how to avoid perceived difficulty which may cause resistance.
- Adequate **trigger** which can take three different forms: **spark** to target those with a low motivation (e.g. social support), facilitator to target those with a low ability (e.g. one click to get things done), and signal to target those with high ability and motivation (e.g. reminders).

2.3 TECHNOLOGY-ASSISTED BEHAVIOURAL CHANGE

Behavioural change technology (AKA E-health) is software-based tools designed to provide a wide range of services to promote broader management of healthcare especially for those who cannot access healthcare services. The provided services can range from simple reminding and monitoring utilities to complex management and interventions systems (Bennett et al. 2010).

2.3.1 THE ADOPTION OF TECHNOLOGY IN HEALTH CARE

In mental health practices, research has shown a growing need for alternative approaches to providing health interventions. This is due to the limited resources in psychological services (Leigh and Flatt 2015). For example, according to a report released in 2010 (Mind 2010), NHS waiting time to receive mental health treatment is becoming a serious issue. The report stated that one in five people have been waiting over a year to access physiological therapy. In extreme cases, the human cost of this lack can be very critical. In September 2014, the Independent newspaper

revealed that thousands of people have tried to commit suicide as a devastating impact of the inability to receive the treatment at the right time (Cooper 2014).

The introduction of the IT solutions to healthcare management has generated technological innovations that have a potential to address this constraint. E-health technology for behavioural change is one of these innovations that offer an opportunity to mediate professional interventions and promote health and well-being.

E-health technology for behavioural change is an emerging topic where its adoption in several addiction related fields is increasingly witnessed. For example, online intervention is being used for alcohol addiction to encourage responsible drinking (Bewick et al. 2008). Also, the advances in information technology and Web 2.0 have enabled a new range of possibilities including a more intelligent, context aware, continuous and social online interventions. As evidence, the use of mobile applications for behaviour change is becoming a trend, e.g. for smoking cessation (Bricker et al. 2014), medication adherence (Dayer et al. 2013), diet and eating disorder (Pagoto et al. 2013), to name a few.

2.3.2 THE RAPID-GROWTH MARKET AND RISKS

According to a recent report investigating the market size of these applications, there will be 1.7 billion devices with access to E-health applications by 2017 (Research2Guidance 2013). The revenue of this market will grow by the end of 2017 to \$26 billion generated not only from paid downloads but also the services and hardware sales supporting them. These growth projections suggest the great potential and adoption of this technology.

Despite this trend, there is a lack of credible evidence of the effectiveness of these applications. What could be vital is the ever-increasing volume of people using these applications and the high incidence of their negative side-effects, e.g. technology dependency and anxiety for self-diagnosis (Leigh and Flatt 2015). Also, software-based mental interventions, such as the ones in NHS library (NHS 2015), fail to prove clinical evidence of a long-term change (Leigh and Flatt 2015). One of the reasons could be the lack of robust integration of these applications with primary healthcare systems (Research2Guidance 2013).

2.3.3 E-HEALTH TECHNOLOGY AND DESIGN CONSIDERATIONS

Wendel (2013) outlined two types of behaviours that can be addressed in behavioural change technology. The first type is for behaviours within daily lives, e.g. losing weight. This can be labelled as technology to *facilitate a change* in which adjusting the behaviour is the main purpose of using the product. The second type is behaviours that are part of using a product, e.g. learning a language by using software, which can be labelled as technology to *mediate a change* in which adjusting the behaviour is needed to benefit from the product. In both cases, people have the ability to make some voluntary adjustments to benefits from such technology.

In the field of addictive behaviours, the intervention strategies are suggested to consider designing to avoid triggering habits and replace them with better ones. Wendel (2013) argued that in order to design for behavioural change, three stages need to be taken into account: i) ensure users' satisfaction with using the product, ii) thorough understanding of users' behaviours to be able to influence them and iii) continuous testing of the product.

Before someone executes an action, five preconditions, i.e. mental process, must occur at the same time. These are cues, reactions, evaluation, ability and timing. To design a product for the behavioural change, one or more of these five preconditions should be influenced. **Figure 4** shows these five stages and the barriers that may prevent the occurrence of an action. A good design should also address these barriers, e.g. distractions (Wendel 2013). To maximise the opportunity for behaviour changed to occur, three components need to interact: i) capability (e.g. goal-settings, monitoring, feedback and specific plan), ii) opportunity (e.g. rewards), and iii) motivation (Michie et al. 2011).

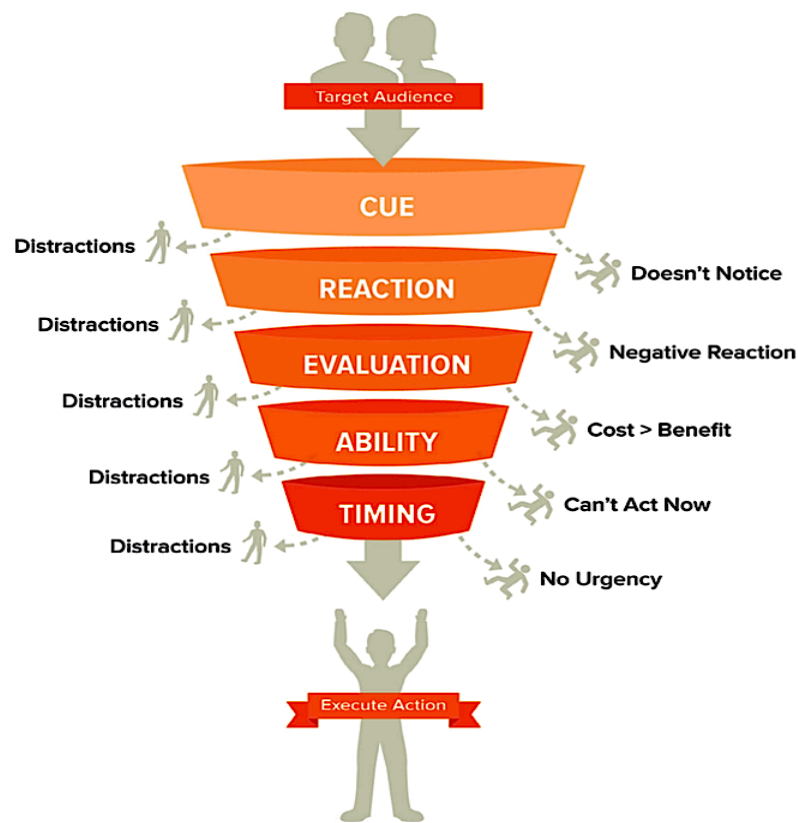


FIGURE 4: THE FIVE STAGES TO EXECUTE AN ACTION (WENDEL 2013)

2.3.4 E-HEALTH TECHNOLOGY AND DIGITAL ADDICTION

To date, most of the recent research in DA has been conducted from the social science perspective (Ryan et al. 2014). This includes work by Sofiah et al.(2011) as well as Cam and Isbulan (2012). Past literature has also shown that many studies on DA are focused on development of SNS measurement scales, e.g. (Elphinston and Noller 2011, Andreassen et al. 2012, Hong et al. 2014). This suggests that more research is needed in software design practices (e.g. Requirements Engineering and HCI), particularly in the area of intervention systems for DA (Ryan et al. 2014).

Past research on online intervention systems includes areas in the Internet addiction and smartphone addiction. For the Internet addiction, Su et al. (2011) developed a software-assisted intervention system for college students to reduce online usage. The system offered interventions in terms of providing online plans based on usage complemented with reminding cards. The study results revealed that the intervention system effectively reduced students' online usage per week. Another study conducted by Lee et al. (2014) on smartphone addiction and an intervention system for management of smartphone addiction was proposed. The system consists of four main

functions: monitoring, data archive, data analysis, and intervention and treatment. Smartphone usage is monitored and analysed to provide appropriate interventions.

Ko et al (2015) surveyed 41 smartphone intervention apps meant to help people regulate smartphone usage. These apps were then classified into four themes: 1) smartphone addiction diagnosing, 2) overuse intervention, 3) children use monitoring and 4) task distraction elimination. Different persuasive techniques were used in these systems, such as self-monitoring, usage tracking and apps locking features. The authors highlighted that *primary task support* dimension (Torning and Oinas-Kukkonen 2009) was the dominant intervention strategy. Ko et al. (2015), then, proposed an approach to limit smartphone usage through improving “self-regulation” based on social cognitive theory (i.e. social comparison and surveillance). The approach (i.e. the system) consists of three components: self-monitoring, goal-setting and social learning and competition.

The recognition of software role and the potential for using persuasive techniques has led to growing interest in utilising self-regulation software systems to moderate digital usage. Typically, these systems motivate users to take some responsibility to adjust their behaviour. Persuasive messages and interactive warning labels, as proposed in (Ali et al., 2015), can help to initiate and maintain that change. In another study, a new approach to ICT-facilitated self-regulation was proposed based on social cognitive theory to limit smartphone usage (Ko, Yang, et al. 2015). The approach facilitates creating groups of users to share their usage information. Generally, these systems are based on the assumption that people have the individual ability to adjust and optimise their own behaviour to maximise their gains according to their particular circumstances.

2.3.5 TECHNOLOGY-ASSISTED PERSUASIVE TECHNIQUES

Persuasive techniques are defined as “*interactive technology designed to change users’ attitudes or behaviours*” are means for behavioural change interventions (Ko, Yang, et al. 2015). Primary task support, dialogue support, system credibility, and social support are the key principles in the persuasive systems (Torning and Oinas-Kukkonen 2009). These systems can help to modify the

perceived rewards through different principles, which are summarised in (Torning and Oinas-Kukkonen 2009).

2.3.6 CAPTOLOGY

Captology is a research area focused on the studying of “*computers as persuasive technologies*” (Fogg 1998). It aims at influencing (persuade) individuals’ behaviours and attitude with the aid of interactive technologies by stimulating change. The persuasion is defined as “*an attempt to shape, reinforce, or change behaviours, feelings, or thoughts about an issue, object, or action*” (Fogg 1998). Atkinson (2006) prefers using the term “*enhanced usability*” to label this perspective into the design of technology since it is more focused on creating “likeable” technology using principles from social psychology.

Torning and Oinas-Kukkonen (2009) proposed the Persuasive Systems Design model (PSD). It is a widely recognised framework to prescribe software requirements and design for technology-mediated persuasion. The PSD comprises two main pillars: the *context* and the *persuasion*. The context is described by three core components the *intent*, *event*, and *strategy*. The persuasion is focused on the operational level which has four main support dimensions: the primary task, dialogue, system credibility, and social support. The design principles such as tailoring, social comparison, tunnelling, reminders, and reduction are categorised based on these dimensions. For example, tailoring supports the primary task, while reminders deal with the dialogue by providing users with persuasive feedback.

2.3.7 GAMIFICATION

Gamification is the use of game design elements in non-gaming context (e.g. health and education) to enhance user experience and to improve productivity. The applications that belong to this family of technology are labelled as “gamified” applications (Deterding et al. 2011).

Gamification is defined as “*the process of game-thinking and game mechanics to engage users and solve problems*”. It pays greater attention to user “engagement” which can be defined as “*the period of time at which we have a great deal of connection with a person, place, thing, or*

idea". Engagement can be assessed and measured using different metrics such as recency, frequency, duration, vitality and ratings (Zichermann and Cunningham 2011). Understanding the motivation of the users (the players) is a key element to build a successful gamified design. A successful engagement can be achieved via balancing between three factors: i) difficulty, ii) ability, and iii) variable reward in terms of ratio and interval. Considering the type of the player, i.e. achiever, explorer, socialiser and killer, in the design process can play an important role to increase the engagement (Zichermann and Cunningham 2011).

Another aspect is the source of motivation: intrinsic and extrinsic (Zichermann and Cunningham 2011). **Intrinsic** motivation is "*the doing of an activity for its inherent satisfaction*", e.g. fun and challenge, while **extrinsic** is "*the doing an activity simply for the enjoyment of the activity itself, rather than its instrumental value*" (Ryan and Deci 2000).

Mechanics-Dynamics-Aesthetics (MDA) framework is a formal game design methodology proposed by Hunicke et al. (2004) to analyse and describe the gaming attributes of design. The authors explain the framework as follow:

- **Mechanics** describes the game elements in terms of data representation and algorithms, e.g. points (score), levels (progress bar), badges and Leaderboard.
- **Dynamics** describes how players interact with these mechanics at the run-time, e.g. time pressure from challenge, and fellowship from sharing information.
- **Aesthetics** describes the players' emotional responses that are created as an outcome of the game mechanics and dynamics in the player experience, e.g. fantasy, discovery, challenge, game as drama, and fellowship which is about having the game as a social framework (Hunicke et al. 2004).

SbM is another engineering framework which was proposed by Shahri et al. (2016) to look into the design of Digital Motivation (DM) technology within work environments. In this framework, DM refers to the use of technology in general, such as gamification, persuasive technology and entertainment computing. This framework is build based on i) the *Personas*

approach to group people based on their characteristics, ii) *feedback elicitation*, e.g. (Almaliki et al. 2015, Shahri et al. 2016), to adapt the system and ensure meeting the motivational requirements, maximise the level of acceptance and minimise side effects (e.g. work pressure (Shahri et al. 2014)), and iii) *control theory* (Carver and Scheier 1982) and *social sensing* (Ali et al. 2011) to enable socially adaptive motivational system. The SbM was complemented by 22 strategies proposed by Algashami et al. (2017) to apply management corrective measures that can alleviate potential side-effects of the digital motivations.

2.4 PEER GROUPS

Peer group is a method by which members who share a similar interest can provide mutual support to influence each other behaviours or even beliefs. This mutual support can be defined as a “*process by which persons voluntarily come together to help each other address common problems or shared concerns*” (Davidson et al. 2006). Hepworth et al. (2009) classified groups into two types: i) treatments groups and ii) task groups. The author pointed out that each type has distinct characteristics. In the treatments groups, the communication style follows an open style where self-disclosure discussions are expected to be high. The members’ roles evolve and are shaped through interaction over time. The procedures within the groups can be formal or fixable. The progress evaluation of this type is based on meeting the treatments goals. Tasks groups, on the other hand, follow a structured communication style with low self-disclosure. Procedures are more formal, and roles are normally assigned. Achievements evaluations are based on accomplishing the tasks.

In peer groups, some aspects need to be considered to improve the effectiveness of this type of intervention. These aspects include groups’ dynamics, interactions patterns, sustainability, goal settings and groups’ homogeneity, to name a few.

Several theoretical frameworks can help to understand the processes underpinning peer groups. This includes:

- *Self-Psychology* and its role in explaining, for example, concepts related to interpersonal conflict in social contexts (e.g. “role captivity”), the role of helping others to strengthen the identity, and how values are weighted based on the context (e.g. strength to judge someone’s physical characteristics and honesty to judge performance of a political party leader) (Kaplan 2013).
- *Cognitive Consistency Theory* which suggests that behavioural change can motivate attitudinal change. This theory is linked to other theories such as Self-Perception theory, Balance theory, and Cognitive dissonance. It also highlights the role of helping others to resolve behavioural ambivalence (Petri and Govern 2012).
- *Social Psychology* which suggests that those offering help are also benefited through the commitment to behavioural maintenance, i.e. “self-persuasion through persuading others” (Riessman 1965).
- *Helper therapy principle* which suggests that those offering help are also benefiting through the commitment to behavioural maintenance, i.e. “self-persuasion through persuading others” (Riessman, 1965). This is also a recognised concept in Social Psychology (Leene and Schuyt 2016). For example, it is common to see recovered problem gamblers having their social network accounts to help others and at the same time demonstrate their new life-style and duration for which they are recovered.
- *Social Learning Theory* which suggests that, in social contexts, some processes of the observational learning (e.g. “copying”, “internalisation”, and “role-taking”) can help to accelerate behavioural change (Bandura 1997).
- *Group Psychotherapy* which proposes some key factors of the help processes and dynamics when it is delivered in small groups. These factors include, for example, *universality* (i.e. realising that a problem is a common concern helps to alleviate isolation), *altruism* (i.e. the role of helping others can improve self-esteem and support the healing process), and *instillation of hope* (i.e. increasing the help

expectations can improve the treatment outcomes, e.g. mixing people at different stages of the rehabilitation can inspire those suffering from a higher severity and those starting the treatment) (Yalom and Leszcz 2005).

2.4.1 PEER GROUPS INTERACTION STYLES

According to Toseland and Rivas (2005), interactions in face-to-face groups can take one of two forms. The first form is *leader-centred* which has several interaction patterns, such as i) *Maypole* in which moderators monitor and offer prizes, rewards and penalties, ii) *Round-robin* in which members take turns in playing the facilitating role, and iii) *Hot seat* in which moderators interact with one member and the rest watch. The second form is *Free floating* where all members share some of the moderators' roles.

2.4.2 ADVANTAGES OF PEER GROUPS FOR COMBATING ADDICTIVE BEHAVIOURS

Introducing peer groups mechanisms to recovery programmes can be a promising approach to support long-term change. One might argue that why addicts need peers' support approach as long as treatments delivered by non-peers, e.g. therapists; provide the same degree of effectiveness (Davidson et al. 2006). In fact, peer groups can be more effective if applied to complement, not to replace professional treatment. For example, peer groups can support pre-treatment stage by helping individuals to recognise the issue, i.e. the progressing from pre-contemplation to contemplation stage according to the Transtheoretical Model (TTM) proposed by Prochaska and Velicer (1997).

Linking addicts to peer groups prior to the professional treatment can reduce the duration needed in the initial episodes of treatment and increase recovery rates. Also, extending the participation in peer groups reduced the need for subsequent treatment episodes (Moos and Moos 2004). The peer groups approach can also be utilised in the post-treatment to reduce relapse rates (Moos and Moos 2005). This approach supports several persuasive and motivational mechanisms such as commitment and consistency, reciprocity, and social proof (Cialdini 2009) and surveillance. Peer groups technique could utilise the helper-therapy principle (Riessman 1965)

which suggests that it can be personally beneficial for addicts to assist others to deal with their own addictions.

2.4.3 ONLINE SUPPORT GROUPS

Online peer groups are a type of social software that utilises certain behaviour change and persuasion mechanisms, such as social pressure through surveillance (Fogg 2002), to challenge negative behaviours or to reinforce positive ones (Davidson et al. 2006, Alrobai et al. 2016a). The design of online peer groups for DA can embed features and interaction styles spanning across both treatment and task groups discussed in **section (2.4)**. The need for formality, i.e. task groups, is mainly due to the risks of reinforcing a negative behaviour or trivializing it. The need for high self-disclosure and a degree of autonomy, i.e. treatment groups, is to give a sense of ownership and commitment especially that users can be geographically distributed with little or no face-to-face contact with each other and the counsellor.

Online interactions differ from face-to-face setting in different ways. Most importantly, it is performed in a less restrictive environment leading to more self-disclosure (Al-Deen and Hendricks 2011).

Traditional online peer groups are used as forums to host treatment practice, such as counselling, which could be helpful for providing care and assisting positive behaviour in remote settings. Alrobai et al. (2016b) argued that despite the new facilities online peer groups can provide, e.g. real-time and intelligent interventions enhanced by gamified and persuasive experience, designing them as typical social networks could lead to adverse side-effects. This includes the spread of negative emotions, misleading peer comparisons, and spreading and justifying negative behaviours.

There is a wide range of unanswered questions in the application of the motivation approach. For example, the lack of measures to assess which stage of change members belong to. Further questions related to the important attributes the system should consider selecting moderators, e.g. recovery status, experience, experiential knowledge, demographic profile and personality characteristics. Moreover, different groups' configurations might require specific attributes. For

example, ex-addicts might be less supportive to moderate goals, which are, in fact, encouraging goals for those who are in the transition stage as they emphasise gradual change.

Monitoring and analysing all communications occur in face-to-face peer groups are very challenging tasks. However, group moderators can develop skills to capture non-verbalised messages (Toseland and Rivas 2005). Such limitations do not exist in online groups due to some inherent characteristics, e.g. monitorability and the use of feedback mechanisms, e.g. rating.

The patterns of interactions mentioned in **section (2.4.1)**, e.g. *Hot seat* and *free floating*, will certainly need to be adapted to the nature of the online peer groups. This research suggests addressing interactions in such systems from two different dimensions. Firstly, interactions related to the use of the object of addiction (e.g. reward members when time spent online is decreased). In other words, the system should monitor and evaluate the interaction between members and their SNS account, i.e. SNS usage. Secondly, interactions related to the communication between members themselves (e.g. penalise a member who violates group's norms). This example can be seen as a metaphor for what is called **hot seat** which might be applicable to interactions belong to the second dimension. One might argue that *free floating* form might increase the social interaction. This could support behavioural change or the opposite, i.e. create another addictive communication medium.

The key insights gained from the literature review suggests that current practices do not follow systematic rules on how groups should be structured and how interaction is designed and many of these aspects are managed in an ad-hoc manner.

2.4.4 GROUP DEVELOPMENT

Group development concerns with the change over time in small groups. Several theories and models were proposed to explain different aspects of small groups development. Examples include the Fisher's theory (1970), the TIP theory (McGrath 1991), and the Tuckman's model (1977). All these models are stage-based.

Tuckman's model (1977), which is the most cited model in the literature, argues that groups need to pass through four phases, forming, storming, norming and performing to achieve desired outcomes, see **Figure 5**. *Forming* refers to establishing shared expectations, similarities and goals to develop bond and trust. *Storming* refers to identifying power and control issues, expressing and appreciating differences. *Norming* refers to developing common rules, roles, group culture, and problem-solving processes. *Performing* refers to achieving desired results through collaboration, respect, care and appropriate control. Each one of these phases builds on the top of the previous one.

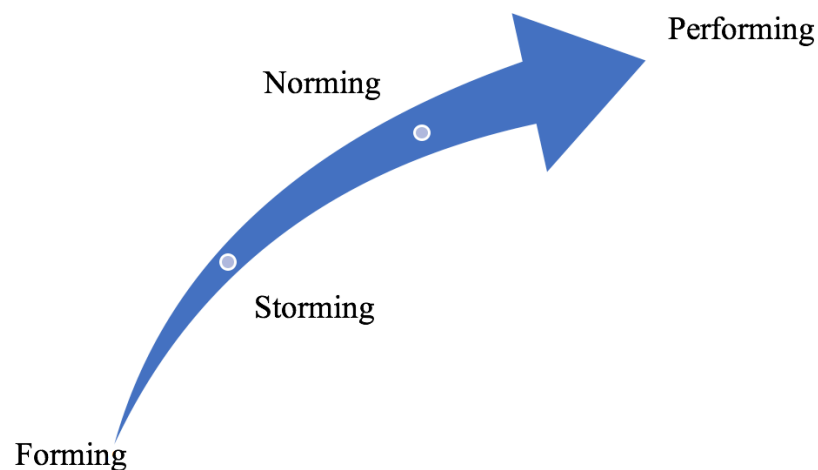


FIGURE 5: TUCKMAN'S MODEL OF SMALL GROUPS DEVELOPMENT
(TUCKMAN AND MAC JENSEN 1977)

2.4.5 GROUP DYNAMICS

Group dynamics is defined as a “*field of inquiry dedicated to advancing knowledge about the nature of groups, the laws of their development, and their interrelations with individuals, other groups, and larger institutions*” (Cartwright and Zander 1960). A shorter definition proposed by Forsyth (1990) “*a group is (a) two or more individuals (b) who influence each other (c) through social interaction*”.

There are different dimensions of groups' dynamics that can influence groups' functioning, such as interaction patterns, group cohesion, group size, social integration, goal settings, and

group culture. This thesis argues that it is important to understand dynamics and how they would influence online peer groups to progress in the treatment programme. The reason is that what works in face-to-face peer groups' might not work in online peer groups. For example, the *free-floating* interaction style where all members share some of the moderators' roles the collective decisions might not always be in favour of the group. As such, in peer groups for DA, new types of addictive processes, tools, or behaviours might be suggested which may, in fact, impact the group performance. In this case, implementing some decision-making processes within the groups might be needed, such as assigning non-addict or therapist to approve or reject such "suggested" interactions.

Some treatment practices adopt open-ended and close-ended frameworks in face-to-face groups therapy (Schopler and Galinsky 1990). For example, the Centre for Psychological and Behavioural Science in Florida utilised the closed-ended groups in a sequential process treatment to support those who are new to the treatment or want to be supported by peers who share similar goals (Center for Psychological Behavioral Science 2015). On the other hand, they used open-ended groups to support individual at any stage of the treatment. In this framework, members are assessed before joining and then encouraged during the programme to select goals and receive the needed support to achieve them. As such, new members can still find an opportunity to engage and benefit from the group. In online peer groups for regulating DA, such frameworks need to be investigated to understand how they might influence group dynamics, such as performance and sustainability (Schopler and Galinsky 1990). For example, the conformity effect can be a threat when a user temporarily changes his behaviour only to conform and to avoid any contrary actions. While this is considered a positive behaviour according to Toseland and Rivas (2005), one might argue that is this only in task groups as it can speed up achieving groups' goals. In treatment groups, however, this might be a threat as the relapse is potential.

Online peer groups approach raises further doubts about to the group configurations and their influence on different group aspects, e.g. homogeneity and performance. The configuration can, for example, refer to forming a group whose members are at different stages of change (e.g.

pre-contemplation and maintenance) according to the Transtheoretical Model (Prochaska 2013). It can also refer to various structural possibilities. For example, different types of relationships can influence the performance of different social structures in groups. According to Fiske (1993), there are four types of relationships: “*communal sharing*” (someone you share everything with, e.g. a best friend), “*authority ranking*” (someone you respect, e.g. the parents), “*equality matching*” (someone you equal with, e.g. a classmate) and “*Market pricing*” (someone you compete with, e.g. a work colleague).

The configuration can also be referred to the group type. For example, in friendly configurations where members more into discussions rather than scoring points, increasing the group size might be positive. However, in serious groups where surveillance and competition mechanisms are applied, having a large group size can negatively impact group performance and integrity as group monitoring and maintenance (e.g. applying rules and constraints and building consensus for that) can be very challenging (Toseland and Rivas 2005). This may also raise the question about the optimal number of a group size in the online peer groups to ensure better performance as large groups may cause group clustering issues.

2.5 DIGITAL ADDICTION AND TECHNOLOGY RELATED TOPICS

The section presents a review of the literature specific to various topics that could contribute to the technology space to engineering online peer groups.

2.5.1 REQUIREMENTS ENGINEERING AND DIGITAL ADDICTION

Zave (1997) defined Requirements Engineering as a “*branch of software engineering concerned with the real-world goals for, functions of, and constraints on software systems. It is also concerned with the relationship of these factors to precise specifications of software behaviour, and to their evolution over time and across software families*”. In Requirements Engineering, Non-Functional Requirements (NFR) are seen as quality attributes, which act as measures of the degree of excellence of a system or a system configuration. Despite their importance, the demand and expectation to rapidly deliver software systems that fulfil the functional requirements, i.e. the operational requirements, would lead to overlooking some quality attributes. This would lead to

a product that would be perhaps less usable, less acceptable or even harm. In some other cases, it might lead to catastrophic effect, e.g. privacy and reliability health-related systems.

2.5.1.1 THE NON-FUNCTIONAL AND FUNCTIONAL REQUIREMENTS

NFRs are the characteristics that refer to systems ability to maintain certain properties. Wiegers (2009) defined an NFR as “*a description of a property or characteristic that a software system must exhibit or a constraint that it must respect, other than an observable system behaviour*” (i.e. the system to be). Some NFRs end with the word “ability” (e.g. usability and traceability) to convey an operational quality attribute rather than a description of a specific task a software can perform. Some others follow different linguistic patterns, but they can be still interpreted as “ability to”. For example, performance and privacy refer to the ability to meet the functional requirement in a way that maintains certain efficiency aspects and privacy criteria. A full list of NFRs can be found in (Mairiza et al. 2010).

According to Glinz (2007), there is a low-level consensus about the definition of NFRs and their nature. The author highlighted a list of common definitions where some “*conceptual discrepancies*” issues may arise. Such issues include:

- The lack of a clear definition of the key concepts (i.e. properties or characteristics, attributes, qualities, constraints, and performance attributes).
- The ambiguous representation which may appear as an NFR, but after careful refinement, it could turn into functional requirements.
- Adopting different classification schemes.

Then, the author proposed a framework to overcome these problems and provided a systematic methodology for analysing and clustering different NFRs. By addressing these problems, a set of classification rules were proposed to create a new requirements’ taxonomy illustrated in **Figure 6**. Other classifications are also proposed, such as (Mairiza et al. 2010) taking into account extra dimensions (e.g. typology, types of systems, and application domains).

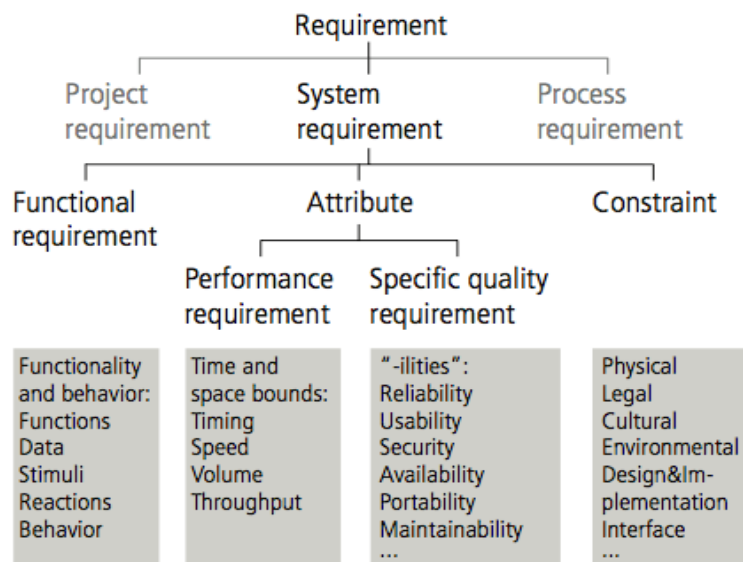


FIGURE 6: A CONCERN-BASED TAXONOMY OF REQUIREMENTS (GLINZ 2007)

In Goal-Oriented Requirements Engineering (GORE) research community, NFRs are seen as soft-goals while functional requirements are seen as hard goals or simply goals. Soft-goals express the notion of subjective, or a desired state of the world. In some cases, soft-goals have fuzzy criteria whether they are fulfilled or not. Accordingly, they are “*satisfied when there is sufficient positive and little negative evidence*”, and as they can influence each other, they should not be analysed independently (Mylopoulos et al. 1999).

In contrast, the functional requirements (FR), e.g. reporting functionalities, has got a common understanding and widely agreed definition of their meaning and nature. FR can simply refer to a service that stakeholder would like to achieve by using a software system and it has a clear-cut criterion whether it is delivered or not. A service refers a business state (e.g. sales are increased) or a software service to reach that business state (e.g. software to filter products that are about to expire and apply discounts on them).

Researchers suggest that NFRs can be broken down into measurable components (Nuseibeh and Easterbrook 2000). Usability, for example, can be expressed by considering the components efficiency, effectiveness and satisfaction. Metrics such as time spent on task, are then created to quantify data for each component (Nielsen 1994). This means that NFRs are not atomic concepts and they need to be refined to reach their tangible and measurable elements.

2.5.1.2 DIGITAL ADDICTION AS AN INDICATION OF NEGATIVE QUALITY ATTRIBUTES: REFLECTIONS

This research views DA as an indication of the state of having negative quality attributes in the system design. Modelling and specifying countermeasures for DA is complicated as quality attributes, in general, tend to represent the quality of the system as a whole, i.e. cross-cutting concern. On one side, they cannot be engineered (i.e. systematically analysed, approached, tested and measured) in isolation of the other aspects and concerns of the system (e.g. privacy and usability). The reason is that an NFR can be a characteristic of a design entity (e.g. a strategy to reach a requirement) or a specific software behaviour (e.g. performance). This means it is possible to engineer an entity and then measure it against the targeted quality attributes following trial-and-error approach. On the other hand, it is not straightforward to specify them at a fine-grained level, and discoverer the correlations as it requires time and, in some cases, achievable but only partially.

The increasing interest for designing self-regulation systems that are more aware of DA, indicates that countermeasures for DA can be seen as an important emerging quality attribute. One might ask how such attributes can be defined, classified and satisfied. Given the debates about DA (e.g. addiction “to” or “on” cyberspace), and the fuzzy nature of this concept, this research suggests classifying addictability of a software in the class of software characteristics and attributes which also has to do with people perception. This means exempting software engineering from drawing the relation between this negative attribute and the software. In fact, this research suggests socialising the process by allowing stakeholders to perform this task. This insight will have a significant influence on the design approaches **section (2.5.7)** in which users’ involvement is an important aspect of the future methods and frameworks to design for regulating DA.

2.5.2 SOCIAL COMPUTING

Parameswaran and Whinston (2007) defined social computing as a dramatic evolution of the web to be more concerned with shifting “*the computing to the edges of the network, and empower individual users with relatively low technological sophistication in using the Web to manifest*

their creativity, engage in social interaction, contribute their expertise, share content, collectively build new tools, disseminate information and propaganda, and assimilate collective bargaining power". Social computing is a perspective that influences the process of the software development to be more "*participatory and often voluntary*" (Parameswaran and Whinston 2007).

Social networks are software-based spaces that enable the formation of social circles and facilitate mass communication and collaboration. It represents unique design perspectives where attention is given to social interactions such as instant messaging, relationships, profiling, groups formation, and the dual role of individuals as content producers and consumers (Pereira and Baranauskas 2010a). In these virtual spaces, the users are provided with interactive tools used to form groups and maintain relationships.

Boyd and Ellison (2007) defined social network websites as "web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system. The nature and nomenclature of these connections may vary from site to site".

2.5.2.1 SOCIAL COMPUTING DESIGN

Tools, approaches and framework are available to design social networks for general purposes. Kietzmann et al. (2011) proposed the Honeycomb framework as a guide to identify social networking systems characteristics and classify them from a functional perspective. The framework consists of seven functional blocks. **Figure 7** presents these blocks, which provide a better understanding of audience, and their engagements need. *Identity* block refers to the way users present and profile themselves. *Conversations* block refers to degree and type of communication amongst members. *Sharing* refers to the scale and facilities offered to members to exchange digital content. *Presence* block refers to tools and ways people express their availability and status. *Relationships* block refers to the part of the social network dedicated to forming and describing social links. *Reputation* refers to tools enabling and describing the social standing of members and their generated content. *Groups* block refers to the facilities offered to

form communities and regulate their interaction. These blocks can be configured differently to satisfy different engagement needs of the targeted audience. This is because each block has specific implications on user experience. Different social websites tend to focus on different blocks. For example, LinkedIn, revolve around the identity block, followed by the reputation and relationship blocks.

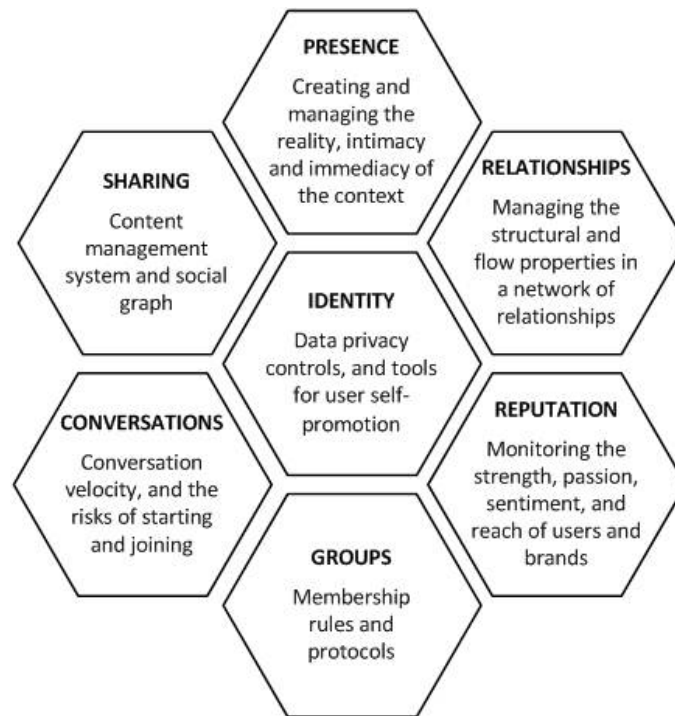


FIGURE 7: SOCIAL MEDIA FUNCTIONAL BLOCKS (KIETZMANN ET AL. 2011)

The framework provides a starting point to understand social software by getting the core facets of what this family of software means. This is regardless the de facto market classification of the software. Also, the framework emphasises that social software products can take various forms based on the emphasis of the design. For example, Xie et al. (2007) proposed a theoretical framework for the phenomenon when a customer produces value, e.g. content, for his own consumption. They labelled this type of interaction as “prosumption”. Prosumption-like behaviours can exist in the social software where users, for example, post something to create value for other users and for themselves as well, e.g. “*personal branding*” (Labrecque et al. 2011). However, Mantymaki and Islam (2014) argue that separating the duality of the prosumer role (i.e. analysing the production and consumption behaviours separately) can help to understand the

implication of each role on the design. In turns, this helps to decide what building blocks should be emphasised. The authors pointed out that users' behaviours within social computing are influenced by one of the above-mentioned roles. They also argue that content consumption significantly predicts voyeurism, while content production predicts exhibitionism. More, interestingly, they highlighted that, in social computing, service providers, e.g. Facebook, pays considerable attention to exhibitionism through introducing "*exhibitionistic features*" in comparison to "*voyeuristic features*". In other words, users are offered with much more features and functionalities that facilitate self-presentation.

2.5.3 SELF-REGULATION

Self-regulation is defined as "*controlling oneself through self-monitoring, goal-setting, feedback, self-reward, self- instruction, and enlistment of social support*" (Glanz et al. 2008). Glanz et al. (2008) Pointed out the self-regulation systems are expected to be built based on the self-acquisition of required skills (e.g. purposeful action) to improve self-managements, rather than relying on the willpower.

In self-regulation systems, monitoring is a fundamental design element. It provides a useful basis for effective intervention design by enabling users to track their performance and support them in achieving their goals, while also maintaining their regulated behaviours (Torning and Oinas-Kukkonen 2009). Self-monitoring is a "*process of having individuals record data regarding their own behaviour for the purpose of changing its rate*" (Coleman and Webber 2002). When doing so correctly in social settings, such as in peer groups, it can further support the behavioural positive change.

Some studies, such as (Vohs and Baumeister 2013), concluded that intervention systems for addictive behaviours might fail due to poor application of goal-setting theory, e.g., difficulty in setting standards as well as poor consideration:

- ***Conflicting goals*** such as regulating mobile usage and enjoying the moment.
- ***Distorted goals*** such as surfing the Internet to improve mood.

Self-regulation systems can be effective when carefully designed with the six concepts in mind: self-monitoring, goal-setting, feedback, self-reward, self-instruction, and social support (Bandura 1997). However, Posner and Rothbart (2000) suggest the need for investigating mechanisms for self-regulation from cognitive psychology perspective (i.e. brain functioning such as in attention-related mechanisms) rather than only behavioural perspective.

Self-regulation systems are very complex and multifaceted. As such attributing failure to one cause is challenging. Often, there are three main causes of the failure: inappropriate standards, poor monitoring, and overlooking users' lack of capacity (Baumeister and Heatherton 1996).

2.5.3.1 SELF-REGULATION AND REFLECTIONS ON DA

Self-regulation systems can either monitor behaviour, e.g., the user shared 40 posts this week, or monitor change in the behaviour, e.g., the user shared fewer posts than last week (Maitland and Chalmers 2010). It is fundamental to investigate which type of monitoring would motivate users.

While there are some successful intervention cases, they are often short-term, as such interventions are expensive and hard to maintain (Green-Demers et al. 1997). This suggests the need for complementary strategies to support long-term interventions and to reduce relapse rate. This could be achieved through in-patient care, which is an expensive and heavyweight for the early stages of DA.

2.5.4 SELF-ADAPTATION

The increasing complexity of software systems and the frequent change of heterogeneous users' requirements and operating conditions have motivated software engineering research to come up with innovative solutions to overcome these challenges. Self-adaptivity, therefore, has become an important research area. It is the autonomous ability to change software behaviour(s) (i.e. configuration) to adapt to the change in the context, goals, functional and non-functional requirements at the runtime. The adaptation mechanisms consist of four processes; monitoring, detecting, deciding and acting (Salehie and Tahvildari 2009).

There are two types of uncertainty that need to be addressed by requirements engineers. First is the “*environmental uncertainty*”, which aims at preventing requirements violations and maintaining stakeholders’ objectives. This is by adding the capability of autonomous adaptation as a response to change in the operating conditions. Second is the “behavioural uncertainty” which aim to change the requirements themselves (Whittle et al. 2010). With respect to online addition, behavioural uncertainty needs to be investigated in order to satisfy different users’ needs.

2.5.4.1 SELF-ADAPTATION TECHNIQUES AND REFLECTIONS ON DA

Whittle et al. (2010) proposed RELAX as a formal language to express both environmental and behavioural uncertainty in self-adaptive systems. The requirements in these systems can be classified as critical- and non-critical. The critical requirements are those must be met based on stakeholders’ objectives. Hence, the RELAX language enables engineers to express non-critical requirements that can be “RELAXed” temporarily as a response to change. The language supports expressing both the factors that should be monitored (i.e. users’ needs or operating conditions) and also the sources of uncertainty, in addition to the flexibility points. This is rather than predefining all alternatives. Another technique is called the FLAGS. It was proposed by Baresi et al. (2010) to add the concept of “adaptive goal” to goal models. This thesis suggests that such languages and techniques need to be investigated to study their suitability to facilitate managing the self-regulation systems requirements to design interventions systems for DA.

Ali et al. (2012) pointed out that self-adaptivity is expected to consider new emerging paradigms such as Ubiquitous Computing (UbiComp) where the environment is almost unknown (i.e. environmental uncertainty). This has led to introducing contextual goal models which stem from the fact that context can have considerable influence on users’ goals (Ali et al. 2010). Souza (2012) pointed out that the self-adaptive systems differ from the adaptive systems which are driven by external factors, such as users or sensors. Fickas and Feather (1995) highlighted that adaptation decisions entail identifying what and how to monitor requirements at the runtime in order to detect when the design assumptions become invalid for the current context. Souza et al. (2011) presented a new class of requirements that have to be also monitored: *awareness*

requirements and meta-awareness requirements. This family of requirements refers to the success and failure of other requirements. As an example of awareness requirements: the system should be able to record all emergency calls with success rate 98%. Detecting unsatisfactory success rate can be used as an indication of the need for adaptation. However, Ali et al. (2010) argued that certain information cannot be self-monitored, because of the diversity in contextual requirements. This motivated them to propose a novel approach in which adaptation decisions are driven by users' collective judgments (i.e. quality feedback). Software can alter its behaviours by re-configuring itself to meet users' different needs more effectively.

In DA, a software can utilise users' feedback to adapt its behaviours in order to regulate technology usage. However, while some adaptation decisions have to be taken by the users themselves, others can be taken autonomously. These decisions have to be identified empirically to investigate how users' collective judgments can be utilised to deal with such *behavioural uncertainty*. The answers to these questions might help to exploit above approaches and techniques to design adaptation mechanisms appropriate for online peer groups.

This thesis assumes that a tool set and interaction patterns will be made available to the group members to take several forms and to adapt to the status of the group and their feedback. Hence, the model for groups and their interaction style should take that variability and also the adaptivity into consideration. Given that such an adaptive design has a heavy human-related element, the thesis will open the feedback loop to allow the decision-making process to be always up to date with the members' perception of the group design and prevention mechanisms. This also introduces a question on the conceptualisation of such feedback and how it could be aggregated to take a collective decision.

2.5.5 SITUATIONAL AWARENESS

Situational awareness (SA) can be defined as "*perception of elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future*" (Endsley 1988).

Figure 8 shows the SA model in dynamic systems (Endsley 1995). SA is a goal-oriented where the focus is on the user's performance (Endsley 2011). It involves perceiving critical elements in the system and environment (level 1), understanding their significance to the current task and overall goals (level 2), and projection of near future actions (level 3). Lee et al. (2013) highlighted that the elements of SA are very domain specific and they have to be observable and meaningful to the user. The novice users are likely to face challenges in these three levels due to lack of knowledge and other domain tasks' mechanisms. As such, utilising mental models, schema and goal driven processing can reduce these challenges (Lee and Kirlik 2013). Endsley (2011) argues that SA is the key to achieve User-Centred Design (UCD) in that users must be in control within the automated process to optimise SA.

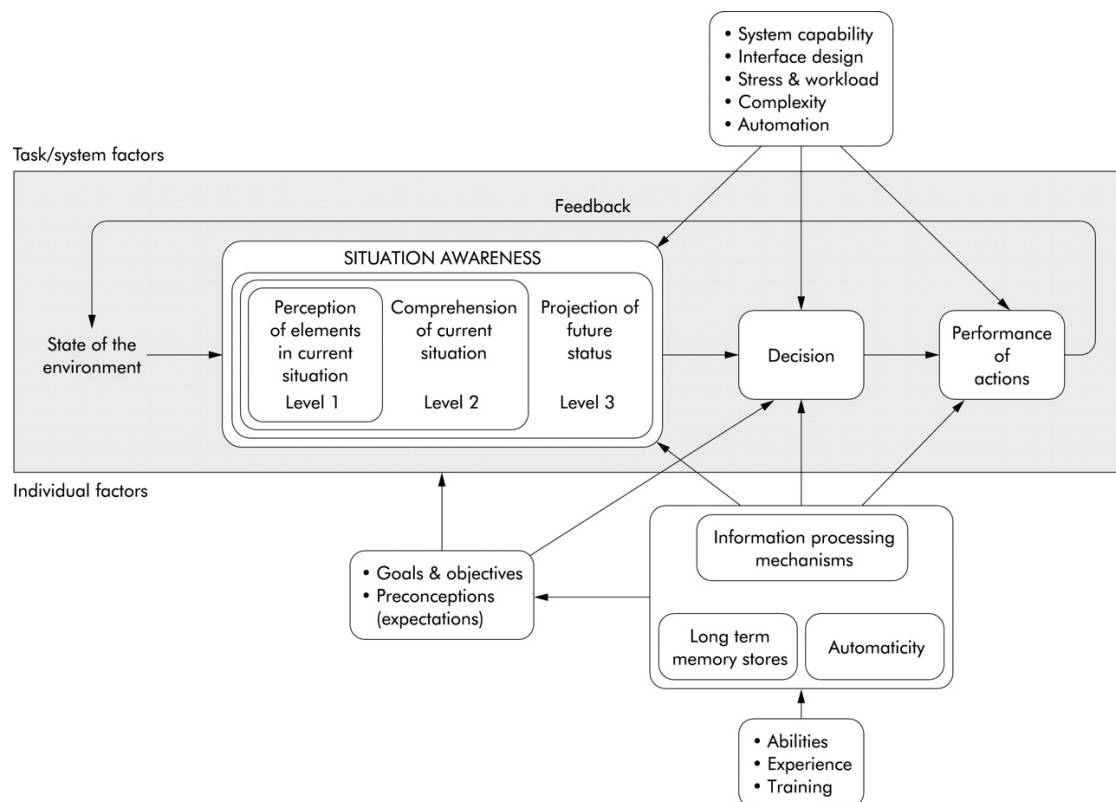


FIGURE 8: MODEL OF SITUATION AWARENESS (ENDSLEY 1995)

2.5.5.1 SITUATIONAL AWARENESS AND REFLECTIONS ON DA

In DA, the elements in the above-given definition can be the software features, environmental cues, triggers, emotions, rewards or even users' goals and motivations. Hence, the self-regulated systems can be incorporated into the SA model to enhance situation awareness, i.e. levels (1, 2

and 3), or to intervene with the decision-making phase by providing users with some recommendations to regulate usage and improve performance. However, for a given situation, it is still essential to identify relevant elements that play a role in addictive usage. An illustrative example mapped to the SA model is presented below:

‘A student is expected to submit a coursework by the end of the day. There is no much time left to the deadline. The student wants to post a Facebook status. The student is aware that posting on the Facebook at this time would likely to cause a high volume of responses which may aggravate habitual checking. As a result, the goal (the deadline) will not be achieved’.

In this example, meeting the deadline is the user’s goal. Posting Facebook status, the impact of time, the expected high volume of responses, the aggravation of habitual checking are the critical elements in this situation. Identifying such information is critical to fulfilling level (1) of SA and to support the student in understanding the relation between the goal and these elements is the level (2) of SA. As such, the student can be proactive in making the right decision to achieve the goal (level 3 SA).

If self-monitoring to be mapped to level (1) of SA. Identifying the critical elements relevant to the problematic usage (e.g. cues, triggers, motivations, time or even addictive activities) is needed. However, capturing certain elements, such motivations and goals, might be challenging because of their implicit nature in addition to the diversity of the contextual information. Hence, the self-monitoring processes must be open to the users’ collective judgments, i.e. “quality feedback” to enhance the monitoring mechanisms (Ali et al. 2010). For example, users can feed level (1) SA with knowledge about the goal-setting to support the monitoring processes.

Addictive triggers, in general, can contribute to the level (1) of the SA, which is users’ perceptions of the elements that can spark the use of certain features and functionalities of digital technology. Rewards are more relevant to the projection of future status, i.e. the level (3) SA, to perceive what actions could lead to regulate the use and avoid addiction. Rewards can also contribute to level (1) SA, the more the users are aware of the outcomes, e.g. rewards, the more

their comprehension would be influenced. Consequently, decisions, i.e. actions, can be influenced, e.g. limit the use in this “situation”. In this scenario, users’ situation awareness is enhanced to enable taking better decisions.

Self-regulation systems can be empowered through situational awareness to be able to monitor or predict relevant triggers exist in different social and environmental contexts and then utilise persuasive techniques to modify perceived rewards. According to Kofod-Petersen and Cassens (2006), the context is a fundamental concept in the interpretation of a situation. The authors’ proposed a context model uses the activity theory constructs of Koszalka and Wu (2004). The activity theory structure consists of six constructs: artefact, object, subject, rules, community and division of labour. Kofod-Petersen and Cassens’s model (2006) maps the taxonomy of contextual aspects, which are: personal, task, environmental, spatio-temporal, and social contexts, as shown in **Figure 9**.

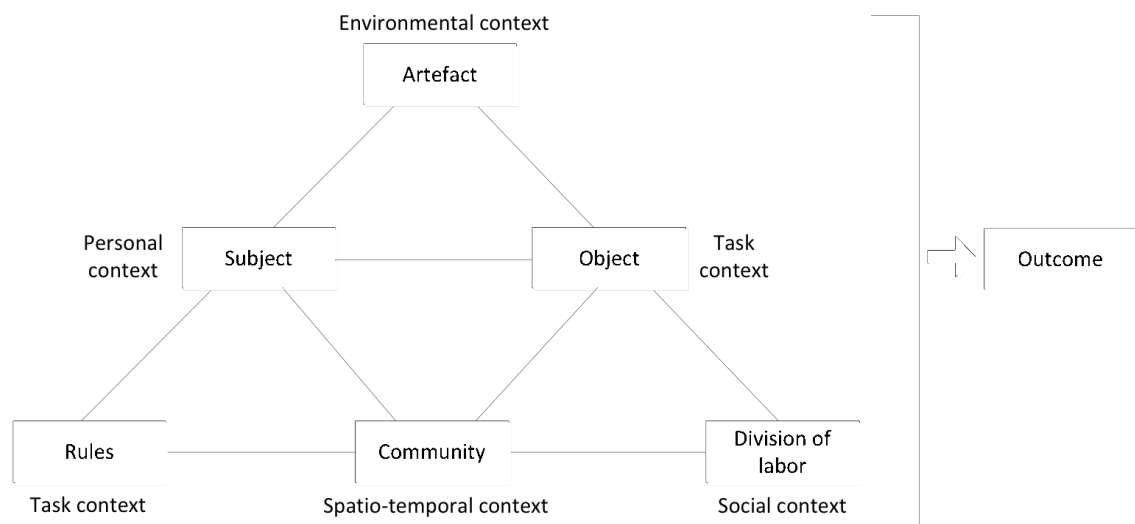


FIGURE 9: KOFOD-PETERSEN AND CASSENS’ CONTEXT MODEL (2006)

Although the model was used for context-awareness in pervasive systems, this thesis believes that the model could be useful in framing the activities in cyberspaces that can be further used to identify addictive usage or addictive patterns to inform users. The reason is that the model illustrates the context-awareness from the activity theory paradigm, which provides a holistic framework to investigate the dynamic relationships among individuals, technology, goals as well as the social and cultural factors that are influencing them (Koszalka and Wu 2004).

The human element is a fundamental part of SA for DA as perceptions vary widely from one individual to another. For example, engaging in cyberspace activities for six hours a day may not be seen as an addictive use for some. As such, the interpretation of the collected data cannot be done autonomously but, in fact, it requires users' involvement. Such variance in data analysis should drive the design of self-regulation systems and allow certain adaptability and personalisation to self and peer monitoring based on users' models. In peer groups, also, users' awareness of self and peers' status, group's structures, relationships and other possessed properties such as norms is very important to increase the efficiency of peers' interactions.

The above-mentioned discussions focus on *Human SA* (Kokar et al. 2009), i.e. individuals' cognitive level, and how the system can be more intelligent by advancing situational assessment and understanding to support the users' decision-making processes which are the main emphasis of Endsley's model (1995). The thesis views *Computer SA*, on the other hand, as a process that focuses on the variables related to the context of the performed task to provide more effective intervention with minimal impact to user experience. For example, applying coercive persuasion interventions approaches with the lack of knowledge about task context, e.g. locking the mobile screen while using navigation system during driving a car, could impact user experience severely.

2.5.6 HUMAN-COMPUTER INTERACTION ASPECTS

Hewett et al. (1992) defined HCI as “*a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them*”. Improving the interaction between users and computers is the principal goal of HCI.

User experience (aka UX) is a widely accepted notion in HCI due to the limitation of the traditional usability framework which is mainly focusing on user performance (Law et al. 2009). The ISO on ergonomics of human system interaction (2009) defined user experience as “*a person's perceptions and responses that result from the use or anticipated use of a product, system or service*”. It is the overall perception of a user before, during and after interacting with a system. UX is not static as user's interaction with the system evolves with time due to changes in different

factors including users' familiarity with the software, the competitive technology and peer reviews, etc. Thus, UX is dynamic and requires an iterative life-long monitoring. Therefore, asking "what" and "why" for experience changes over time should help to capture some of these factors (Vermeeren et al. 2010). To enable effective investigation, users' values (e.g. comfort, respect and healthy) which help developers identifying desirable characteristics have to be always taken into consideration (Kujala and Väänänen-Vainio-Mattila 2009).

In HCI, it is important to consider the conceptual overlap between Usability and UX in terms of users' satisfaction and also evaluation methods. UX is an extra dimension in HCI and a concept beyond usability as it is taking a holistic view of users' needs and expectations and also addressing any possible threat to the long-term experience (Kujala and Väänänen-Vainio-Mattila 2009). In terms of the evaluation methods, usability is more towards task performance (i.e. efficiency and effectiveness), while UX is utilising usability measures besides addressing extra subjective qualities such as motivation and expectations (Vermeeren et al. 2010). Some studies found out that user experience is not negatively affected even when social software such as YouTube, Facebook, Wikipedia have poor compliance with usability principles (McCarthy and Wright 2004, Silva and Dix 2007, Hart et al. 2008, Thompson and Kemp 2009). Therefore, UX can provide more holistic understanding to DA as Usability ignores "felt experience" such as "pleasure, curiosity, and self-expression".

2.5.7 DESIGN APPROACHES

Collecting data on user interaction with digital technology (e.g. behavioural observations and user comments) can help to investigate DA and how online peer groups may work to regulate it. Also, it is necessary to incorporate a broader scope of user experience (UX) and include a mixture of data collation methods that facilitate accessing such knowledge in the design time. To achieve this, user active involvement is needed. Such involvement would also help to improve the level of acceptance to the design of online peer groups as the treatment of DA could result in a trade-off with UX. This section presents different approaches that can help to achieve this and understand the interplay between HCI of the online peer groups and DA.

2.5.7.1 USER-CENTERED DESIGN (UCD)

User-centred design (UCD) is defined as “*a broad term to describe design processes in which end-users influence how a design takes shape*” (Norman and Draper 1986). It emphasises the relationship between HCI and design practices where user involvement is the core aspect to ensure meeting users’ needed (Marcus and Wang 2017).

However, Lowdermilk (2013) highlighted that user involvement is not to provide a “*retail experience*”. In fact, users should be guided through their involvement to effectively utilise their knowledge. Otherwise, such involvement can lead to extreme mistakes.

Abras et al. (2004) provide a set of guidelines on how and when to involve users in the design and what type of information can be gathered:

- A series of interviews and questionnaires at the beginning of the design to capture the users’ needs and expectations.
- Further interviews and questionnaires at the early stage of the design to understand the work sequence.
- A series of focus groups and on-site observations at the early design cycle to collect the requirements and information related to the environment where the potential system would be deployed.
- Role playing, walkthrough, and simulation (e.g. prototyping) at the early and mid-point of the design cycle to facilitate the evaluation and gain additional information.
- Usability testing, interviews and questionnaires at the final stage to measure usability and assess satisfaction via collecting qualitative and quantitative data.

2.5.7.2 PARTICIPATORY DESIGN (PD)

Participatory design (PD) is an approach to User-centred design where users are involved as co-designers (Abras et al. 2004). PD emphasises that “*researchers and designers must come to conclusions in conjunction with users*” as an attempt to “*examine the tacit, invisible aspects of*

human”, and to ensure that their interpretations are taken into account (Spinuzzi 2005). The PD has three stages:

- **Exploration:** it involves performing some bottom-up investigation and stimulation for insights and knowledge, e.g. ethnography, observations and organisational visits.
- **Discovery:** it involves cooperative group interactions to understand and prioritise goals, values, and the desired outcomes. This stage should, also, consider identifying concepts that guide how the software constructs, e.g. interfaces, messaging and adaptivity, are designed.
- **Prototyping:** it involves iteratively shaping the design artefacts in terms of having a proof of principle, i.e. *concept prototyping*. Also, it can cover some the functional aspects, i.e. *functional prototyping*. Guida et al. (2013) pointed out that this prototyping approach acts as a requirement engineering tool used to achieve a list of goals:
 - Understanding users’ needs and operational context.
 - Eliciting, refining and validating needs.
 - Assessing appropriateness of the design decisions.
 - Exploring design issues.
 - Promoting communication and development team progressive learning.

Participatory design is an approach that emphasises representing users’ involvement in the design process. This approach can be used in the design process of future intervention tools with caution. Kujala and Väänänen-Vainio-Mattila (2009) explained that the values of representative users who participated in the design process might conflict individuals’ values. Consequently, this would not maintain interest and engagement of real users.

However, there is a need to devise methods and guidelines supported by best practices to govern the users’ involvement especially addicts who may exhibit a denial of reality. Hence, more research is still needed to utilize user-centred and participatory approaches for designing technology the regulate DA. For example, it is not clear whether and how to involve ex-addicts

in the design and test processes. While ex-addicts may have more empathy for addicted users, they might dictate their opinion due to their bias and their own experience.

2.5.7.3 *VALUE-SENSITIVE DESIGN (VSD)*

Value-Sensitive Design (VSD) which is a framework that takes a comprehensive grounded approach to iteratively investigate ethical values (e.g. human welfare, dignity, justice, courtesy, etc.) throughout the design and development phases (Friedman et al. 2006). In VSD, moral values are independent of users' preference as long as they are ethically justified. In other words, social importance is the criterion, not the individuals' desires (Kujala and Väänänen-Vainio-Mattila 2009). Users' involvement in the design process is a key aspect to discover any ethical concerns. Hence, Value Sensitive Design (VSD) and Participatory Design (PD) were proposed as promising methodological frameworks to account for such concerns (Davis 2009).

The design decision of software that addresses addiction has much to do with stakeholders' goals, including end-users needs, motivations and values. There are different approaches to deal with the users' values; each following a certain perspective and emphasis. Kujala and Väänänen-Vainio-Mattila (2009) reviewed the perceptions of value in marketing, management science, psychology and HCI to distinguish it from motivations, goals, and needs. This led to introducing what they called "user values" which is "*users' psychological values that affect their views as to what kind of purpose, functions and characteristics are important to them in a certain usage situation and context*". As such, users' goals and values are different in that the values are "cognitive representations" of the goals and can sustain users positive emotion towards a software design (Kujala and Väänänen-Vainio-Mattila 2009). The same study concluded that the value from users' perspective is not a main focus in the literature and practice. This means that the values of the software developer or the business cooperation, for which software is developed, are dominants while end users in the sense of individuals are rarely given a voice. This approach and similar ones are very relevant to online addiction as they bring users' perspectives to the design process in order to introduce further explanation about users' behaviours.

Zimmerman (2009) pointed out that most of the HCI approaches focus on experience either during, or immediately after, the use as an outcome. However, Worth-Centred Design proposed by Cockton (2006), is another approach that tries to address the values that emerge with the repeated use. In other words, “*worthwhile, something that will be valued, as manifested in people’s motivation to invest time, money, energy and commitment*” (Kujala and Väänänen-Vainio-Mattila 2009).

2.6 CHAPTER SUMMARY

This chapter presented a review of the state of the art in relation to DA and the online peer groups as a motivational mechanism. The chapter, also, reviewed the potential approaches that could inform the development of the tools, methods and frameworks to build systems that regulate digital usage. The next chapter will present the thesis methodology, assumptions and choices to achieve the research objectives.

3. CHAPTER 3: RESEARCH METHODOLOGY

This chapter introduces the thesis methodology, choices and their justifications. It starts with highlighting the general aspects, underpinning assumptions and the practical considerations to explain the thesis philosophical ground.

In essence, the research philosophy can be characterised by four concepts (Guba 1990):

- **Ontology** which is concerned with what realities can researchers find and what facts exist to constitute that reality.
- **Epistemology** which is concerned with what propositional knowledge can be discovered about a reality and how to approach that based on the understanding of the source of knowledge. In other words, the “how” to know things is the core question in this philosophical concept (Saunders et al. 2009). For example, if a researcher views a reality to be governed by laws, an objective stance should be taken to acquire knowledge about that reality. In turns, this will influence the adopted methodology.
- **Methodology** which is concerned with what strategic plan to take in order to get knowledge about a reality. The methodology should provide clear linkage between the choices of the methods and the desired outcomes.
- **Axiology** which is concerned with the roles that the researchers’ own values can play in all the research stages. It is more relevant to the qualitative research (Saunders et al. 2009).

To summarise, ontology and epistemology are the theoretical backgrounds of the chosen methodology, while methods are the techniques and procedures that make a particular methodology actionable.

This chapter will be structured based on the Saunders’s Framework (2009) in **Figure 10** which was adopted to demonstrate and summarise the philosophical stance of this research. The

framework illustrates the stages of the research process that are based on the assumptions and the nature of the knowledge to be acquired. A researcher should peel away the onion's outer layers before selecting the techniques and procedure needed to effectively formulate the research methodology. The underlined items in **Figure 10** shows the methodological selections of this thesis. A reflective commentary will also be incorporated to justify the choices.

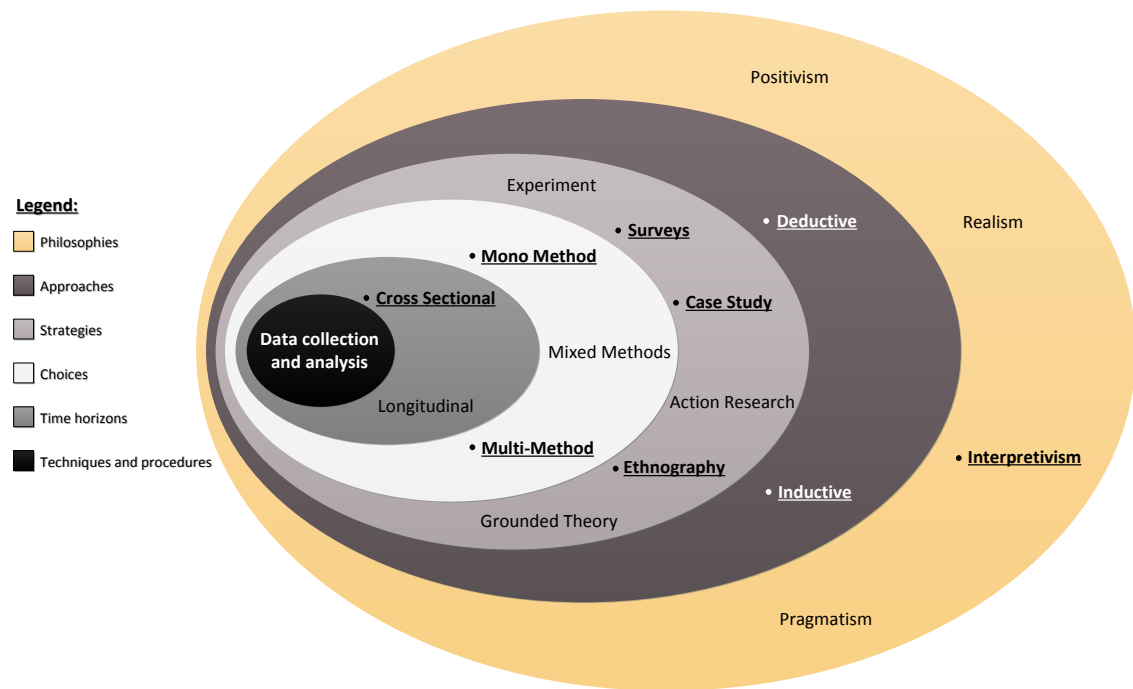


FIGURE 10: RESEARCH ONION (SAUNDERS ET AL. 2009)

3.1 RESEARCH PHILOSOPHIES

This section outlines four research paradigms that are widely discussed in the literature. These are positivism, realism, interpretivism, and pragmatism. These paradigms describe different views of the world and what is considered valid knowledge. Being aware of the research philosophy will help to formulate the research beliefs and assumptions.

3.1.1 POSITIVISM

This philosophy holds that science is what researchers can observe and measure. The social phenomenon can be studied in the same way of the natural phenomenon. In other words, the phenomenon should be described as it is experienced and the data analysis should be “value-free” to aim for prediction and control (Krauss 2005). As such, different studies can arrive at the same

findings using standard methods (Bryman 2015). In practice, positivists do not participate in the world they study, while researchers in other paradigms need to participate to understand better the properties of the world they study (Saunders et al. 2009).

3.1.2 REALISM

Realism philosophy is defined as “*the view that entities exist independently of being perceived, or independently of our theories about them*” (Phillips 1987). It considers all the universe features that can be perceived by human senses and have an influence on the phenomenon being investigated (Maxwell 2012). In other words, the reality is objective and independent of the mind. Hence, a scientific approach is required to acquire the knowledge (Saunders et al. 2009). These attributes define the first type of this philosophy which is called *direct realism*.

The second type is the *critical realism* which can be divided into two phases. Phase one encourages viewing what perceived through senses, e.g. experiences, as just the entities and characteristics of the reality. In phase two, the scientific inquiry should proceed to examine those sensations further to reach the reality (Saunders et al. 2009).

3.1.3 INTERPRETIVISM

This philosophy intends to understand “*the world of human experience*” (Cohen et al. 2013). Consequentially, the interpretivism throughout the research processes tends to focus on investigating participants’ views, experience and interests to better explain situations under the investigation (Creswell 2014). Also, properties of individual interactions are an essential intent to seek a further subjective interpretation of the context (Creswell 2014). Qualitative data collection methods, such as observations and interviews with open-ended questions, are widely used in this philosophy to enable participants to share their views (Saunders et al. 2009). Personal visiting the context under the investigation and the researcher social engagement are essential activities to generate more accurate meanings (Creswell 2014). In this philosophy, sample sizes are often small as in-depth qualitative investigations are required to reach the real principles that are motivating individual actions (Saunders et al. 2009).

This thesis adopts the interpretivism philosophy due to the complexity of the phenomenon being investigated. Also, this is because the generalisability of the findings is beyond the scope of this thesis which is more exploratory in nature (Saunders et al. 2009). For axiological reasons, the thesis cannot generalise the data in a value-free manner. This is because the researcher of this thesis cannot take an objective stance as he cannot be detached from the phenomenon being observed.

3.1.4 PRAGMATISM

Pragmatism emphasises the research problem more than the method of inquiry. Thus, this philosophy is more fit to mixed methods researchers to approach their needs. However, it is still important to rationalise need for mixing the methods (Creswell 2014).

Unlike positivism, the approaches within this philosophy are value-oriented (Johnson and Onwuegbuzie 2004). The reason is that pragmatism paradigm is problem-centric, so researchers can combine positivism and interpretivism views to satisfy the research question (Saunders et al. 2009).

3.2 RESEARCH APPROACHES

The research approach is a broad concept that summarises the whole research processes specifically in terms of the data collection, analysis and interpretation (Creswell 2014). There are two classifications of scientific research approaches: deductive and inductive, see **Figure 11**.

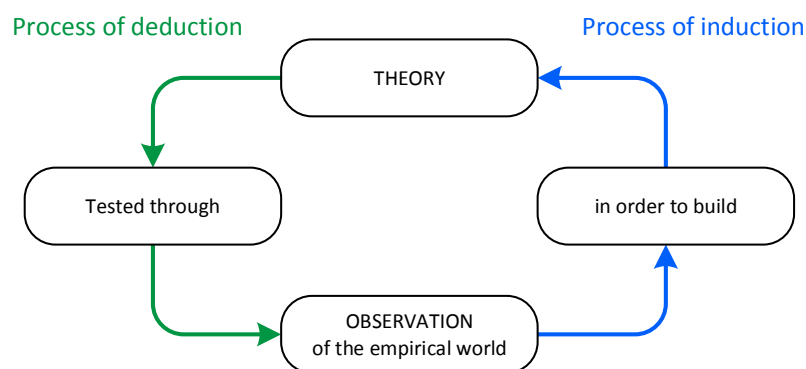


FIGURE 11: RESEARCH APPROACHES LOOP. ADAPTED FROM (GILL AND JOHNSON 2010)

The *deductive approach* requires an understanding of the theories or the concepts underpinnings prior the research starts. The collected data is analysed and tested rigorously based on the foundations of the identified theories or concepts. Then, based on the data analysis, the research view of the problem can be deduced or developed (Creswell 2014).

This approach has some unique characteristics. Firstly, the reliability is an important quality attribute of this approach to allow replication of the findings. This needs the use of highly structured methodology and the researcher to be independent of the phenomenon to reduce any potential bias. Secondly, there is a need to develop operationalised concepts to permit quantitative measurement of the identified facts. Thirdly, the need for sufficient sample size to facilitate the generalisability of the findings (Saunders et al. 2009).

The *inductive approach* involves exploring the phenomenon without a predetermined theory or a conceptual framework. Based on the data analysis and interpretation, a theory can be developed and linked to the literature. The inductive approach requires an adequate understanding of the subject being investigated to facilitate discovering new findings. Occasionally, a researcher may conduct a study trying to discover new facts while there is already a theory or conceptual framework that can provide an adequate explanation. The research may also end up with the same theory (Saunders et al. 2009).

The deductive approach is dominant in studies set out to investigate cause-effect relationships between variables (Saunders et al. 2009). However, for the emergence and complex social, behavioural, and cognitive problems where practical and pragmatic interventions are required, scientists need to consider inductive reasoning (Thomas et al. 2015). This would facilitate identifying cause-effect relationships without the need to fully understand people interpretations of their social worlds (Thomas et al. 2015). Practical and pragmatic interventions can include, for example, persuasive technology (Fogg 2002) and affective computing (Picard 1997).

The collective insights gathered in **chapters 2** and **4** indicated the need to adopt the inductive approach to support studying the social elements and their complexity and then construct the

abstractions. Also, there was a lack in the literature concerning the design frameworks or methods that facilitate the management of building online peer groups platforms in general. Hence, the effort was needed to construct such knowledge specifically for the DA-related behaviours. For these reasons, this thesis mainly adopts inductive reasoning.

3.3 RESEARCH STRATEGY

The research strategy is the methodological entity that directs the research to achieve its purpose. The research strategy is guided by different factors, including the research questions, objectives, philosophical underpinnings, and other research constraints, such as existing knowledge, and the available time (Saunders et al. 2009).

Examples of research strategies include experiment, survey, case study, grounded theory, ethnography, and action research. The major research purposes are exploratory, descriptive and explanatory. Each strategy can be used for all of those purposes (Yin 2012). These strategies are not mutually exclusive. For example, surveys can be used as a part of the case study (Saunders et al. 2009). The following subsections provide an overview of the six research strategies.

3.3.1 GROUNDED THEORY

The grounded theory focuses on the “*systematic discovery of theory from the data of social research*” (Smith and Biley 1997). It provides a researcher with flexible guidelines to direct the study as knowledge increases. These guidelines are mainly driven by the research question(s) (Saunders et al. 2009). This strategy requires iterative and comparative analysis, i.e. “*progressive focusing*”. Grounded theory is a qualitative based strategy. It does not require a particular data collection method, but that again solely depends on the research questions (Smith and Biley 1997, Charmaz 2014).

The aim of this strategy is to construct theories or to develop analytical processes and frameworks (Creswell 2014). Practically, a researcher works to derive code categories to explain the properties of the social processes under the main research concept(s) (Smith and Biley 1997). Smith and Biley (1997) highlighted that when little research into an area has been done, grounded

theory is more appropriate, especially in identifying relevant variables to the phenomenon. It is also an adequate strategy when there is a lack of a theoretical framework to guide the data collection process, analysis and interpretation.

Grounded theory strategy mainly emphasise inductive reasoning (Saunders et al. 2009). The obtained data can be confirmed with the aid of other methods, e.g. interviews, and the drawn conclusions are expected to contain theoretical insights (Saunders et al. 2009). As there is a wide range of the theoretical frameworks that can explain the dynamics behind users' addictive behaviours, this strategy inspired the analysis of the studies performed in **chapter 5** to form basic knowledge about technology-assisted behaviour change. This thesis cannot claim “full-fat grounded theory” (Braun and Clarke 2006) which require theoretical commitment where Discourse Analysis (Lupton 1992) is a critical step. A full-fat grounded theory would go beyond the “surface of the data” and address deeper questions such as: what does an emerged theme mean? What are the underpinning assumptions? What are its implications? Why people attitude is taking a specific way?, etc. (Braun and Clarke 2006).

3.3.2 ETHNOGRAPHY

Ethnography is a systematic strategy to learn and gather in-depth qualitative information about communities shared variables in their natural environment. As such, it does not have control over the field settings. It uses both inductive and deductive approaches (Saunders et al. 2009).

The strength of ethnography stems from the research flexibility it provides to the researchers to identify patterns in people behaviours including the aspects that they may be unwilling to disclose. It can also inform next research steps, e.g. interviews and surveys (Lazar et al. 2010).

There are some challenges associated with ethnographic research. It can be a time-consuming exercise as it requires extended immersion in the social environment being studied. The gathered information can be very subjective. Hence, it triggers some validity concerns. However, utilising multiple sources of evidence, repeated observations and performing follow-up qualitative studies, e.g. interviews, can be used to form a comprehensive understanding and to

reduce researchers' bias by accurately reflecting on the interpreted experiences and opinions of the people.

Ethnography is applicable to this thesis where there is a need to investigate peer groups interactions, beliefs, behaviour, and even language used in their communications including other group dynamics, e.g. dominance. As such, this thesis utilised ethnography strategy in **chapter 7** to collect insights from the face-to-face and online peer groups to devise design principles, risks, constraints and governance insights.

3.3.3 CASE STUDIES

A case study research is defined “*as an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used*” (Yin 2012). Lazar et al. (2010) defined a case study as “*an in-depth study of a specific instance or a small number of instances within a specific real-life context*”. It is a strategy to perform an empirical investigation and contextual analysis in a real-life situation (i.e. a case) to understand a phenomenon (Yin 2012).

It provides a researcher with the opportunities to collect quantitative and qualitative data. Unlike ethnographic research, the case study strategy is more interested in a particular instance(s), event(s), individual cases, and even a particular group including the implication of that “case”. This strategy holds a little basis for scientific generalisation due to the sampling nature which can be limited to one subject only (Yin 2012). Case study often used for explanatory and exploratory research purposes (Saunders et al. 2009).

It can help to generate theories, hypotheses or evidence by close exploration and inspection of individual cases (Lazar et al. 2010). Case studies do not require replication as they provide “limited confidence” (Kitchenham et al. 1997). To achieve **objective 5**, this thesis utilised case study strategy in **chapter 9** to evaluate the thesis findings and provide proof of concepts.

3.3.4 EXPERIMENTS

Experiments are used to study the cause and effect between variables. In a simple experiment, the investigation would be limited to find out if there is a link exist between two variables. More complex experiments would assess the importance and the effect size of a change (Saunders et al. 2009).

This strategy was not adopted in this thesis as it requires applying standardised procedures to induce greater control over the dependent variables conditions in order to study the independent variables (Ross and Morrison 1996), which was not the purpose of this thesis. Also, external validity, i.e. generalisability to other settings, is less emphasised in experimental research. Generally, the experiment strategy is more interested in the internal validity which concerned with attributing the findings to the applied intervention(s) (Ross and Morrison 1996).

3.3.5 ACTION RESEARCH

Action research is “*a flexible spiral process which allows action (change, improvement) and research (understanding, knowledge) to be achieved at the same time*” (Dick 2002). It involves researchers collaborating with participants systematically to examine a problem and find a solution. Action research was not adopted in this thesis as this strategy has a great emphasis on i) problem-solving to practical issues (e.g. enhancing the service quality), ii) how to approach a change in the organisation practices, and iii) how to understand and evaluate the change (Saunders et al. 2009).

While the findings of this thesis may provide insights to help improving the practices in the treatment centre where the observational study was conducted, this is still out of the scope. Also, as this strategy is more concerned with the change, an extended involvement is required where a considerable amount of time needed to examine current practices, planning the change and applying it to proceed with the evaluation (Saunders et al. 2009).

3.3.6 SURVEYS

The survey is one of the most used strategies. It is utilised to collect data from a large number of people with a low cost if it is designed to be self-administrated. Surveys are not limited to the questionnaire technique but also structured observations and structured interviews (Saunders et al. 2009).

As surveys are usually deductive in nature and can contain a limited number of questions, it cannot provide a comprehensive understanding of the reality being investigated. Also, this method is not appropriate if designed to recall past experience, e.g. mood (Lazar et al. 2010) which may provide biased answers.

3.3.6.1 SAMPLING

There are two sampling techniques can be used based on the nature and the goals of the survey. **Probabilistic sampling** (AKA random sampling) aims at providing population estimate (Lazar et al. 2010). Yet, a well-defined sample is needed to achieve that. Also, when a population cannot be well defined, strict random sampling is not possible. However, the population estimate is not a goal in this thesis. While random sampling can provide more valid results, some techniques can still be applied to increase the validity of the **non-probabilistic sampling**, e.g. oversampling (Lazar et al. 2010). Babbie (2013) outlined four types of non-probabilistic sampling:

- **Convenience sampling:** it focuses on selecting participants who are easy to access. While it is the most commonly used sampling strategy, it is still a weak form of sampling (Gravetter and Forzano 2011). The author explained that this is due to the little control over the representativeness of the sample. As such, biased findings may be obtained. However, in exploratory studies, in which inferences may be the aim, such as in this thesis, this technique can be sufficient (Sue and Ritter 2007). Also, researchers can increase the representativeness of the sample; if they ensure that the sample is rich enough, i.e. it consists of participants belong to different groups, e.g. males and females, a wide range of age groups, different academic backgrounds, etc. (Gravetter and Forzano 2011). This is to ensure that the inherited attributes of that

sample are similar to other populations. For example, a rich sample generated from a particular college would be representative for other colleges, unless the survey is about specific topics, skills or needs. For example, surveying computer graphics students to assess their satisfaction with computers performance. Results in such scenario cannot be generalised to other students.

- **Judgmental sampling:** the selection of participants would be based on a researcher's knowledge and judgment about the most representative subjects in the targeted population.
- **Quota sampling:** participants are equally selected from a segmented population, e.g. male segment and female segment. Gravetter and Forzano (2011) pointed out that, in some cases, a quota is adjusted to represent the real population. For example, selecting 40 females and 60 males when the real population consists of 40% females and 60% males. While this sampling has inherent characteristics of probability sampling, it is still non-probabilistic because the selection is not random but judgemental.
- **Snowball sampling:** it is when the selected participants help to recruit further subjects. It is often used when locating representative participants is difficult, e.g. finding users suffer from severe addiction.
- **Saturation sampling:** it is not a technique by itself, but in fact, an approach used when the social structure of the target population is identified such as university students, and then every member in that social structure has a chance to be selected (Sue and Ritter 2007).

It is highly important to determine how many responses are required. The answer depends on the nature of the study and the sampling technique used. In studies applying probabilistic sampling, the required number of responses depends on the acceptable level of confidence and margin of error (Lazar et al. 2010). In non-probabilistic sampling, the number of participants can

be very critical as the quality of the sampling depends on the techniques used. However, Sue and Ritter (2007) suggested that a minimum of 30 responses is essential in any survey study.

3.3.6.2 *SURVEY DESIGN AND STRUCTURE*

Lazar et al. (2010) outlined some of the common issues with questions wording including “double-barrelled questions”, biased wording and “hot-button” terms. The author also listed three signs of wording issue: (1) a question with a very low answer rate, (2) a question that received different answers when a specific one was expected or (3) when the “other” options have been selected the most.

In order to eliminate ambiguity and to ensure clarity, surveys are recommended to be tested in three stages: i) with a knowledgeable person, ii) with a potential respondent(s), and finally, iii) with an actual participant(s) (Lazar et al. 2010).

3.4 RESEARCH CHOICES

Saunders et al. (2009) explained that research choices are concerned with the number of the data collection methods. Also, if more than one method is needed for a particular study, how are these methods are going to be combined. Saunders et al. (2009) outlines three research choices:

- **Mono method:** the research adopts one data collection method and perhaps different data analysis procedures for a particular study.
- **Multiple methods:** the research adopts a collection of exclusively qualitative or quantitative techniques for data collection processes and perhaps different data analysis procedures.
- **Mixed methods:** the research mixes between qualitative and quantitative methods for a particular study.

This thesis adopts the multiple methods choice in all the conducted studies. This thesis recognises the difficulty in establishing generalizable findings due to the facts highlighted in **section (3.1.3)**, and due to the need to have different interpretations of the obtained data.

Therefore, the thesis mainly uses multiple methods in a particular study to establish consensus on the drawn conclusions.

3.5 TIME HORIZONS

Saunders et al. (2009) articulates that time horizon perspective is a methodological aspect that deals with the properties of the problem being studied. Some studies are concerned with observing a process over time to capture the dynamics of a problem, e.g. human development. However, the change can also be not apparent, i.e. the investigated properties are stable. For a given research design, cross-sectional or longitudinal time horizon can be adopted (Saunders et al. 2009):

- **Cross-sectional:** when the answers of a problem can be obtained at a particular time.
- **Longitudinal:** it requires an extended period of time to answer the “why?” questions taking “a diary perspective” (Saunders et al. 2009).

The time horizon perspective is independent of the research strategies. However, cross-sectional often utilises the survey strategy (Easterby-Smith et al. 2012).

This thesis is not applying interventions to the users’ experience. Hence, collecting the change in users’ perceptions and attitudinal responses is not the aim of the thesis. Also, as the answers of the thesis problem can be obtained at a particular time, the cross-sectional horizon was adopted.

3.6 ADOPTED METHODS

As the thesis takes a bottom-up approach moving from the data to the theoretical level, the methods adopted are principally qualitative.

3.6.1 SURVEY

The survey method provides a researcher with more control over the research process. Data generalisability can be improved if an appropriate sampling technique is applied (Saunders et al. 2009).

This research utilised this method in **chapter 6** to get further confirmation on the findings and to obtain insights from the comments provided by larger sample size. The other reason for selecting this strategy is the fact that surveys tend to be used for exploratory and descriptive research, and the findings can be generalised at a lower cost when large and rigour sampling is used (Saunders et al. 2009). The online self-administrated survey technique was used due to the need for a large sample size.

3.6.2 OBSERVATION

The observation method can be defined as a systematic method to observe, and record description notes, analysis and interpretations of individuals' and groups' behaviour (Saunders et al. 2009).

There are two types of observations:

- ***Participant observation***: it is a qualitative approach to discover meanings of people actions. It entails researcher immersion in the research settings to be an active member in the group and to participate in their activities.

Gill and Johnson (2010) proposed a taxonomy of four roles in **Figure 12** to describe the extent to which the field research is covert and also the extent to which the researcher interacts with members. **Figure 12** was originally adopted from (Saunders et al. 2009).

- ***Structured observation***: it is a quantitative approach to investigate frequencies of people actions. It requires a pre-determined structure, e.g. a list of the behavioural aspects and their contextual factors, to quantify the behaviour.

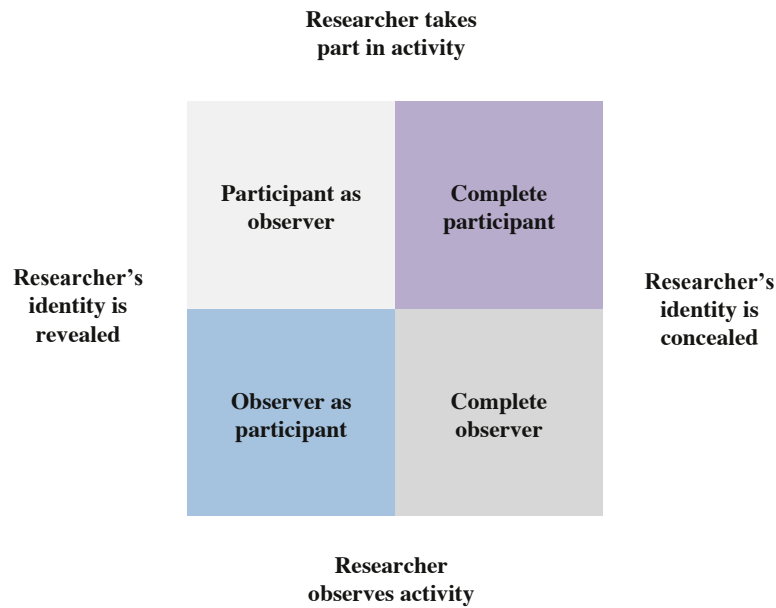


FIGURE 12: TYPOLOGY OF PARTICIPANT OBSERVATION RESEARCHER ROLES (SAUNDERS ET AL. 2009)

In this thesis (**chapter 7**), the *participant as observer* role was played to collect data in the observational study performed in the residential rehab centre. Also, the *observer as participant* role was played to collect data from the online peer groups platform. This helped to achieve **objective 4**.

3.6.3 DOCUMENT ANALYSIS

Document analysis is a qualitative research method used to systematically reviewing and evaluating documents to develop empirical knowledge (Bowen 2009). Documents can be in various forms:

- **Official materials:** public records in which ongoing institutional activities are documented, such as annual reports, policies, strategic plans, and meetings minutes.
- **Personal materials:** sources that contain individuals' actions, such as emails, blogs, social media posts, customer reviews, diaries
- **Artefacts:** other printed materials, such as maps, posters and flyers.

It is essential to provide metadata for the analysed document, i.e. data about the data. It can be adopted as a stand-alone method for particular research, such as (Wild et al. 2010). However, it is often used as a mean of triangulation to reduce potential bias (Bowen 2009).

This thesis utilised this method in **chapter 4** to collect data that help to build the DA reference model as a part of **objective 2**. The method was also used in **chapter 5** to understand users' views towards e-health intervention applications as a part of **objective 3**. To help in achieving **objective 4**, the method was also used in **chapter 7** by looking at some forms and artefacts to gather insights related to the treatments practices and protocols in the face-to-face peer groups.

3.6.4 INTERVIEWS

The interview method is a direct and “*purposeful discussion between two or more people*” to elicit detailed information (Saunders et al. 2009). Lazar et al. (2010) highlighted that interviews could be used for:

- ***Initial exploration*** where broader questions are formulated to investigate needs and challenges rather than functionality and design.
- ***Requirements gathering*** where the questions are more focused on stakeholders' goals and how to meet them alongside the current system limitations and users' frustrations and concerns.
- ***Evaluation*** where the questions aim at capturing subjects' reactions.

An interview can be ***fully structured*** which is a form of an administrated survey but with higher chance to verbally collect extensive data than the written answers. Analysing fully structured interview is easier as questions follow the same order. A ***semi-structured*** interview pays significant attention to the interviewees' comments. It adds more room to include additional questions to follow up the comments provided. It follows a conversational form by using questions such as “could you elaborate on this...?”. An ***unstructured-interview*** deals more with

participants concerns and interests as an interviewee moves from a topic to an another which indicates the importance to the respondent.

The semi-structured and unstructured interviews are suitable for the initial exploration phase, while fully-structured ones are useful for the evaluations (Lazar et al. 2010). This thesis utilised semi-structured interview technique for the studies in **chapters 5** and **6** to understand users' perceptions towards E-health interventions and online peer groups which helped to collect some data relevant to **objective 3**. The method was also used in **chapter 7** to collect data from the addiction counsellor and refine the gathered inference as a part of **objective 4**.

3.6.5 FOCUS GROUPS

The focus group method is an interactive discussion that requires a moderator to administer, control and maintain the focus (Saunders et al. 2009).

Lazar et al. (2010) pointed out that a group interview is a form of focus group method where a direct discussion with a group of participants is performed. This is to collect responses from a larger sample size (often between four and eighth, to 12 participants (Saunders et al. 2009, Robson and McCartan 2016)) at one time. Typically, sampling follows non-probability technique, "*often with a specific purpose in mind*", e.g. having the appropriate experience and familiarity in specific topics (Saunders et al. 2009).

Saunders et al. (2009) suggested that a group discussion can focus on emotional constructs, e.g. attitudes and preferences. Also, it can be a performance oriented. Challenges in applying this method include potential conflicts, lengthy discussion on specific questions or tasks, talkative participants, side conversations and the need to encourage all participants to speak up.

This thesis utilised this method in **chapter 4** to validate the DA reference model as a part of **objective 2**. Also, it was utilised in **chapter 6** to understand different perspectives on online peer groups and their interactive design as a part of objective three. Finally, **chapter 9** utilised this method in a case study to evaluate the proposed method as a part of **objective 5**.

3.6.6 “EXPERT” MEMBER CHECKING

In qualitative research, member-checking is the process of verifying the accuracy of the preliminary findings by seeking informant feedback. The method focuses on the internal validity of the results by reducing the potential bias by a researcher (Schwandt 2014).

The method involves taking the findings and interpretations to the study participants to confirm the credibility of the analysis. This can be done collaboratively in a focus group discussion or an interview session. In the interpretation studies, such as this thesis, improving the interpretations accuracy and trustworthiness of the results is a major concern. Hence, member-checking method is highly recommended (Creswell 2014).

McConnellHenry et al. (2011) stress that member-checking conflicts the main principles of the interpretivism philosophy. This is mainly due to two main issues. First is the challenges a member may face when checking information collected over an extended period of time, and where the data is highly synthesised, decontextualized and abstracted (Padgett 2008). The member-checking, in this case, would be inappropriate as participants will not be able to “*recognise themselves or their particular experiences*” (Houghton et al. 2013). Secondly, involving one member may provide one-side of the reality, i.e. it might be rejected by other members (Padgett 2008).

This thesis utilised this method in **chapter 9** to establish the credibility of the data collected in the observational study at the residential rehab centre which is part of **objective 5**. However, the data was checked by an expert who is a member of the social structure being observed. This thesis argues that employing experts who are also a member to check the interpretations and the findings can increase the rigour of the findings. Hence, the method will be referred to as Expert Checking.

3.6.7 DIARY STUDIES

Lazar et al. (2010) define diary as a “*document created by an individual who maintains regular recordings about events in their life at the time those events occur*”. The authors state that this method is good for answering questions related to “how” and “why” technology is utilised in naturalistic settings. Moreover, it can work well for collecting "fluid" data such as mood, emotions and perceptions (Lazar et al. 2010).

Bolger et al. (2003) highlighted three main diaries’ protocols:

- **Interval-based diaries** in which users’ experience should be reported at predetermined intervals. This protocol can be either fixed or random-based. The reporting times are predictable and can be accommodated into a participant’s schedule. However, desired events might not occur during the selected intervals.
- **Event-based diaries** in which participants report their diaries when a predetermined event(s) occur. In this protocol, it is essential to clearly define the predetermined events, focus on one class of the phenomenon to reduce the number of events and eliminate any ambiguity.
- **Signal-based diaries** in which participants are signalled to start reporting their experience.

Newman (2004) proposed a customised form of event-based protocol in which participants’ plan and prioritise their next day objectives, and then note what has impeded them which can then be elaborated in subsequent interviews.

Interval-based diaries method was adopted in **chapter 5** to capture users’ experience related to their interaction with technology which is part of **objective 3**. As the subjects of the thesis are those whose interaction can be described as excessive, the risk of missing the desired events was minimal.

3.7 DATA ANALYSIS TECHNIQUES

Data analysis techniques refer to the approaches, processes and procedures applied to analyse, evaluate, describe and present the data. This thesis mainly utilised qualitative data analysis using the content analysis technique.

3.7.1 QUALITATIVE CONTENT ANALYSIS

Content analysis is a qualitative based research method. It is concerned with producing new knowledge through a systematic analysis process of information coming from different sources, e.g. interviews, printed publications, broadcast programmes and websites (Lazar et al. 2010). It is defined by Hsieh (2005) as “*a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns*”.

However, Marks and Yardley (2004) argue that **content analysis** is focused on the instances in a given text. On the other hand, **thematic analysis** pays more attention to the qualitative aspects of the given text to guide the coding process and to categorise the data. Both terms used in some studies interchangeably.

Hsieh (2005) presented three approaches to content analysis: *conventional*, *directed* and *summative*. In the **conventional approach**, the text is analysed to derive coding categories in order to describe the phenomenon. It can be used when there is a lack of theories that explain the captured events. Based on the relationships between the articulated categories, a researcher might combine and re-organise them. The **directed approach** starts with relevant theories to guide the coding process. The aim of this approach is to validate or extend the theory. In the **summative approach**, the aim is not to derive inferences but to understand the usage of the keywords by quantifying them and analysing their contexts. Each of these three approaches needs specific activities to increase results' credibility. A list and discussions of these activities are outlined in (Hsieh 2005).

This thesis adopts this method to investigate DA concepts to support the construction of DA reference model, (**objective 2**), to investigate the requirements of self and peer monitoring in self-regulation systems (**objective 3**), and also to collect insights from the observational data obtained (**objective 4**).

3.8 ETHICAL CONSIDERATIONS

To ensure disciplined enquiry, the internal ethics policy of Bournemouth University was used to guide the planning and conducting of the research studies. Before commencing each study, an application was prepared and sent out to the Bournemouth University Research Ethics Committee (UREC) to ensure quality and integrity. All the research studies applications were granted by the university committee. The studies in **chapters 4, 5, 6, and 9** were below minimal risk, meaning that the possible harm due to the participation in the studies is not greater than what participants encounter in their everyday life. The participants in these studies were fully informed about the studies goals, procedures, participants' role, and the data protection and anonymisations procedures. Then, the participants' consents were obtained by signing consents forms that explain their rights in the study. All the data was anonymised and stored in a confidential place. The audio files were first transcribed and then destroyed.

The two studies in **chapter 7** were performed to collect insights to identify what designers need to consider when developing online peer groups. The first study was in an addiction rehab centre where clients who suffer from different addiction behaviours attend to obtain professional healthcare. As such, these two studies were above minimal risk. To ensure the right ethical practices when collecting data from such vulnerable community, the study involved an expert in the domain of addiction from the rehab centre. That benefited the research for two reasons:

- While the observation was set out only to understand how communications occur and how they are managed in peer groups, it is always a possibility that clients are open to parts of their personal life experience. This may lead to emotive discussions opened up by the participants themselves due to the sensitive context of the topic (i.e. addiction). The research considered the tendency of participants to be subject to

relatively unconscious distorted, conflicting, requirements which could be accompanied with a denial of reality. Hence, the staff member will enhance the process of data collection through minimising such risks, mitigate any discomfort and risks of causing stress to the clients and ensure appropriate and moral management of such events when occur. However, it was agreed by the researcher and the rehab centre that it would be very appreciated if participants, at some point, thought that there is useful and relevant information they deliberately choose to share for the benefits of the research.

- Having an additional observer (the moderator of the sessions) provided a scientific validation for the data by providing psychological justifications and reflections on the responses. As the researcher is from computing background, such involvement enabled combining a deeper understanding of the collected responses. Burnard (2004) concluded the need for an “insider” individual to recognize certain central aspects and also to help a respondent elaborate on particular issues and to describe them in more details when needed.

With regard to the risk of influencing participants by the involvement of an expert from the centre, it should be highlighted that participants are in fact clients who pay for their treatments. Being free from any obligation to participate will reduce this risk. Also, the study was conducted in a context where trust and sharing stories, personal experience and preferences is a norm. In other words, this is already the nature of the relation between the treatment centre and their clients. Unlike other contexts, such as prisons where such self-disclosure might cause severe distress.

The second study that designed to observe online peer groups related to problematic gambling. This study was also above minimal risk. The research has obtained the support from the head of the online platform to conduct the study. This included the agreement to join the sessions as *observer as a participant*, meaning that the identity as a researcher is revealed and the role was to observe not to participate actively. Participants in the online therapy peer support

sessions were informed about the study, and its objectives and procedures to ensure freely given and fully informed consent.

3.9 THE ADOPTED METHODOLOGY

This section presents brief discussions to justify the selection of the research methodology. Research methodology is the philosophical framework that provides a systematic way in which research is undertaken (Saunders et al. 2009). It involves providing scientific justification for the methods identified to be appropriate to achieve the research objectives (Kothari 2004). A qualitative methodology is selected for this thesis due to the following reasons:

- It is more realistic to deal with users' behaviours and use of digital technology as a consequence of the way they perceive their gains, loss, goals and needs, rather than just reactions to certain objective properties in the design of the software. For example, a user decides to add someone as a friend on a social platform not because the "adding friend" feature was offered. Thus, it can be doubted that only deactivating such feature will induce positive implications to the clinical addiction components proposed by Griffiths (2005) which are: salience, mood modification, tolerance, withdrawal, conflict and relapse.
- Persuasive technology raises ethical issues, such as privacy, autonomy, social pressure, and the leaning towards designers' intent (Davis 2009). As such, Davis (2009) argues the need for users' involvement throughout the design process as a key aspect to uncover any ethical concerns. Then, the author argues that Value Sensitive Design (VSD) and Participatory Design (PD) are two methodological frameworks that have great potential to account for such ethical issues. In reference to the research philosophy of this thesis, interpretivism epistemology gives more priorities to the users' subjective interpretations of the social phenomena they are part of (Bryman 2015) and to the understandings of their own actions.
- Patton (2014) lists a number of justifications for selecting qualitative approaches to solve a research problem: 1) to understand users' perspectives and experience, 2) to

provide explanation of how systems influence users' actions, 3) to identify unanticipated consequences, 4) to discover patterns, and 5) to study how things work. All these justifications apply to this thesis.

- The research reality is governed by social and psychological influences, rather than by laws. Therefore, the epistemology of this thesis is based on interpretivism philosophy, in which the qualitative data is preferable.
- This thesis concerns with users experience to facilitate applying the desired change. Chang and Law (2009) conducted a survey covering 275 researchers from academia and industry about the views of User Experience (UX). They concluded that UX is “dynamic, context-dependent, subjective” and must be grounded in User Centred Design (UCD) practices. In other words, bottom-up approach is needed.

3.10 RESEARCH DESIGN

This section presents the research design of this thesis. The design is broken down into four phases, orientation, exploration, investigation, and finally confirmation. These phases and the related research objectives, processes, methods and techniques are depicted in **Figure 13**. Each of these phases will be discussed below in separate subsections.

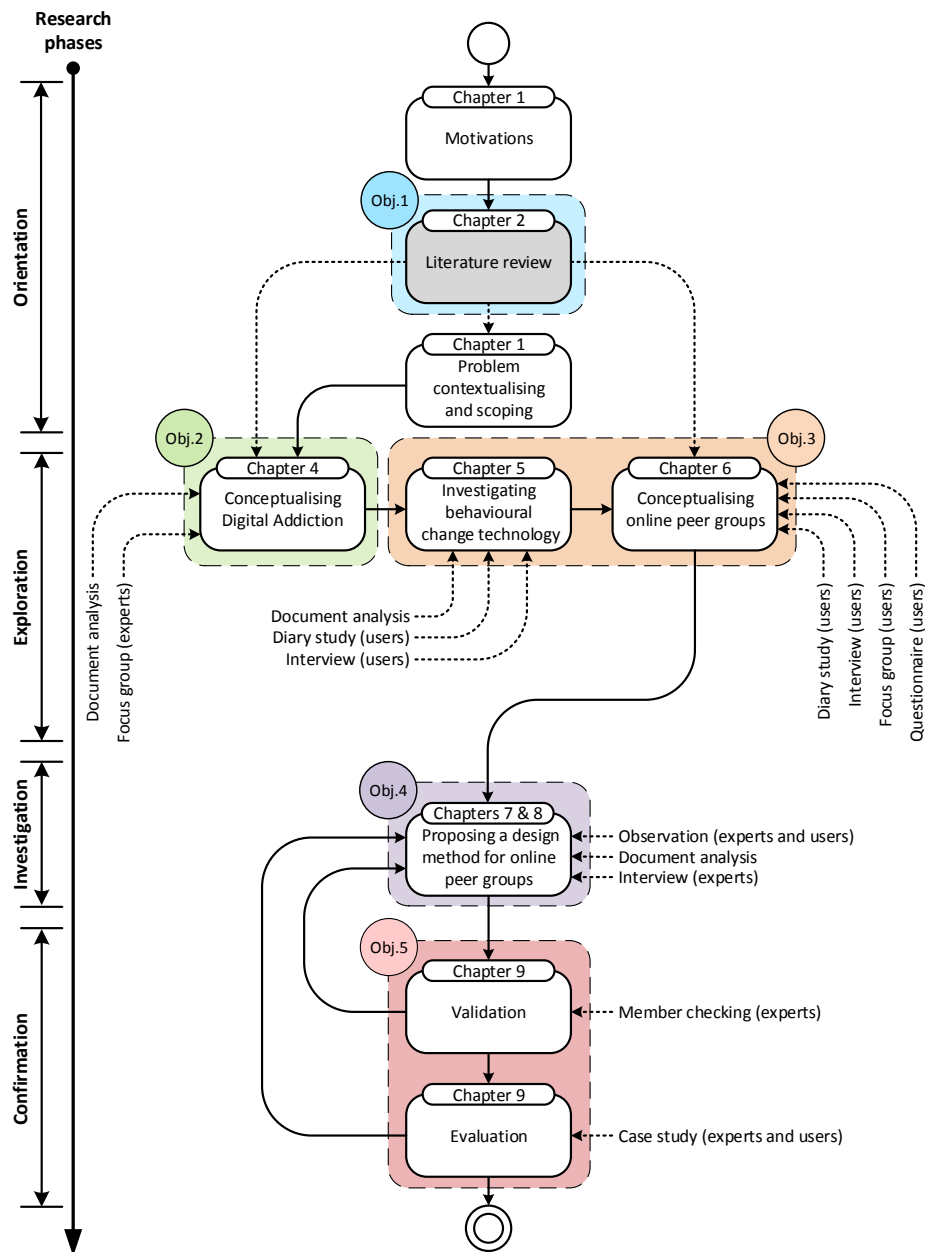


FIGURE 13: RESEARCH DESIGN OF THE THESIS

As the thesis is concerned with users' interactions with digital technology, it is essential to understand what user research methods work best to achieve the thesis objectives. Also, in order to further enhance the four phases of the research design, the Rohrer's three-dimensional framework (2008) in **Figure 14** was utilised. This is to help in identifying which methods are more appropriate for user experience studies and when. The Rohrer's framework (2008) consists of three dimensions:

- **Attitudinal versus behavioural:** the *attitudinal* methods, e.g. participatory design, are concerned with users' feelings and opinions, while the *behavioural* methods, e.g. eye-tracking, are concerned with users' actions.
- **Qualitative versus quantitative:** researchers need to decide how the behavioural and attitudinal data can be captured, i.e. directly through qualitative methods, such as interviews, or indirectly through quantitative methods such as self-administrated surveys. The practical considerations can, also, play a role.
- **Natural versus controlled settings (the context of use):** Montag and Reuter (2015) pointed out that in the field of psychology, the classic laboratory experiments, self-report questionnaires and interviews are the most widely used methods to study and predict human behaviours.

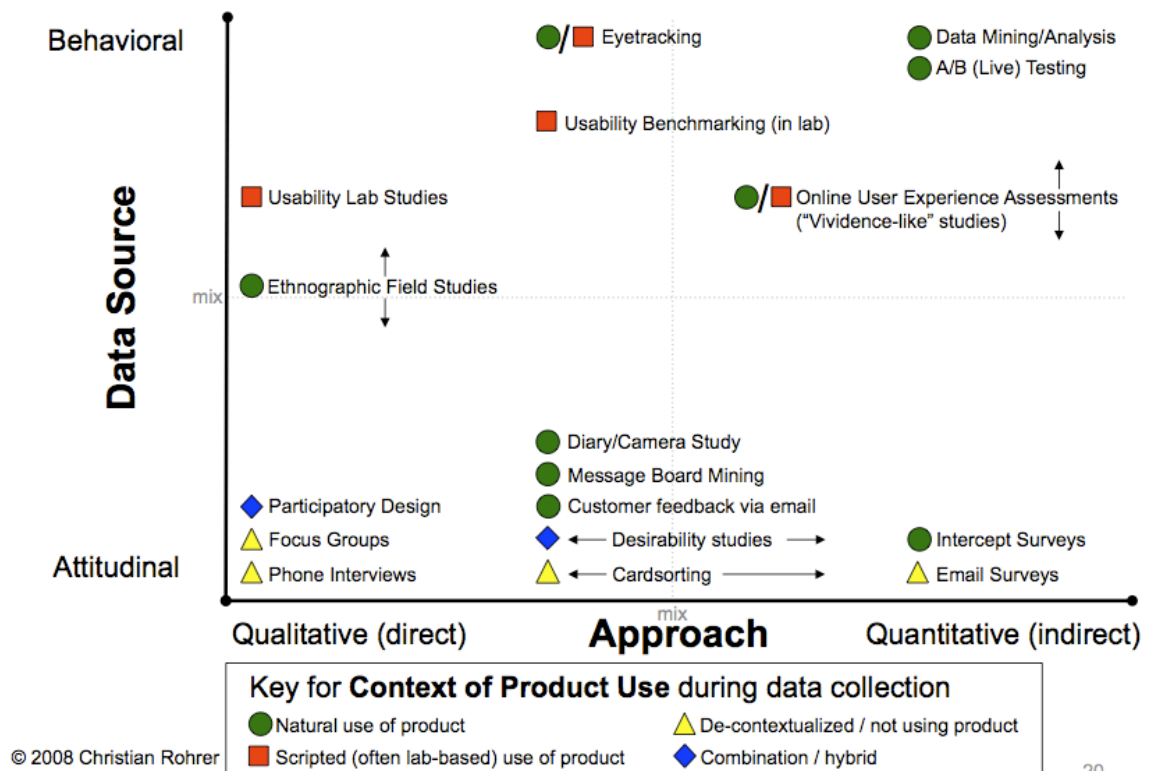


FIGURE 14: THE LANDSCAPE OF USER RESEARCH METHODS. ADOPTED FROM (ROHRER 2008)

3.10.1 PHASE ONE: ORIENTATION

This phase focuses on formulating the research topic, context and boundaries as a starting point. The thesis followed a typical literature review process by defining the scope and selecting papers from reputable conferences and journals, following key groups working on the areas and enhancing that with backward and forward snowballing (Wohlin 2014). This was not in the form of a systematic literature review due to the wide range of areas to cover and the time scale of this thesis, and also because the literature review is mainly to inform the following research activities, rather than being a major outcome per se.

3.10.2 PHASE TWO: EXPLORATION

While exploratory studies are always broad and not fit to answer specific questions, they can help to conclude the adequate research design, data collection methods and subjects' selection criterion. Also, it helps to test the feasibility of these considerations taking into account the time constraints of the thesis (Saunders et al. 2009).

Given the limited research on methods for engineering intervention systems for DA, a bottom-up approach was taken to explore this phenomenon in relation to the software design. Thus, the research applied iterative process to analyse the domain knowledge and identify the main concepts and entities (i.e. factors of DA), then represent that using a lightweight ontology. Also, this research exercise helped to inform the following empirical research studies.

To collect behavioural insights, participants' attitudinal data, such as perceptions of their interaction with the digital technology and preferences towards the potential intervention strategies, was explored using diary studies. While the framework in **Figure 14** shows that diary studies support attitudinal understanding, Goodman et al. (2012) pointed out that diaries can include questions that can uncover rich behavioural aspects.

Several steps and methods were performed in three empirical studies. The first study investigated self-monitoring as a behaviour management technique using a diary method to minimise recalling issue and support the following semi-structured interviews. The aim was to

investigate users' perceptions towards the significant features of the software-based intervention software and how they view them in different contexts. The second study followed an experimental design to study how users like to customise peer groups and what are their diverse preferences. The third study was an ethnographic investigation to observe how peer groups are structured and how interactions occur in offline settings. Also, the thesis sought to understand addicts' perspectives on peer groups to inform surveillance optimisation.

Overall, the methods used in this phase were mainly based on the survey strategy (interviews, focus groups, and diary studies). This phase was focused on both the problem space and the solution space. As a result, the research gap was identified, and the next phase then started.

3.10.3 PHASE THREE: INVESTIGATION

This phase will be more focused on devising a process method that guides the design of the systems concerned with influencing the use of digital technology. These systems do not seek only to persuade individuals to take action, but also to contemplate about their belief and intentions that enforce undesirable habits.

This phase will follow a mixture of observation, interview and documents analysis methods in face-to-face and online peer groups. The conclusions will be used to construct design artefacts, and guidelines. Iteratively, and through formative assessment, the final method will be devised. The method will be enhanced with a communication protocol to govern the interaction between different stakeholders who are expected to use the method in a participatory style.

3.10.4 PHASE FOUR: CONFIRMATION

The first step in this phase will focus on validating the outcomes obtained from the studies performed in **chapter 7**. An expert will be recruited to review the findings and models created and check their validity and accuracy.

Next, a case study strategy will be utilised to ask a set of users and stakeholders to try the proposed method and then draw some conclusions. The method will be evaluated subjectively by collecting participants' reactions, comments, and recommendations. This would require critical

observation of the participant interactions with the method, communications within the group, the progress of the design activity. This will help to identify the participants' requirements to enhance the method artefacts and support different design activities. However, using a case study to evaluate the method will provide limited confidence in the method effectiveness.

3.11 CHAPTER SUMMARY

Achieving the research goal requires an in-depth understanding of user experience with digital technology at first place. As such, the adopted methods helped to facilitate an extended engagement with users to obtain thick descriptions of their interactions patterns, perceptions, and engagement needs. These social factors provided access to the reality which is subjective and socially constructed. Hence, interpretivism philosophy was adopted to guide how the research reality is understood. The thesis has adopted several empirical studies including, qualitative meta-analysis, qualitative user studies and observational investigations.

4. CHAPTER 4: CONCEPTUALISATION OF DIGITAL ADDICTION

Several studies, such as (Hart et al. 2008, Thompson and Kemp 2009), have shown that user satisfaction when using some social platforms, e.g. YouTube and Facebook, is not severely affected, even when the design has poor compliance to usability principles. The question here is why users are still prone to experiencing excessive and problematic usage-related behaviours when interacting with such social platforms. This question deals with the factors that drive the uncontrolled and excessive use of digital technology in general. Incorporating a mixture of data capturing methods can help to address this question. This chapter is divided into two parts. Part one presents the analysis performed to derive a working definition of DA from software design perspective. Part two presents the reference model for DA. This chapter will attempt to achieve **objective 2** by conceptualisation DA and building a reference model for its different aspects.

4.1 TOWARDS A DEFINITION OF DIGITAL ADDICTION

The existing definitions found in the literature show that DA is entirely articulated within specific domains such as psychology, sociology and health care, see **chapter 2 - section (2.1.1)**. Therefore, an attempt was made to emphasise that software industries and academia can play a very important role in finding solutions that complement current intervention strategies for this condition.

These definitions have been analysed to derive the logical models. The steps for using the logical model representational notations are described by Dickerson (2008) and implemented in similar cases by Dogan et al. (2011).

4.1.1 LOGICAL MODELS

The literature lacks a standardised definition of DA. Consequently, the logical modelling approach was used to analyse different definitions to extract the concepts and relationships between them (Dickerson 2008). A definition of DA was derived as a result of the logical model

analysis. The relationship between the concepts, i.e. “concept multiplicity (Dogan et al. 2013)” helped to identify the core and common correlations between these definitions. The existing definitions of the condition do not emphasise the role of the software design. Therefore, a definition from software design perspective has been derived in a way that it is still recognised in other communities.

Logical modelling is an approach that was used to analyse definitions by exploring relationships between concepts, principles and terminology. This is to ensure consistency with the different views of the condition. Different addiction-related studies use different definitions based on the focus and emphasis of the study. As such, this approach was used to come up with a definition that covers various perspectives. The identified definitions were analysed to derive the logical models. The steps for using the logical model representational notations are described by Dickerson (2008).

- Definition 1: **Problematic Internet Use** is a multidimensional syndrome that consists of cognitive, emotional, and behavioural symptoms that result in difficulties with managing one’s offline life (Caplan 2005), see **Figure 15**.

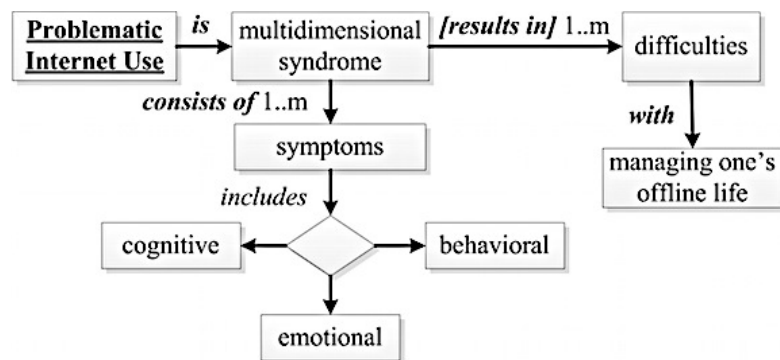


FIGURE 15: LOGICAL MODEL OF THE PROBLEMATIC INTERNET USE DEFINITION

- Definition 2: **Generalised Pathological Internet Use** is conceptualised as a multidimensional overuse of the Internet itself that results in negative personal and professional consequences (Davis 2001), see **Figure 16**.

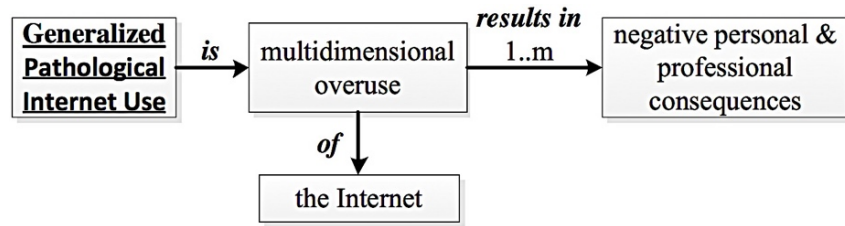


FIGURE 16: LOGICAL MODEL OF THE GENERALISED PATHOLOGICAL INTERNET USE DEFINITION

- Definition 3: **Internet Addiction** is “*the inability of individuals to control their Internet use, resulting in marked distress and/or functional impairment in daily life*” (Ha et al. 2006), see **Figure 17**.

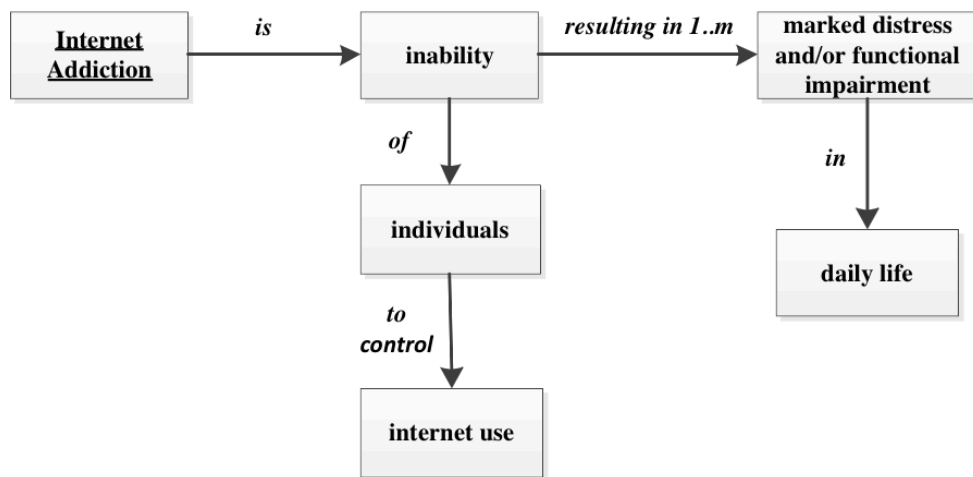


FIGURE 17: LOGICAL MODEL OF THE INTERNET ADDICTION DEFINITION

- Definition 4: **Technological Addiction** is operationally defined as “*non-chemical (behavioural) addictions that involve human-machine interaction*” (Griffiths 2000a), see **Figure 18**.

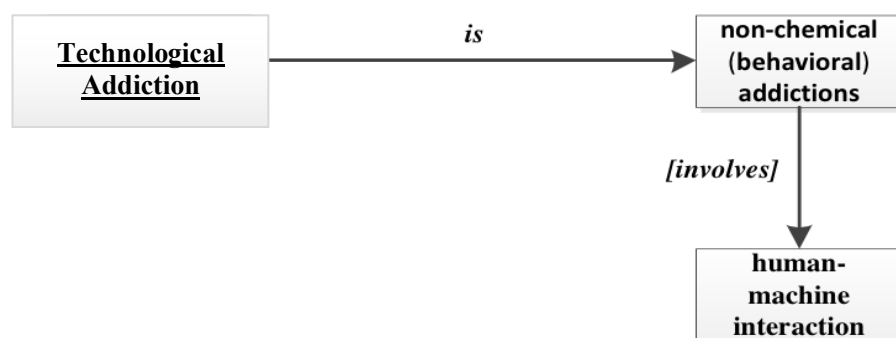


FIGURE 18: LOGICAL MODEL OF THE TECHNOLOGICAL ADDICTION DEFINITION

Relationships between concepts, principles and terminology were created. These four models were then reduced and summarised in a concluding logical model, as shown in **Figure 19**, which forms the basis of the new definition. The following changes were applied:

- Replacing “*Internet Addiction*” with the term “*Digital Addiction*” as a main concept. This is due to the role of digital devices, such as smart phones, in accelerating addiction (Young and de Abreu 2011).
- Replacing the term “*behaviour*” to “*compulsive-impulsive use*” based on the classification of the behaviour (Block 2008).
- Discarding the term “*consequences*”, as the term “*compulsive/impulsive use*” would implicitly convey the negative impact.
- Using the term “*to reach certain requirements*” to denote interaction requirements.
- Replacing the term “*Internet*” with “*software-mediated operations*” to emphasise the diverse impact of different software products.

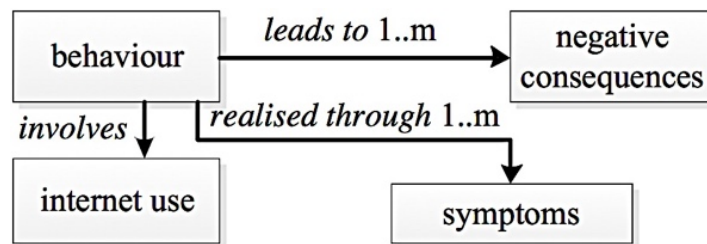


FIGURE 19: SUMMARY OF THE FOUR LOGICAL MODELS

Based on these logical models, a working definition of DA is proposed below and represented in the logical model shown in **Figure 20**. Digital Addiction (DA) “*is the compulsive and impulsive use of software-mediated operations to reach certain requirements and it can be realised through multiple symptoms*”. The message to be communicated via this definition is that digital technology should not be treated as an object of addiction, rather enabled through certain software-mediated operations and user requirements should be considered in searching for less addictive alternatives.

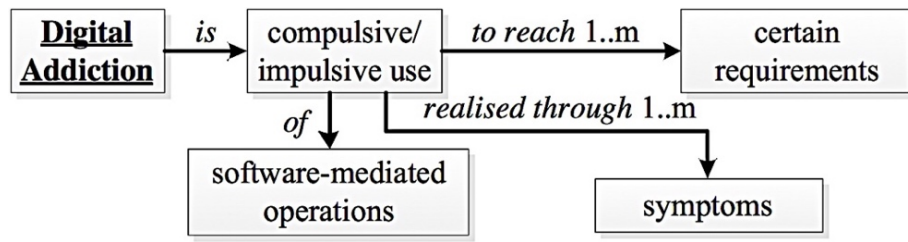


FIGURE 20: THE LOGICAL MODEL OF DA DEFINITION FROM SOFTWARE PRESPECTIVE

The findings show that there is inconsistency in using the terms that are labelling the condition. According to Widyanto and Griffiths (2006), this is because the understanding of the phenomenon and its implications are still in the early stages. Therefore, this research view DA as an umbrella term that covers various themes of compulsive, impulsive and excessive use of digital devices unified by the noticeable adverse impact on individuals’ social and professional life.

4.2 REFERENCE MODEL FOR DIGITAL ADDICTION

This part presents a holistic view of the condition to introduce DA to the software design communities. This is to help recognise the need for their active role to find models, techniques, design methods, test approaches that can contribute to building effective solutions. As such, creating a working reference model was needed to facilitate subject-matter discussions, collaboration and knowledge sharing.

There are already existing studies on sub-areas of DA, e.g. Internet addiction (Widyanto and Griffiths 2006) and game addiction (Park and Hwang 2009) which focus on the perception of users and their characteristics which lead to DA. However, crucially, these studies do not focus on the peculiarities of the object on which DA is centred, i.e. the software.

4.2.1 RESEARCH GOAL

The goal of this research is to understand DA with respect to the software design, the addictive attributes influencing user interaction and the role of context and triggering cues.

4.2.2 RESEARCH METHODOLOGY

Given the inherent diversity of users and the multidisciplinary nature of DA, bottom-up approach with the aid of content analysis approach was used to create an initial reference model. Directed and conventional thematic analyses (Hsieh 2005) have been applied to draw some inferences. The former was used to utilise some of the existing theories, whereas the latter was to derive further coding categories directly from the text. The expert checking method was used to increase the trustworthiness of the derived coding categories. To establish the credibility of the directed approach outputs, the coder did not start the coding unless the text identification step was completed. This is to eliminate any biased coding such as ignoring non-supportive inferences (Hsieh 2005).

Then, the research followed a good practice in ontology building to create an ontology for DA as a knowledge repository. This was based on quality literature on the topic of DA to build an upper ontology, which can then be used as a universal framework for creating further domain-specific ones (Niles and Pease 2001). Quality was measured in terms of the relevance and rigour of the reviewed resources. Coding method was used to facilitate categorising the data into main themes. The qualitative analysis tool (Nvivo) was used to qualitatively analysing the concepts and their initial relationships.

To evaluate the ontology, the research followed a focus group study with subject matter experts, see **Table 3**. Since the research addresses a multidisciplinary problem, having diverse viewpoints is an essential requirement. Judgemental sampling was used to select experts who have good knowledge about relevant research fields including HCI, requirements engineering, psychology, and software engineering and design. To ensure that the participants have sufficient understanding of the problem, an assessment survey shown in **Table 4** was used. All selected participants were sent an invitation email to join the research study.

While there are various ontology evaluation approaches, e.g. golden standard, application based, data driven, and assessment by humans, the purpose of the evaluation should guide the selection among them (Brank et al. 2005). As the evaluation was mainly targeting the ontology

concepts and the proposed structure, manual evaluation with the aid of human experts was needed (Brank et al. 2005).

TABLE 3: THE BACKGROUND OF THE PARTICIPANTS

Participants	Age group	Gender	Field of study	Years of experience	Home country
P1	30-40	Male	Computing	13	Turkey
P2	30-40	Male	Computing	16	China
P3	20-30	Female	Psychology	5	UK
P4	30-40	Male	Psychology	5	UK

TABLE 4: THE PARTICIPANTS' FAMILIARITY WITH RELEVANT TOPICS

	P1					P2					P3					P4				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Digital Addiction			•				•								•				•	
Social informatics					•					•			•				•			
knowledge representation and evaluation					•					•			•						•	
User Performance				•						•				•					•	
Human Computer Interaction					•					•			•						•	
Requirements Engineering				•				•					•					•		
Technology use for behaviour change				•			•							•					•	
Internet marketing			•				•						•						•	
Human enhancement					•				•					•					•	

The questionnaire was based on the Likert scale which can be interpreted as follows:
(1) Very Poor (2) Poor (3) Fair (4) Good (5) Very Good. These cells represent the 5-points Likert scale, and the dots show the participants' responses.

4.2.3 RESEARCH RESULTS

4.2.3.1 DA MIND MAP

This lack of consideration of the software motivated this research to carry out the investigation by reviewing the literature to identify those factors that appeared to lead to DA and then to analyse discussion forums on DA which were found in widely accessed and well-reputed websites to validate and enhance the initial findings. In doing so, a range of factors was identified and then classified under five main categories, namely; software-mediated activity, attractiveness, personal, cultural and situational. The last three categories are directly related to qualities of the software while the personal and cultural dimensions are factors that would fit studies in psychology and sociology.

In this study, 29 sources cover a wide range of disciplines were selected (14 domains and subdomains). This covers peer-reviewed and non-peer-reviewed articles written by professional people in academia and industry who have expertise in addiction-related domains. Posts on web discussion forums were also analysed. **Table 5** outlines some stats about the analysed materials. The extracted knowledge is visualised in a mind map to structure and classify the findings, see **Figure 21**.

TABLE 5: ANALYSED RESOURCES

Types of data source	Quantity	The covered domains and subdomains
Peer reviewed Articles	21	Cyber psychology - Psychology - Neuroscience - Sociology - HCI - Management - Human Factors - Internet technologies and applications - Behavioural engineering - Requirements Engineering - Behaviour - Internet studies - Information Technology - Marketing
Books	2	Sociology - Psychology
Online articles	3	Behaviour engineering
Web Forums (355 post)	1	General
Formal discussions	1	Requirements Engineering
Formal speeches	1	Marketing

This mind-map merely provides answers to the “what” question, that is, what has an impact on DA? Ultimately the thesis might hope that studying user experience (UX) could, ideally, provide insights on the “why” questions. Several studies, e.g., (McCarthy and Wright 2004, Silva and Dix 2007, Hart et al. 2008, Thompson and Kemp 2009), showed that user experience is not negatively affected even when social software such as YouTube, Facebook, Wikipedia have poor compliance with usability principles (Rosson and Carroll 2002). Therefore, to understand the true nature of DA, the broader scope of UX may need to incorporate not only the “felt experience” such as “pleasure, curiosity, and self-expression”, but also what users gain, rightly or wrongly, from particular behaviours. To some extent, this thesis could see these users as using the ‘addictive’ behaviour to satisfy some ‘internal’ requirement. Hence, it may not be enough simply to describe the associations among aspects of the software and specific, possibly addictive, behaviours, but rather to understand the nature of the satisfaction and how it relates to user’s internal and private requirements, and their individual values.

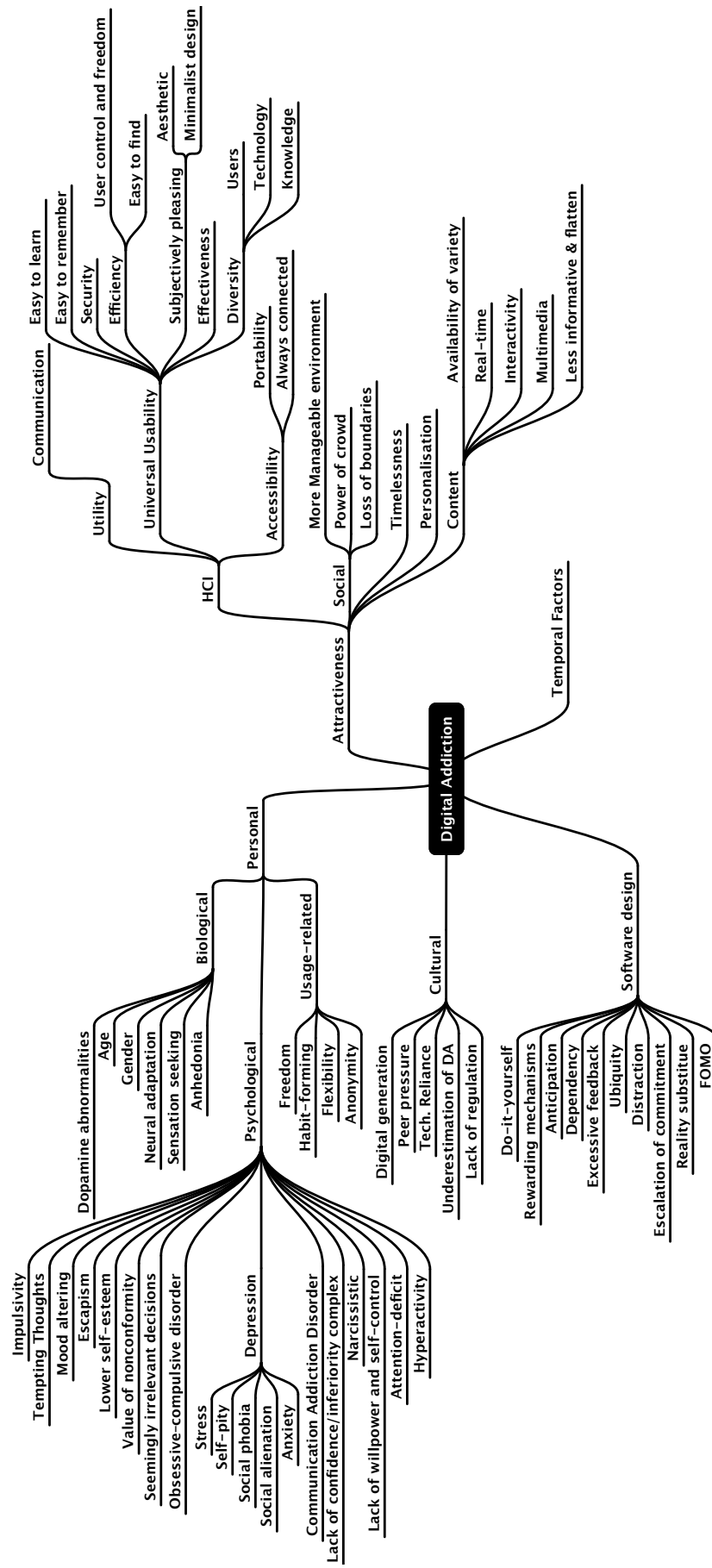


FIGURE 21: DIGITAL ADDICTION MIND MAP

4.2.3.2 ONTOLOGICAL REPRESENTATION FOR DA

An ontology is defined as “*an explicit specification of a conceptualisation*” (Gruber 1993). In software engineering, ontology is seen as a promising approach to higher-level issues such as modularisation, distribution and reusability (Hesse 2005).

The ontological approach was used to enhance the outputs of the analysis results by creating explicit descriptions of the extracted knowledge. Thus, the extractions were re-analysed to create classes (i.e. concepts) and individuals (i.e. instances) (Noy and McGuinness 2001). The knowledge was then organised into tables to show the original text of each concept, their definitions and the extracted knowledge. **Table 6** provides two examples of the text analysis. The rest of them in addition to the glossary can be found in (**Appendix 1 Part 1**). The classes and instances have been arranged into a taxonomic hierarchy. All these research activities were to provide meaning to the concepts.

TABLE 6: CONCEPTS EXTRACTION AND DEFINITION

Example one: Extracting the concept “Escalation of commitment”	
Original text:	
In the 8 th of April 2014, in a formal discussion, Daniel Berry, professor of requirements engineering at University of Waterloo in Canada, pointed out that “ <i>users get instant gratification and instant replies to changes in Facebook page, e-mail, tweets and etc. The instant replies demand instant replies, which is very reinforcing and thus very addictive</i> ”.	
Definition:	
“ <i>Tendency to allocate additional resources to a chosen course of action</i> ” (Harvey and Victoravich 2009).	
Extracted knowledge:	
Individual(s)	Escalation of commitment
Example two: Extracting the concept “Hyperpersonal aspect”	
Original text:	
“Individuals have almost total control of self-presentation. Individuals can create and maintain aspects of themselves that would be difficult to present in face-to-face (ftf) situations. Electronic communications ameliorates significant characteristics of the individual (i.e. gender, ethnicity, age, handicap, etc.) that might adversely affect social relationship formation in ftf encounters” (Bellamy and Hanewicz 2001).	
Definition:	
A way to be more selective about how one presents one’s self (Bellamy and Hanewicz 2001).	
Extracted knowledge:	
Individual(s)	Hyperpersonal aspect

4.2.3.3 VALIDATION

The ontology has been validated by subject matter experts following a focus group study. The focus group was based on the hybrid card sorting technique (**Appendix 1 Part 3**). Participants were asked to evaluate and modify predetermined concepts and categories, along with their created/modified ones, e.g. they can create new concepts and classes. **Table 7** lists the documents prepared to be used by the experts. **Table 8** presents the session settings and procedures. These documents in addition to the procedures were provided to the experts via an invitation email. During the validation session, the participant information sheet, the consent form, and the background questionnaire were provided. All these documents can be found in (**Appendix 1 Part 2**).

TABLE 7: THE PROVIDED DOCUMENTS DURING THE FOCUS GROUP

Document No.	Documents	Description
1	Ontology structure	The drafted 1 st version of the ontology which was provided in an invitation email.
2	Notes form	Each participant should use this form to make notes about the provided version of the ontology.
3	Glossary	Most of the ontology concepts are self-explanatory. However, the participants were given a document listing all concepts' definitions accompanied with the original text from which concepts are extracted for further clarification. Participant might not need to refer to this document for all concepts definitions.
4	Cards	Predetermined cards with extra blank ones were provided to enable adding more concepts or categories.

TABLE 8: FOCUS GROUP STRUCTURE

Phase No.	Activity	Description	Notes	Est. time
1	Preparation	The moderator briefed the participants about the exercise goals and structure.	-----	10 min
2	Reviewing	The participants were provided with a copy of the ontology structure to individually review and make notes in document two (i.e. the notes form).	Notes might include missing concepts or categorise, structuring issues and probably refinement suggestions.	15 min
3	Sorting	Each group was provided with the same set of concepts and categories cards to carry on with the sorting task. This was based on a group activity.	Participants were informed to remove concepts/categories and re-organise them as they think appropriate. Disagreements were	15 min

			expected to arise but resolved during the discussions. The remaining unresolved ones were not ticked in the notes form.	
4	Presenting	Each group presented a version of the ontology with the refinement suggestions.	Each group was given five minutes	10 min
5	Discussion	Each group discussed the other group's card sorting findings and highlighted all disagreements and recommendations for further resolution.	Each group was given five minutes	10 min

The focus group validation resulted in different changes to the ontology. **Figures 22** and **23** present the final version of the ontology. Below are some of the observations highlighted in the focus group and also some of the important changes applied to the ontology:

- There was a consensus on organising the classes into the groups: User, Software and User Interface.
- “*Disinhibition*” should be moved to the *emotions* class rather than the *behaviours* class. “*disinhibition*” and “*self-disclosure*” are relatively correlated in that the former is the emotional motor that leads to the latter. In other words, “*disinhibition*” is the temporary loss of inhibition, which is a feeling of shyness that stops an individual from doing a desirable action.
- The reason for having “*values*” branch is because some concepts under this group can influence other behaviours. For example: “*disinhibition*” as behaviour is driven by the value “*freedom from fear*”. When someone asks why users might feel “*freedom from fear*”, concepts such as “*anonymity*” and “*invisibility*” can provide answers. Therefore, the ontology should be mature enough to reflect these correlations.
- “*Accessibility*”, “*mobility*” and “*availability*” can refer to the same idea. Therefore, these three concepts were combined under one concept named “*accessibility*”.

- Combining “*learnability*”, “*efficiency*”, “*effectiveness*”, and “*memorability*” into one group named “*usability*”.
- Adding “*synchronous*” as an instance in the *types of communications* class.

Analysing online interaction data can help to reveal how rewarding mechanisms in social software are linked to user requirements (i.e. motivations, values and goals). This cannot be taken into account with the isolation of other factors (e.g. personal traits). For example, what are the online interactions that can trigger addictive behaviours for users who are anticipating more social recognition? What are the software features and interactions that are used more for this type of users? How would the social structure and given roles in particular social software influence the addiction behaviours? Therefore, studying the interaction between individuals and the software without analysing the human behavioural elements and social structure can lead to misleading answers.

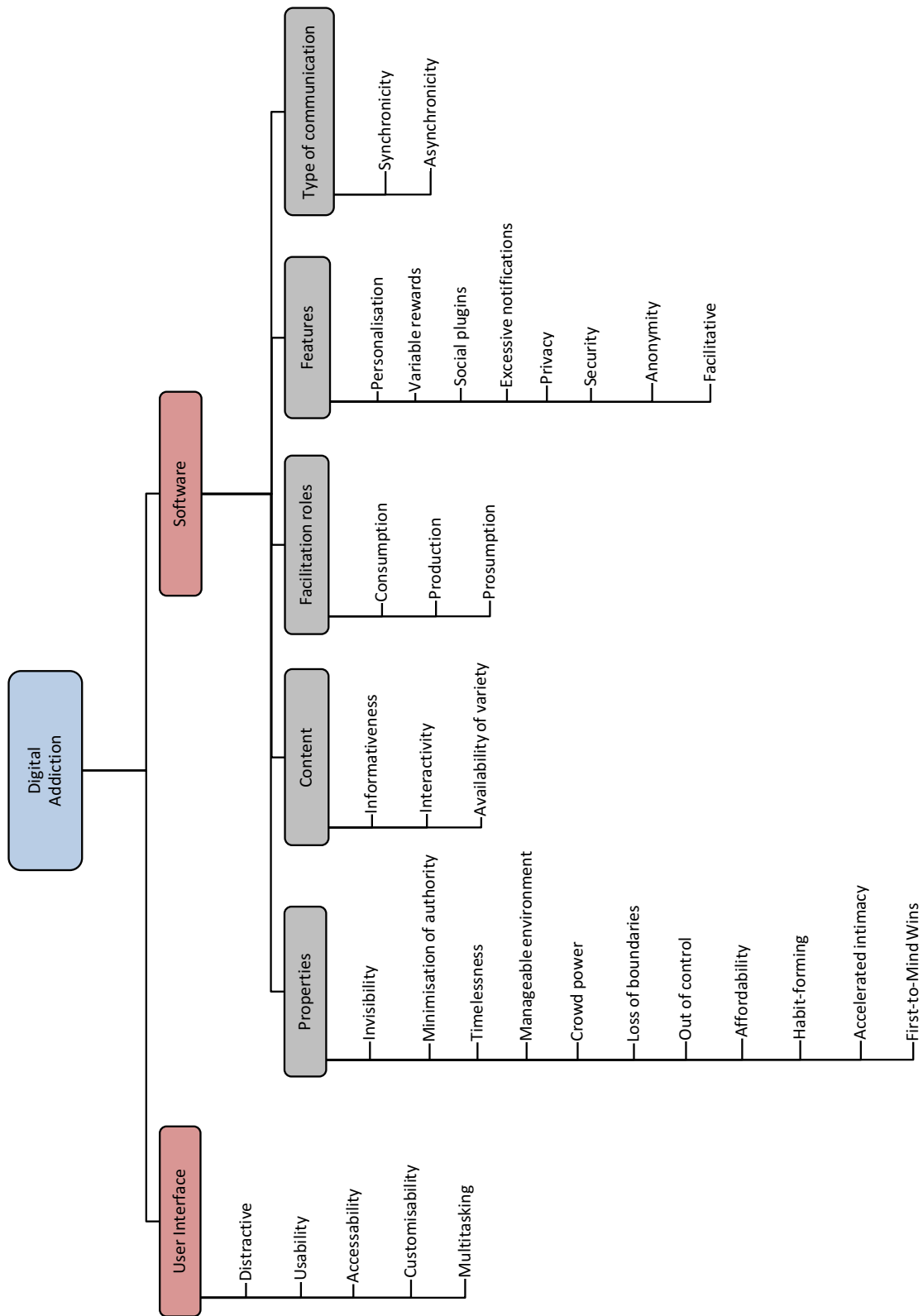


FIGURE 22: DA REFERENCE MODEL (PART ONE)

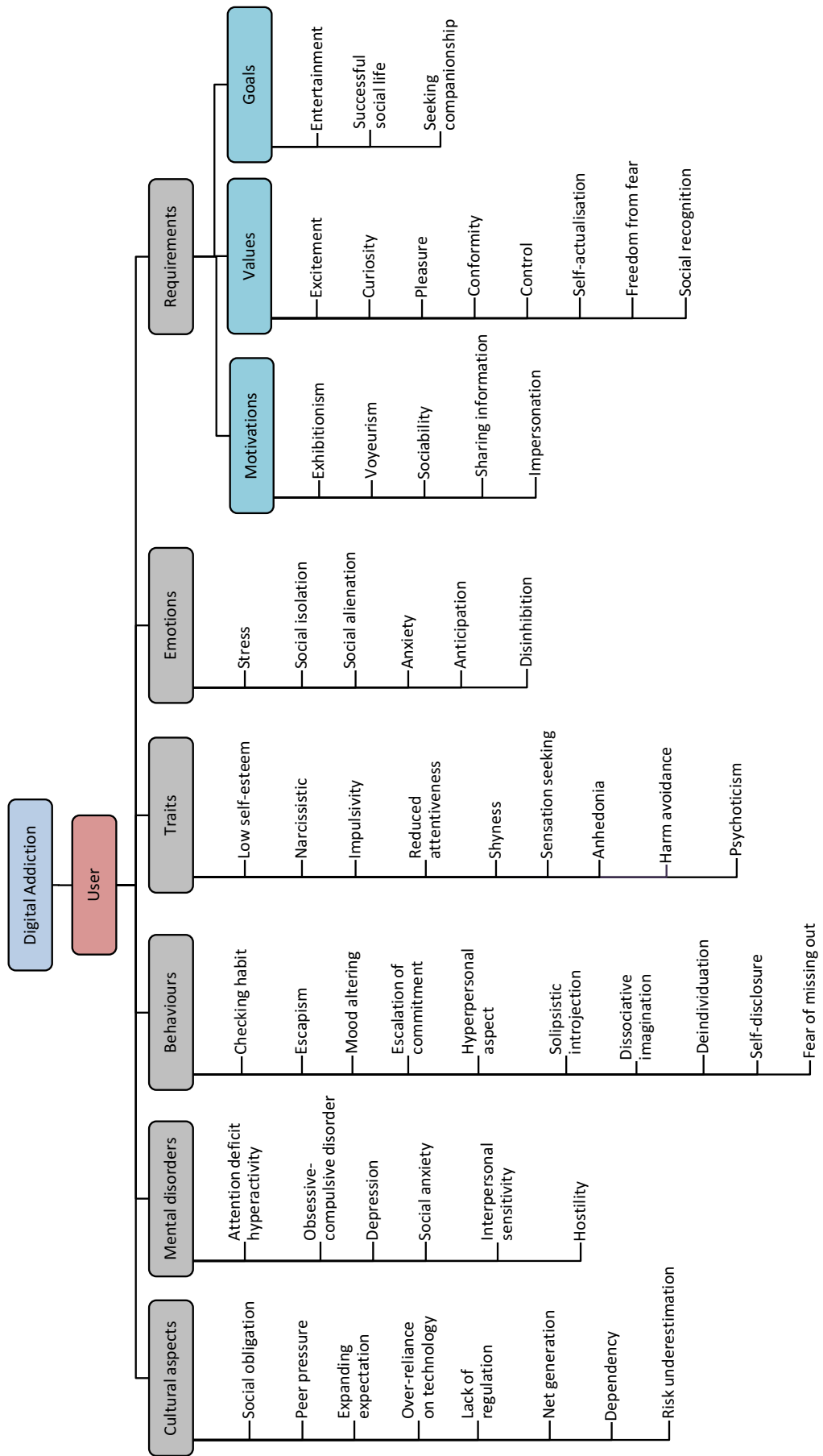


FIGURE 23: DA REFERENCE MODEL (PART TWO)

4.3 DISCUSSION

The ontology has been revised based on experts' comments and observations. Some participants highlighted that few concepts seem to overlap each other, such as self-discloser and disinhibition. They suggested providing detailed definitions supported by examples to contrast between these concepts and eliminate such overlaps. Another limitation includes lack of business and marketing perspectives in the ontology. The validation highlighted that the ontology contains unnecessary classes resulting in structural complexity. The experts also developed consensus on the main classes of the ontology, which resulted in reducing the main categories into user, user interface and software (i.e. software-mediated interaction).

The results provided preliminary ontology which still needs to undergo more iterations by analysing further materials. Also, to enhance the ontology and ensure validity and evolvability, a collaboration process can be implemented with the aid of collaborative ontology engineering approaches such as Folksonomy (Vander Wal 2007), FolksOntology (Van Damme et al. 2007) and Wikis technologies (Hepp et al. 2006).

However, the aim was to assess the emphasis on the role of software design, users' requirements, perceptions and expectations in regulating usage of digital media which were found to be less recognised in the literature. Overall, this research has identified the following key challenges:

- The diversity of software features and user traits, requirements and patterns of use will increase the complexity of understanding and designing to overcome DA. This is when taking into account the potential trade-offs which can negatively impact user experience.
- DA relates heavily to user perceptions, expectations and personal requirements, which are not easy to be expressed by users due to their tacit and fuzzy nature, private and sometimes very sensitive. Also, there is lack of software-based measures to detect addictive behaviours.

- How, or even whether, users would like to be aware of DA when they have it? What decisions should be taken by the software designers when developing such systems? On the other hand, what decisions should users take when interacting with the software systems?
- There is a well-known debate on the causes of DA (Widyanto and Griffiths 2006). Some argue that digital technology is just a medium and irresponsible for the condition. However, this thesis argues that while the software design is not the “main” cause in all DA cases, some addiction themes can be mitigated through the software itself, as such addressing DA in software development practices can play an important role.

Future research can focus on some aspects of the ontology. For example, the correlation between addicts’ motivations and software features and functionalities. The analysis of online interactions should also reveal some of the appealing features that can be mapped to addicts’ motivations, e.g. exhibitionism. This can be addressed by different software engineering approaches. For example, self-adaptive systems can derive better adaptation decisions driven by users’ requirements. It may partially answer what to observe and what are the features that can be adapted. Also, when, how and, probably, where these features can be adapted. Adaptation can include different filtering techniques, such as persona-based and attribute-based filtering options. Finally, the research should investigate how the software design can complement rehab practices (e.g. CBT-based treatments and peer support groups).

4.4 CHAPTER SUMMARY

This chapter focused on conceptualise DA to be more recognised in software design research. As an early step, a working definition of DA was proposed based on analysing different definitions found in the literature to understand the contexts of these definitions and then analyse the terminologies used in each one.

An initial ontology was, also, created based on a content analysis study to facilitate subject-matter discussions and formalising the representation of the domain knowledge. The materials

used were from heterogeneous domains. The outputs were validated through expert focus group supported by hybrid card sorting technique. However, more empirical investigations are still needed, such as experts' interviews, users' exploratory studies, diary studies.

5. CHAPTER 5: PERSUASIVE INTERACTIVE TECHNOLOGY (PIT) TO COMBAT DIGITAL ADDICTION

Technology-assisted behaviour change is an emerging topic. An increase in its adoption in several domains and for different addictive and problematic behaviours is witnessed. For example, online intervention is being used for alcohol addiction and encouraging responsible drinking (Bewick et al. 2008). Also, the advances in information technology and Web 2.0 have enabled a new range of possibilities including a more intelligent, context-aware, continuous and social online intervention. As evidence, the use of mobile applications for behaviour change is now a possibility, e.g. for smoking cessation (Bricker et al. 2014), medication adherence (Dayer et al. 2013), diet and eating disorder (Pagoto et al. 2013), to name a few.

Despite this trend, there are still few principles and design guidelines on how technology-assisted behaviour change should be engineered. Amongst other aspects, there is a lack of studies on users' views and their requirements, personal and collective (Dennison et al. 2013). In general, there is a limited amount of theory-based solutions, and this deters their acceptance, efficiency, usability and sustainability. In developing such solutions, there seem to be interesting intersections amongst several disciplines. For example, topics like personalisation, either based on automatic adaptation or user's direct modifications (Dumas et al. 2012), social norms and social comparisons (Bewick et al. 2008) which fall within a psychology remit, would be familiar concepts in computing areas such as requirements personalisation (Sutcliffe et al. 2005) and persuasive technology (Fogg 2002).

This chapter will attempt to partially achieve **objective 3** by exploring the behavioural change technologies, their functionalities and some potential risks.

5.1 RESEARCH GOAL

This study explores users' view on persuasive intervention technology (PIT) to combat DA. Also, it investigates users' preferences on how the basic elements of self-monitoring and persuasion should be designed for behavioural change. This is a preliminary step prior studying the introduction of the peer group approach to this technology. The goal is to inform software engineering practices about the relevant requirements, design facets, concerns and paradoxes to cater for. Also, to conclude a set of recommendations to follow and risks to avoid when designing PIT for combatting DA. An example challenge is on the way to deal with denial of reality, relapse and tolerance associated with addiction. This research comments on the functionality of such technology through the lenses of behaviour change and draws conclusions.

5.2 RESEARCH DESIGN

To achieve this, a set of commercial e-health persuasive applications to combat DA is investigated to collect evidence of their capabilities, design defects and their potential to cause adverse impact. The study follows a qualitative approach through analysing users' online feedback on a set of popular PIT and conduct a diary study with a group of users having a problematic usage style to capture their experience with such technology for a period of time.

5.3 RESEARCH METHOD

This research followed a qualitative method to understand users' perception of PIT for combatting DA. The research began with reverse engineering three representative and popular smartphone applications designed to aid users to regulate their usage and reduce their DA to extract their notable features. An extra application (App.4) has been included later in the study. The reason will be discussed in **section (5.3.4)**. **Table 9** declares the names of these applications, outlines their features and categorises them based on the support strategies and behaviour change principles they utilised. However, as the researcher has a non-disclosure agreement with the development company of the second application, its name cannot be declared. With regard to the declaration of applications names, it is important to highlight that:

- The intention is not to infer any specific advantage or disadvantage of these particular applications which can be then used for marketing and commercial reasons.
- Eventually, these applications might be renamed or even removed from the market
- The applications are being frequently upgraded. As such, some functionalities might be changed, removed or replaced.
- Applications with similar or same names could be released, and this could create confusion and deception.

The popularity was measured by the number of installs (over one million) and feedback provided (over five thousand) provided by end-users. The selection criterion was restricted to IOS and Android platforms to ensure the compatibility with the participants' smartphones. Also, an application to be selected should have a rating of at least three stars out of five, and includes at least five persuasive techniques, e.g. goal-settings, monitoring reminders, and rewarding, coercion and surveillance. The aim was to allow users to engage with a wide range of persuasive features in order to assess their influence and suitability for DA and to get users' perception of these features.

These activities helped to decide the prominent and significant features of such applications and to look at the requirements and contextual factors that can influence their effectiveness and deficiencies. The majority of these features found during the analysis of collected data are listed in a previous study by Oinas-Kukkonen and Harjuma (2009), while the rest is explained in **Table 10**.

TABLE 9: THE FEATURES AND DESIGN PRINCIPLES OF THE SELECTED APPLICATIONS

Features	App.1 (Quality Time)	App.2	App.3 (Moment)	App.4 (Forest Stay Focused)
Actions facilitation features				
Monitoring & tracking	•	•	•	•
Coercive techniques	•	•	•	•
Goal settings	•	•	•	
Tunnelling				
Motivational sparking features				
Competition		•		•
Normative influence			•	
Recognition			•	
Social support		•	•	•
Comparisons	•			
Rewarding	•	•	•	•
Signalling features				
Reminders	•	•	•	
Insights messages		•	•	
Addiction scoring		•	•	

TABLE 10: DESCRIPTIONS OF THE EXTRA E-HEALTH INTERVENTION FEATURES

Features	Description
Coercive techniques	E-health applications for DA should provide means to help users apply restrictive rules.
Social support	E-health applications for DA should provide means to enable users to send messages such as liking to utilise the influence of peer support.
Insights messages	E-health applications for DA should provide plain or visualised feedback messages that are generated based on users' actual use to indicate when a behaviour is appropriate. Addiction scoring can be seen as an example.
Addiction scoring	E-health applications for DA should provide clinically validated masseurs to assess the level of addiction. It has been listed as a standalone feature to emphasis its important impact and the need for careful measurement and feedback.

The key difference in the domain of DA as compared to other addictive behaviours is the fact that this problematic behaviour, i.e., the usage, can be traceable and addressed in real-time in a way which is transparent to users. For example, while coercive techniques cannot be provided in PIT interventions for other health-related issues, such as alcohol dependence, they are more feasible for intervention for digital addiction through actions such as locking a game.

Then, multiple data sources were used to increase coverage and credibility of the study. The first was the diary study to collect data in naturalistic settings. The second was the follow-up individual interviews to develop a better understanding of the data collected from the diary studies. The third was the analysis of an online forum to gather more contextual knowledge about these applications. For an exploratory study, the data coming from the three sources was treated equally and made the content analysis under the assumption that such diversity will reveal more concepts.

5.3.1 SAMPLING

The inclusion criterion required that the participants should have the feeling that the smartphones or social media are used in an excessive and obsessive way. The research used self-reports in which participants were simply asked if they thought they have DA. Such simple self-reports are strongly correlated with available psychometric measures to assess DA (Widyanto et al. 2011). However, a pre-selection questionnaire test was also used as a self-assessment instrument for further validity check to ensure that participants had at least one aspect of problematic usage of their smartphones. The pre-selection test was an adapted version of the CAGE questionnaire customised to fit the properties and remit of DA (Ewing 1984). The CAGE questionnaire is originally used as a screening instrument for alcohol-dependent issues. This self-report instrument was adapted and used as a pre-selection survey to detect addictive behaviours by examining the addiction symptoms such as conflict, tolerance, withdrawal symptoms, mood modification and salience (see **Appendix 2 Part 1**). Participants who met that criterion were then sent an invitation email with a short questionnaire to be completed. As a result, 14 participants were recruited using

the convenience-sampling technique (five females and nine males, with ages ranging between 18 and 50), see **Table 11**.

TABLE 11: THE BASIC DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS

Participants	Age group	Gender	Home country
P1	30-40	Female	Denmark
P2	20-30	Female	UK
P3	20-30	Male	UK
P4	20-30	Female	UK
P5	40-50	Male	Egypt
P6	20-30	Male	UK
P7	30-40	Male	Romania
P8	30-40	Male	Romania
P9	20-30	Female	India
P10	20-30	Female	Ireland
P11	20-30	Male	Romania
P12	20-30	Male	Nigeria
P13	30-40	Male	KSA
P14	20-30	Male	India

5.3.2 PHASE ONE: USERS' DIARY STUDY

The diary studies aimed to obtain participants' feedback in naturalistic settings while they were using a PIT application. The participants were asked to install one of three commercial PIT on their personal mobile and use it for 14 days to reduce the impact of the so-called "wow effect" from a new technology and new discovery of the actual usage. They were asked to record their observations and feelings about the application and their usage style. They were also asked to take snapshots of significant moments during the usage to facilitate recalling their feelings in the follow-up interviews. They were also asked to share that with the research team at least once every two days (see **Appendix 2 Part 2**).

All these activities helped to immerse the participants in the domain so that the interviews allow us to get more insights. Also, participants were given the opportunity to engage with the application and to increase their familiarity with it.

5.3.3 PHASE TWO: USERS' INTERVIEW

The data gathered in phase one was used to guide the semi-interviews with those participants after the two weeks to elaborate on their diaries to get a deeper understanding of users' comments and

to collect more insights. For example, most of the interviewees highlighted in their diaries that these applications are annoying but effective. This guided us to investigate this paradox in the interviews to understand the source of annoyance and whether that can be minimised without reducing the perceived effectiveness.

The diaries have also highlighted other important aspects related to using the application occasionally to cope with stress, the language used and the need for a unique set of preparation before using the application, e.g. what to expect and the potential negative feelings such as frustration. A sample of the interview questions can be found in (**Appendix 2 Part 3**). The interviews were then audio recorded, transcribed and content analysed. A sample of the transcribed interviews can be found in (**Appendix 2 Part 4**).

5.3.4 PHASE THREE: ONLINE FORUM ANALYSIS

The other data source utilised users' online feedback and review on the same three applications. However, the analysis of the diary study data shows that users wanted to be motivated by some rewarding systems that reinforce their sense of accomplishments and care of some virtual object of character. As such, an extra application was selected. The application represents users' achievements metaphorically by providing them with a virtual experience of looking after something, e.g. a tree or a pet, which would become less healthy or less happy when they are busy with their usage of digital technology.

In the analysis of users' online reviews and feedback, 733 informative comments were analysed out of five thousand on the four applications (the three which were used in the diary plus the added one), see **Appendix 2 Part 5**. The ignored comments were mainly related to the technicality of the applications or adding no value to the analysis by being so generic, e.g. "*I uninstalled this app, it exhausted the phone battery*", "*this is absolutely a nice app*". 347 comments were made by male users, 254 by female users and 105 by users with undeclared gender.

5.3.5 DATA ANALYSIS

Three main behaviour change theories guided the analysis of the selected applications; Control Theory (Carver and Scheier 1982), Goal-Setting Theory (Locke and Latham 1990) and Social Cognitive Theory (Bandura 2001). Control Theory suggests that the behaviour is regulated based on the person's intended behaviour seen as a goal. The control system will then compare the actual behaviour with that intended behaviour and actuate interventions if a deviation happens. Goal-Setting Theory emphasises the relationship between the goals and performance. Challenging goals appear to promote higher and persistent effort through motivating people to develop strategies that are more effective. The accomplishment will then reinforce further motivation due to individuals' satisfaction. Social Cognitive Theory suggests that behaviours are influenced by environmental aspects such as observing others. As such changing learning conditions can promote behavioural change. Overall, these theories were selected as they have been widely implemented in behaviour change research and had an evidence base (Webb et al. 2010). In the data analysis phase, these established theories served as a conceptual basis for the priori coding approach to identify potential coding categories (Lazar et al. 2010). Hence, other theories have emerged during the process of the analysis such as Transtheoretical Model (TTM) (Prochaska 2013). Therefore, the methodology utilised behavioural change theories to explain the data analysed rather than controlling the analysis.

The qualitative content analysis was used. Although subjectivity is a common risk in this type of studies, the content analysis process included three researchers, two as evaluators run the coding and categorisation, and the third to take a decision when a consensus was not reached.

5.4 RESULTS

This section presents the results of the analysis of the popular PIT, their features and how these features are seen by users and what concerns their usage would raise. The results also elaborate on users' different views on the features.

5.4.1 DESIGN ASPECTS

This research study concluded four main categories of features in this technology detailed in the next four subsections. This thematic map reflects the features that are considered by users as important. The PIT studied could also contain other features, which were omitted mainly because of the lack of relevance and influence from the users' perspective. The taxonomy which represents the results is shown in **Figure 24**.

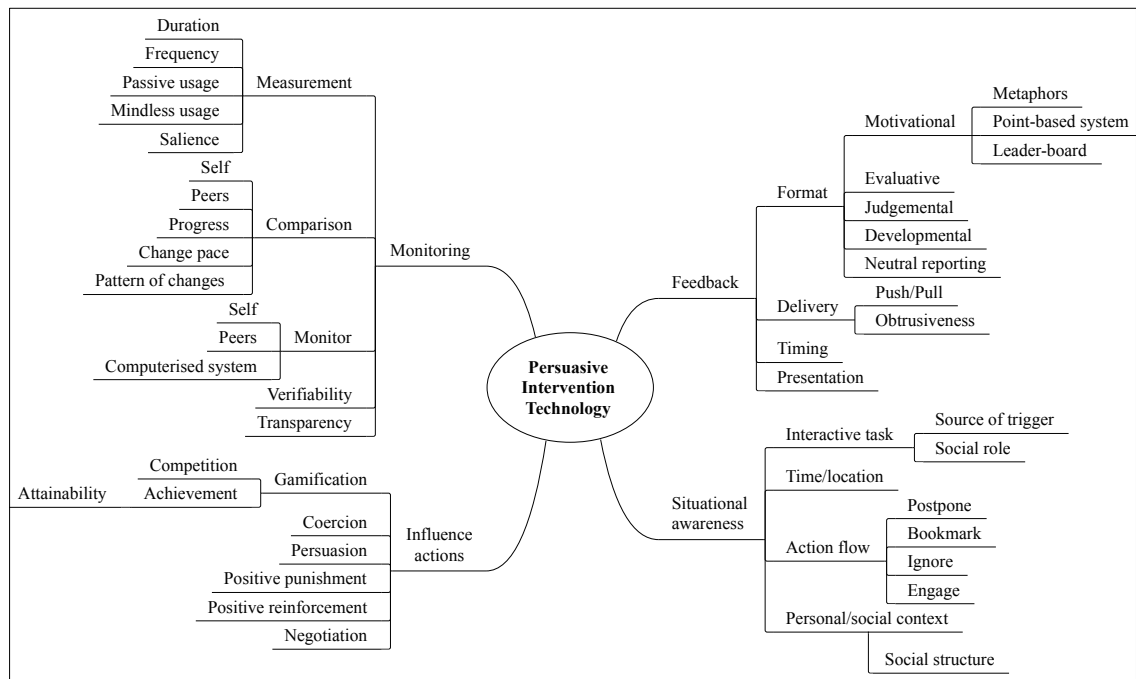


FIGURE 24: THE BASIC DEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS

5.4.1.1 MONITORING

Monitoring is an essential functionality of any self-regulation system. Measurement, comparison and the monitor are the core building blocks of the monitoring activity, while verifiability and transparency are monitoring-related principles that require a high degree of details to increase trustworthiness and reliability from a users' perspective especially for personal and behaviour-related information.

Measurement:

Tracking time on-screen, i.e. *duration*, was the predominant method to calculate the addiction scores in all the reviewed applications. However, different applications rely on different metrics

to measure time on screen. Users commented that these applications lack users' goals identification. As such, all types of usage are included in the measurement model without special consideration of the intention and the reason for that usage. Time spent is perhaps not a meaningful measure for judging addiction if certain contextual factors are ignored and this requires intelligent and context-aware monitors that also look at the requirements and goals of the usage.

A time-based measurement model can be affected by the so-called *passive usage*. An example is the time between closing an application and screen auto-lock. Users commented that they would like not to have passive usage counted against them. On the other hand, receiving notifications, against their will including those coming from PIT, is a debatable case. Some commented that this would still be a type of usage as it requires an additional cognitive load.

Frequency measurement is also used to estimate users' engagement with software products. The reviewed applications provided some frequency-based stats, e.g. screen unlocks. Calculating addiction scores is the quantification of a wide range of frequency-based and time-based stats to provide indications to the degree of usage. However, applying non-validated methods will lead to false conclusions.

The use of quantifying methods that are not validated will lead to false assertions. In more extreme bias users can use such misleading information to claim spontaneous recovery, which is a defensive mechanism known as the flight into health tactic (Frick 1999). For example, a user commented: "*I did not ever know how often I checked my phone, I was using it about 200 times a day. Now I check it about 200 times a week thanks to much for curing me*". Adopting factual and objective approaches, such as in the comment above, could provide more persuasive effect. Yet, careful feedback is still essential to avoid any misleading conclusions.

Mindless usage is another factor that can also influence the measurement models. It can be characterised by the lack of conciseness and awareness during the present interaction with smartphones. This type of usage cannot be identified by duration or frequency. A technique like an eye tracking might be able to identify this behaviour assuming that eye movements, which are

guided by cognitive processes, during normal reading, are different from that during mindless reading and this helps automated detection.

Designing systems that can capture, measure and even intervene with the state of preoccupation, i.e. *saliency*, is one of the open challenges for the design of interactive e-health and ICT-facilitate behaviour change. Saliency attribute is one of the six clinical criteria proposed in (Griffiths 2005) to identify addictive behaviours. It refers to the state when users are not actually engaged in the behaviour, yet they cannot stop thinking about it. For example, a user commented “*I got so tired of thinking in Facebook statuses. Fellow addicts know what I am talking about*”. The challenge stems from the fact that such events do not occur in the system environment “*points-based systems are a good motivational approach but how will [the system] monitor off-line behaviour or preoccupation*”. Thus, designers may need to incorporate users in the monitoring process and feedback loops in order to enable the system to react to such violation. However, proactive and intelligent masseurs that require stimulus identification and minimisation would be more advantageous from the usability perspective.

Comparison:

All monitoring and feedback processes need to adopt some comparison approaches, or benchmarks, in order to measure users’ progress. The overall findings indicate that users may need to be involved in the design phase to understand what would work well for them to avoid providing comparisons in a form that may negatively influence the user or cause them to disengage with the intervention system.

While the system can compare the user to his *self*-past, this can be done at different levels of granularity to reflect preferences on visualising the progress. For example, instead of comparing to the overall self-past usage, the system can compare the usage on each application individually. Such an approach was not implemented in all the reviewed applications. In fact, one of the applications provided very detailed stats, but they were not in a quantified form to facilitate self-comparisons “*I have not figured out yet how to see specifics of the applications that I do use ... just the overall usage!*”.

While comparing the performance with peers or self can help to motivate users progressive change, this social element may lead to negative experiences, such as unhealthy competition. This research argues that this approach can provide better outcomes when considering the stage of change according to the Transtheoretical Model (TTM) (Prochaska 2013) stage of addiction, i.e. early, intermediate and severe and also the stage of treatment pre-, post- and during treatment. Also, the competition between peers is likely to impact self-esteem and self-efficacy (our perception of regulating the behaviour). A user who is in the early stages of the change, e.g. contemplation, may be compared to others in the advanced stages, e.g. maintenance. Although this upward social comparison is suggested to inspire those who are in worse off condition (Taylor and Lobel 1989), it may also severely lower their self-esteem. For example, a user commented that gamifying the systems can be effective with caution “*fun is needed but what about non-addicts appearing in a Leaderboard?!?*”. In other words, having users with different degrees of addiction in the comparison can have adverse effects. This also applies for those who are in the better off as they may use it as a defensive mean by using it and ignoring the other symptoms of addiction such as salience and conflict.

Showing the *progress* while performing the comparison can provide more meaningful information to users. This is a subtype of self-comparison by which users can compare themselves according to their own goals. It can also be a subtype of social-comparison when the goals setting is performed collaboratively as a group activity such as in surveillance systems.

The monitoring system can also compare the pace of users’ progress toward the healthy usage. This research labelled this as monitoring the *changing pace*. For example, one of the applications uses a metaphorical system in which users were enabled to grow trees to represent the progress towards healthier use. This application can be enhanced by monitoring the time between planting trees or how many trees planted in a given period of time to assess the pace of change. While planting trees entails implicit peers- or self-comparisons, the *changing pace* will be assessed by monitoring the outcomes. As such the reference point to compare with will keep changing in a progressive form.

As a follow-up, it may be argued that monitoring the *pattern of changes* can empower stage-based intervention systems. These systems are mainly built upon the TTM which takes pragmatic approach by focusing on “how” rather than “why” users progress through stages of change (Prochaska 2013). While there is still a lack of concrete evidence of its effectiveness on behavioural change (West 2005), improving the tailoring system to take into consideration the unique motivational characteristics and triggering cues of each stage, provided promising outcomes (Borland et al. 2004). The gap here is to identify the influential elements of the personalised information led to that improvement. This on its own is an indication of the applicability of stage-based interventions. However, one of the open challenges is collecting the evidence to confirm the stage transition to identify the current stage and then provide the right stage-matched interventions (SMI) (Sutton 2001). In PIT, the monitorability of software-mediated interactions can help to facilitate monitoring that *pattern of changes* in order to assess the current stage and inform the tailoring system to provide effective and personalised interventions.

Monitor:

This component refers to the agent who will do the monitoring activity itself. It can be performed by the *users* themselves, by *peers* or by a *computerised system*. Selecting one of those agents will have an influence on the other requirements and design choices. For example, the design of peer groups monitoring will require careful feedback engineering to avoid damage to social relationships or the development of maladaptive peer norms of usage. In groups’ dynamics, the conformity effect can be a threat when a user temporary changes their behaviour only to conform and to avoid any contrary actions from peers. While this is considered a positive behaviour (Toseland and Rivas 2005), this could be only positive in tasks adopted within a group to speed up achieving collective goals. In group-based treatment, however, this can be a threat as the relapse will be inevitable afterwards, i.e. when users detach.

Verifiability:

PIT needs to provide means to verify the accuracy of their measurements and judgement of users’ usage and behaviour in order to maximise their credibility and acceptability. Some of the reviewed

applications provide detailed reports of usage. Such information can be used to support the claims of self-regulatory systems. One user criticised the subjectivity of the measurement of their addiction score or level: *“The application allows seeing usage by time and some arbitrary addiction score”*. This study indicated that the ability to verify the measurement process itself is much needed for such PIT especially when considering the tendency of addicts to tolerate the increasing usage and deny reality.

Transparency:

Transparency has been highlighted as a key requirement. Users commented that they would like to see how scores are calculated and how the judgement on their usage is made. However, there was a wide range of scenarios that these systems utilize in the addiction scoring. Yet, users felt uncomfortable with not being involved in deciding them or even knowing them. This is a typical attitude in health-related interaction when patients require knowing details even if they may not fully understand them. One of the scenarios is the aforementioned “passive usage”. Some of the passive usage cases were not identified by the designers. A user commented: *“I didn't realise it counts the time the screen is left on even if you aren't using any of the applications”*. Thus, transparency requires careful elicitation and modelling to reach to an acceptable level. Participatory design and lifelong personalization approaches can support transparency by which users can be part of the decision-making process. This could increase adoption of the decisions and judgements made by the PIT but also introduce the risk of being biased and ineffective.

5.4.1.2 FEEDBACK

Feedback is mainly to inform users about their performance and can take different forms. Feedback is one of the main pillars in self-regulation systems, which function to express users' status and to act as a motivational tool. The users' comments show that feedback techniques among these applications should be given a special considered in terms of the timing, format, delivery method and presentation.

Format:

This refers to the type of content included in the feedback system. Feedback design can play a very important role to help different type of users to track their progress. Yet, it should not conflict other design principles to avoid creating an addictive experience by itself. For example, a user criticised one of the applications *“this application is addictive as well. Actually, it made me use my [mobile] more”*.

Motivational feedback is a complex type of feedback that visualises users’ progress in a meaningful and gamified form to enrich their experience. Users commented that they would like to have point-based and metaphorical-based systems as well as Leaderboard for this type of feedback *“why can’t I connect to Facebook? I wanted to compare the high scores”*. A user suggested that the metaphorical system could be improved by adding *“a delay before the tree dies when using other applications. A notification could say, quickly, your tree is dying”*. Leaderboards, however, could have a contradictory characteristic as they *“may encourage unhealthy competition while they should be more about supporting each other not beating each other”* especially in e-health solutions.

Evaluative feedback uses reference points to compare with, such as *benchmarking, social or group’s norms*, but most importantly to show them how their performance scores were derived. Allowing users to set up their own reference points to compare with can be effective *“I wish this application would allow me to set a time limit I feel is appropriate. If I use my phone for work, it is almost impossible to get [a good] score which is pretty irritating when I have really cut down [time wasted] on my phone”*. The *self-set reference point* is linked to the concept of “goal choice” which is influenced heavily by past experience, past performance and some social influences (Locke and Latham 2006). A follow-up of this feedback is to guide the users to what areas they should improve in their usage and potentially enlighten them to think of what steps to take, e.g. using reductions and tunnelling (Fogg 2002). This feedback needs to be timely to show the user the causes of the provided feedback when the usage contextual properties and cues are still fresh in their minds. However, users’ feedback also indicated that timeliness might not always be

appreciated especially if the user is still in a mental status of preoccupation about what they did or are doing on their smartphones.

Judgemental feedback can take an assessment manner in terms of judging the usage style to be right or wrong, healthy or addictive, etc. While this type can still carry some evaluative feedback attributes, it can be loaded with some emotive and judgmental terminologies, such as “*you had an unusual and unhealthy usage style today*” or “*your usage is above the average time we expected for you today*”, etc. Users differ in terms of their motivations to accept and follow self-regulation systems. Sometimes this genuinely relates to their usage goals and other contextual factors, e.g. those who engage heavily with technology but still do not show addiction symptoms or those stating they are the “digital native” generation. As such, judgemental feedback messages may not suit all users “*I just want data about how I use my phone, not silly platitudes about living my life to the fullest. This application was not for me*”. Techniques like authority and social proof (Cialdini 2009) as well as basing the judgement on the measure or goal given by the user (Locke and Latham 1990) would potentially help in increasing users’ acceptance of such kind of feedback.

Developmental feedback can be used to offer fitting suggestions and tailored achievable plans, which can have greater persuasive powers. In terms of higher education, this can be mapped to the *formative assessment*, which aims to constructively and iteratively evaluate performance and give suggestions for the next steps. A user commented that PIT would help them “*to realise what they need to prioritise*”.

Some users preferred *neutral reporting* feedback, which only reports their usage stats without any further assessment and judgement “*don’t really like the score thing. Showing more real stats would be more useful*”.

Delivery:

Self-regulation systems can communicate feedback messages following *push* or *pull* approaches.

Designers need to understand users’ requirements in terms of when to apply covert and overt

feedback. The pull approach does not require the user to check their status as long as that will be prompted automatically following specific predefined event-based or interval-based modes. The push approach entails that the user is triggered to check their status. The pull approach can also lead to further addictive habits. For example, a user commented about an application uses trees metaphor *“it seems counterintuitive to be building a forest on your phone, meaning you will inevitably keep coming back on to check your progress”*. The push approach, also, has a side effect by acting as a stimulus to initiate unnecessary usage *“I love this application! But they should do something about getting notifications because those are tempting me”*. This approach may work for certain personality types and cultures. The pull approach could increase the sense of ownership, and the fact that the user leads the querying process would encourage commitment and consistency (Cialdini 2009) and hence the success of the change. Still there is lack of designated approaches for validating these design options when implemented in software systems.

Obtrusiveness can be, but not necessarily, one of the accompanying attributes when implementing the push approach, which may then affect users' experience. Obtrusive feedback, which can take a form of pop-up notifications, demands high attention and positions itself as a priority. Many users highlighted that feedback mechanisms were very obtrusive due to the lack of contextual considerations *“this application doesn't let me define what works for me. Feels like a nosy parent ... there's a problem when a note pops up saying that I have spent too much time.”* However, like most interventions, obtrusiveness is still essential, and participants stated that a *“wake-up call”* could be needed occasionally even if it violates some usability requirements.

Timing:

The reviewed applications applied different usage-related timing strategies to deliver the feedback. Some were criticised of being very distracting, while others were very preferable. Feedback can be delivered during users' interaction with their mobile, after the usage (i.e. immediately after locking the screen or closing a specific application), while the user is away from the mobile, i.e. offline, or immediately after unlocking the screen. Users also commented that right timings are highly likely to motivate users. A user commented: *“I like the fact that when*

I go to unlock my phone it tells me how many times I've unlocked it. Then I can think no I don't need to check”.

Presentation:

Presentation not only relates to the visual appearance of the feedback but also to what extent the information is consistent with users' attitudes and preferences, e.g. whether the message is a gain- or loss-framed, its friendliness, strictness, personal, etc. A user commented *“there was a graph of how much I used my phone during the week. I found that quite useful because I could compare the days. Which ones I used it the most”*. In the systems that allow users to set their own plans, the colour coding can have a negative influence on how users set their own plans, especially within social settings *“If I am enabled to decide myself the maximum time I can use my phone, I am more likely to put high numbers. So, in worst case, I'll get the orange colour. So, I don't look that bad”*. As such, using statistical figures rather than colour coding in the intervention systems that enable self-setting of goals, can be more effective to eliminate self-bias. That bias can be used as a mechanism to minimize perceived impact on the self-image.

5.4.1.3 INFLUENCE ACTIONS

This component aims at helping users regulating their usage by implementing behavioural change theories and techniques.

Punishment:

Positive punishment can discourage behaviour by delivering a punishment when that behaviour is performed. Negative punishment, on the other hand, can discourage behaviour by removing positive stimulus when that behaviour is performed. This study shows that these two forms of conditioning can strength likelihood of a healthier digital life style, e.g. *“when I pick up my phone and get distracted, I get a notification telling that my tree died. This motivates me to stay focused next time”*. The tree is the symbolic object a user cares of and reduces the usage to avoid causing harm to it.

Positive reinforcement:

The system can be improved by implementing a rewarding scheme to assign specific rewards to different actions. Secondary actions linked to stimulus control such as a deliberate disabling Internet connection can also be rewarded *“I wish you could get points for putting it in airplane mode or something”*.

Gamification:

Self-regulation systems can be empowered by implementing some gaming elements to create a more engaging experience. Amongst the different game mechanics, competition and achievements seem to be predominant, still with potential for misuse.

Competition can be individual-based or even team-based to maximise users' experience. Any decline in the team performance can be perceived as an individual reasonability. Proper design of competition-based gamification can increase users' engagement significantly *“I would suggest is if you added a 'buddy/friends list' so you can compete with your friends”*. The risk here is that the competition can take an adverse form, i.e. towards more use, or becomes itself addictive. For example, a user commented, *“I can see making it competitive to worsen the addiction, would members want to get better and therefore get addicted to the points/rewards/making their avatar better?”*.

Providing users with tangible *achievements* can increase the likelihood of long-term engagement, which will particularly help to sustain users' behavioural change. Achievements are normally provided to users on an individual basis. However, users can be provided with individual achievement experience within the group context. As such, achievements can be provided to peers to gain social recognition. This is just an example to show how social and achievement aspects can be combined to create a very engaging experience, yet to be supported by consistency and commitment principles as a powerful social influence (Cialdini 2009) to avoid relapse. A user commented: *“I really like this application. Rather just sounding alarm or something, it gives a sense of accomplishment”*.

Some users criticised the rewarding system in some of the PIT. They pointed out that the long time and efforts needed to progress in the levelling system made it significantly difficult to get the rewards and this was very disappointing. On the other hand, the applications provide more *attainable* rewards seem to motivate users substantially “*the little rewards or accomplishments I get are nice little reinforcements for low phone use*”. One approach that can be taken into consideration is to increase the difficulty as the user progress in the behavioural change stages, e.g. those of the Transtheoretical Model.

Coercion:

The converge of the monitoring processes can have a significant impact on users’ experience. The coverage refers to what can be included in the monitoring, e.g. application usage, lunches, device unlocks or even within-application interactions such as likes, posts and sharing. For example, some of the reviewed applications provided functionality to exclude applications from the monitoring process or to allow user specify monitoring specify monitoring preferences “*there should be a new feature in which the phone will close on its own after a certain time period which can be set by the users*”. Such flexibility is required to avoid unnecessary coercive interventions. Users normally have the tendency to exclude work-related applications such as email clients and navigation applications. However, this flexibility would certainly need to be implemented with high caution, as addicts tend to deny reality and invent untrue reasons for excluding an application “*Some people like me need not to be able to manually [stop the monitoring]*”. Other applications provide “snoozing” feature to support task continuity or even to pause the monitoring activity “*a pause feature would be amazing because sometimes I want to get food while studying and I don't want to spend time on the app*”.

Persuasion:

Persuasion is a very important principle to influence users’ intentions and behaviours. Tunnelling, social comparison, reminding, rewarding and suggestion were the most requested techniques by the users “*it would be better to get software recommendations for planning the allowed time of usage and to update this based on my actual usage*”. Research on evaluating effectiveness and

sustainability of the technology-assisted version of such techniques in general, and for DA in particular, is still to be done. For example, personality traits besides the type and stage of addiction could have a high impact on the acceptance and effectiveness of persuasion and also coercion.

Negotiation:

Users' conflicting requirements require careful identification and resolution. The question here is how to intelligently negotiate requirements in a way that considers the peculiarities in addicts' behaviour such as tolerance and denial of reality. For example, most of the PIT enable users to exclude certain applications from the monitoring activity, and this was perceived as a desirable functionality "*I wish this application would allow you to set a time limit you feel is appropriate for green or have certain applications like e-mails and phone calls do not count against you*". This research argues, here, that it would be more efficient to exclude them in the influence layer, but not monitoring and feedback as shown in concluded taxonomy. This is to alert users when addiction patterns are identified in one of the excluded applications. In some scenarios, however, coercive approaches can be used when such patterns are detected as these systems should perceive users as two interconnected personas; current user and user-to-be.

5.4.1.4 SITUATIONAL AWARENESS

Situation includes a wide range of variables related to the performed task. The lack of knowledge about tasks' context as well as poor elicitation of a user's mental models, can affect user experience when implementing self-regulation systems. Thus, expanding the exploratory investigation to include contextual factors is essential to provide empirical rational needed to inform the design of software-based interventions and promote the intended behavioural change. Data analysis of the collected comments highlighted the critical principles below.

Interactive task:

Users highlighted that the system should distinguish between tasks in terms of their nature, e.g. seriousness "I just uninstalled this after I nearly had an accident. Upon setting GPS map route, the reminder pop out blocking my map in the midst of driving", another commented "fails to

meaningfully distinguish between productive phone use and addiction”, and also who initiated it, i.e. triggered by attribute “*only counts the interactions initiated by the phone user. If a call comes in, it should not be counted*”. Again, there seems to be a grey area between the two cases, e.g. receiving a message on Facebook as a result of sharing a post and the escalating commitment on social networks. Here, this research proposes the severity as an important quantifiable task-related attribute to enrich measurements models. In order to achieve this, different interactions need to be categorised based on their implications on the usage style. In the previous example, the sharing a post is likely to cause a high volume of responses, which can aggravate habitual checking. This is unlike other tasks which can be categorised as human to machine interactions. Such interactions can be less problematic as the social element is missing. This also suggests categorising interactions based on their social roles which denote the notion of the extent to which interaction motivate or demotivate face-to-face interactions. For example, interactions that encourage face-to-face communications, such as organising events using software-mediated tools, may need to be treated as positive interactions that should be promoted by the system rather than those encouraging online participation which can still be counted against addiction score. Thus, understanding the goal of the interactions and the task being done is essential for decision-making, e.g. on the type of feedback to give and measurement to apply.

Time/Location:

The system should enable users to decide when and where they want to be monitored. These contextual variables can be very sensitive when it comes to feedback messages. Time, location and tasks can also be combined to identify problematic usage. For example, users can be enabled to select the morning as a working period and any Facebook usage during that time whether it is exempted from monitoring or not will be counted in the addiction score. However, implementing such scenario for users who do not want coercion approaches can create conflicting requirements.

Action flow:

In less coercive settings, the design of PIT is required to minimise affecting user experience. One way of doing that is by providing users with more flexibility to support taking appropriate

decisions as intuitively as possible. Research has shown that self-control has very limited resources for tasks involving a strong desire. So, when users utilise the power of self-control in the initial task, subsequent tasks are compromised due to “*self-control depletion*” (Webb et al. 2010). A user commented “*It needs a strong mechanism to prevent us from simply turning off [digital addiction] rules. This is because self-control is a limited resource that depletes as the day goes by. So, when it's late in the afternoon won't have the energy to stop myself from simply disabling the rules*”. As such, the software must use up this valuable resource intelligently to avoid “*ego depletion*”. One way of doing that through intervention systems is to use self-control resources for the high problematic tasks only such as entirely blocking certain applications. Bolstering self-control through software means is an important aspect to promoting behavioural change.

For this, this research proposes the *postponing* and *bookmarking* techniques to supports task continuity for users who do not like strict coercive approaches. The former technique enables the user to postpone a promoted desired task to be performed later but at the right time. As such the spontaneous urge to perform the task will be controlled with the minimum use of self-control resources since the task can be performed later. The bookmarking technique is to maintain the point of usage before the intervention happened. A user commented: “*the application will not kick me out when the time is up. However, it will prevent me from starting it again if I have used it already for longer than the allowed time*”. While both techniques could be particularly the case with gaming addicts, implementing such interaction is irrelevant to multiplayer video games where more than one player engaged in the same game simultaneously. This highlights the need for consideration of conflicting requirements, which can be addressed by an ontology supported by behavioural change theories and domain reasoner to help designers mapping the interaction artefacts to the application domain.

The intervention software can prompt all muted notifications, or those were postponed during the controlled time. One way of strengthening self-efficacy is by utilising the actions taken towards these notifications. Simply by counting the *ignored* ones for the user not against him and

to reflect that positively on his addiction score. As users are still expected to *engage* with those notifications, they should not be penalised when that is performed out of the controlled time. This emphasises the importance of having considerate interventions which can be categorised as a special form of considerate requirements for social software proposed in (Ali et al. 2014). For example, a user commented, *“I don’t look at my phone when I drive so it would be nice to [reward me]”*. This class of requirements seems to be fundamental and should be advocated to allow evaluating such interactions against addicts’ perception of consideration to avoid any potential harms resulting from interventions.

Personal/social context:

Personal context relates to the innate feeling and status of the user, e.g. mood. Social context refers to the both the position of the user within a group either in the real world or on a social network. Sensitivity to such context is hard to achieve but with advances in sensing mechanisms, e.g. smart watch, and machine intelligence, it can be speculated this would become eventually a reality. Social elements can influence users’ perceptions towards intervention mechanisms. Yet, what is accepted and being effective in human-to-machine interactions, might be harming in social settings due to different factors such as digital identity. This research looked at how social context would affect users’ willingness to use this type of intervention systems. User raised the importance of having a space that is free of criticism *“I think it needs to be a safe space that people can feel free to explore their issues without fear of criticism”*. Having the social elements would also influence what feedback format should be adopted. For example, judgemental feedback is not preferable in such settings *“I wouldn’t consider any group which labelled an individual’s use of a medium or set of media in such a sweepingly judgemental way to be an efficient mode of help”*. In terms of being within an online social network, users also raised the need for considering the *social structure* within social intervention system. A user commented, *“I prefer groups in which members know each other. Nothing is against family members being in the group. But they might be still seen as strangers by others, and this may influence how they communicate with me, e.g. when my daughter is in the group”*.

5.5 DISCUSSION

5.5.1 DESIGNING PIT TO COMBAT DIGITAL ADDICTION

The research findings demonstrate the need for careful considerations and design principles when using PIT in the domain of DA. This section discusses those aspects in light of the literature and other relevant study and then highlight the need for testing and validating methods for this technology. Finally, it pinpoints the main issues and challenges in designing PIT for DA and where the future research studies are needed.

PIT is an example of how technology is enabling individuals to engage with the field of behaviour change in a way that has in the past primarily been restricted to health educators and policy makers. Researchers and practitioners working in behaviour change have developed an extensive research literature on theories of behaviour change, and an evidence base to support the efficacy of different techniques. This knowledge is reflected in sources such as NICE (National Institute for Health and Care Excellence) guidelines on behaviour change for individuals <https://www.nice.org.uk/Guidance/PH49>, which advise on best practice. It is interesting how many of the characteristics of the selected PIT mirror the NICE recommendations for behaviour change in other potentially addictive behaviours such as alcohol and tobacco use. For example, as noted, all of the applications include some form of monitoring, which is the first step of many behaviour change approaches in alcohol and drug use.

Nevertheless, a behaviour is determined by a multitude of factors, and as such, there can be a discrepancy between the behaviour change strategies, which should be expected to work according to theory and those which have an actual impact. PIT may or may not have some basis in behaviour change theory, but even if designed with the best of intentions and some relevant knowledge it may not provide any benefit to users and may even have harmful effects. There are several examples of large-scale behaviour change campaigns that have been unsuccessful, such as the DARE (Drug Abuse Resistance Education) programme in the USA that failed to bring about change and was alleged to inadvertently reduce the self-esteem of participants (Lynam et al. 1999).

Even simple and apparently commonsensical strategies such as suggesting that the individual avoids thinking about certain behaviour may be harmful. For example, it has been noted that advising people to try and avoid thinking about certain behaviour, as often done for instance in relation to smokers and avoiding thinking about cigarettes, can actually increase the compulsion to engage in that behaviour (Wegner 2011). Care must also be taken that a behaviour change strategy is not chosen simply because it is opportune. PIT is especially suited to social comparisons that allow users to see how their usage compares to that of their peers, with the assumption being that those who behave in an excessive way will reduce their usage. However as noted with regards to alcohol use in American college students individuals may base their identity of being the most extreme amongst their group, in which case highlighting to them how they compare to their peers may on reinforce that behaviour (Carter and Kahnweiler 2000). Finally, in any behaviour change, there is the issue of reactance. This refers to when individuals feel that they are being manipulated and respond by engaging more actively in the behaviour that they feel they are being dissuaded from. Overall it could be argued that behaviour change is easy to achieve but ensuring that the change occurs in the intended direction is much more challenging.

It can also be concluded that the requirements engineering and design for PIT introduce challenges in several areas including the decision on the relevant stakeholders and their decision rights and priorities. The failure stories of traditional behaviour change practices also send an alarm on the need for novel testing and validation for PIT. Testing for long-term consequences, e.g. decreased self-esteem, and collective side effects, e.g. creating certain norms of usage, would necessitate novel ways on validating whether such software does meet the requirements sustainably and without unpredictable side effects. This requires a joint effort of multiple disciplines including requirements engineering, human-computer interaction and psychology.

The term universal design describes the concepts of designing for all regardless of their age, gender and abilities (Center for Universal Design 1997). As such, PIT should not be designed with the mind-set of one size fits all and should cater for complex inter-related networks of variables. This research views the domain of behavioural change, as important effort to provide

reactive approaches to deal with this issue. However, there is an evident lack of test frameworks to validate the effectiveness of intervention systems built based on the theories of behavioural change. Validating the effectiveness of such technology requires a unique set of pre-conditions such as *willingness to change*, *openness* to shortcomings, being free from *denial of reality* and also the *seriousness* of the condition. The challenge here is how to measure these factors, e.g. change readiness, to control their influence on the validity of the intervention system.

5.5.2 RISK FACTORS AND SOCIO-TECHNICAL ISSUES

Turning the system into social software by including peers in the monitoring activity requires assessing the long-term outcomes and their sustainability. The validity of such change might be distorted due to various confounding factors arising from peer pressure and other negative influences such as the short-term change only to conform to the group's norms.

Table 12 summarises the findings of this research from the perspective of users' experience (UX) and what could be the source of concerns from the design perspective and also psychological and contextual perspectives.

TABLE 12: DESIGN CONCERNS AND THEIR POTENTIAL SOURCES IN PIT TO COMBAT DA

Concerns	Source of concerns
Lack of interest	Experience fails to engage, ineffective rewarding system, poor levelling design, willingness and readiness to change
Lack of trust	Unreliable addiction scoring, lack of verifiability and transparency, uncertainty of agenda of application's developer(s)
Lowering self-esteem	Peer-pressure, upward social comparisons, low sense of self-efficacy, assigning to non-matched groups
Creating misconceptions	Addiction scoring, minimising the seriousness of the addicting, providing non-stage matched interventions
Biased decisions	Downward social comparisons, self-set goals, flight into health, denial of reality, influence from past experience and performance
Creating addictive experience	Pull and push feedback approaches, gamified experience, creating pre-occupation with targeted behaviour, poor stimulus control
Impacting user experience	Obtrusiveness, distraction, coercive techniques, affecting workflow, lack of requirements negotiations, neglect personalised experience
Unsustainable change	Social elements (e.g. conformity effect), losing interest
Self-image impact	Identification as addict, experience of relapsing

The analysis of the users' comments and the developers' feedback to those comments on the online forum, indicates the rush to embrace this technology in order to cope with the market demand without careful consideration of its adverse effects. A prominent example is dealing with fundamental issues such as the measurement of DA, which requires extensive research, as merely a technical problem promised to be addressed in the next updates. Hence, the outcome of technology designed for behavioural change is currently doubtful at least in the area of DA. This research argues that more research is needed in the area of testing and validating the effectiveness of this technology on the intended behaviour in the short and long-terms. For example, assessing the threats of users' rejection of the interactive intervention systems is a bit challenging. Another example is the negative feelings that can be evoked, such as guilt and obligation, of certain design elements. The former may reinforce the relapse behaviours, and the latter may aggravate addiction-related behaviours such as fear of missing out. While trade-offs are a common observation in HCI research, in the domain of addictive behaviours such compensation may propose undesirable effects.

5.6 CHAPTER SUMMARY

This research explored users' perception of PIT for combating DA and argued the need for a more careful and holistic approach to technology-assisted behaviour change in DA. The unique contribution of this work derives from its attempt to analyse various views, potentials and risks related to a dual use and dual effect of such technology.

6. CHAPTER 6: EXPLORING ONLINE PEER GROUPS FOR COMBATING DIGITAL ADDICTION

The introduction of information and communication technology (ICT) to health-related behaviour, including addictive behaviours such as DA, has led to many controversial arguments. Most notable is the lack of strong scientific proof for their potential effectiveness. In a recent study (Leigh and Flatt 2015), researchers found that many app-based psychological interventions including those hosted by governmental bodies, such as the National Health Service in the UK, fail to demonstrate clinical evidence of a long-term change. A longitudinal research study found that delivering interventions within peer group settings could be harmful as it may introduce negative behaviours such as normalizing the problematic behaviour and reducing its culpability due to excessive peer support (Dishion et al. 1999) such as loafing and compensation (Karau and Williams 1993), and conformity effect (Allen 1965). Some negative attributes of persuasive technologies were also reported in (Hamari et al. 2014), such as frustration, anxiety, peer pressure and feeling of guilt for the participants. This suggests a need for further research on the design of such software-based solutions in order to exploit their power while attempting to avoid or reduce negative side effects.

This chapter will attempt to partially achieve **objective 3** by studying online peer support groups. This study introduces online peer groups as a persuasive mechanism based on self-regulation systems, to support an effective and long-term behavioural change to combat DA. The study conducts exploratory research on the different aspects that need to be considered when designing online peer groups and reflects on the applicability and potential as well as risks of such a mechanism.

6.1 RESEARCH GOAL

Peer groups approach can be an appropriate programme for users in the transition to addiction stage due to their need for less action-oriented strategies in which immediate change is not

expected (Prochaska 2013). It can also benefit those who are also unaware of their level of addiction as it can make them more informed of the consequences occurred to their peers.

The research goal is to investigate a persuasive technique that combines technology with human support to achieve sustainable behaviour change in a flexible and efficient style, hence the suggestion of online peer groups. This research explores the potential of online peer groups as a persuasive technique in that regard and focuses on different design aspects.

6.2 RESEARCH METHOD

This research reports upon work to explore users' perceptions of online peer groups, with respect to their possible use to help digital addicts. Several qualitative methods were adopted in two studies to triangulate the findings and to generate more comprehensive understanding.

6.2.1 STUDY ONE: USER STUDY

In this phase, the rich data collected in the previous research in **chapter 5** was re-analysed with a particular focus on the online peer groups as a motivational approach to enhance persuasive interactive technology (PIT). This was to have a relatively broad remit, to investigate how users would perceive self-monitoring and peer monitoring to combat DA. The re-analysed data was collected in **chapter 5**, i.e. the diary studies in **section (5.3.2)**, and the interviews in **section (5.3.3)**. One of the interviews questions was about the social features of the applications, which represent various aspects of online peer groups.

6.2.2 STUDY TWO: FOCUS GROUP

This phase was focused on understanding different perspectives on online peer groups and their interactive design. Two sessions focus group study was conducted. The first one included six participants, three males and three females, see **Table 13**. The inclusion criterion required that candidate group of participants should have pre-existing social relationships with each other, so they aligned with the concept of a peer group, which requires some degree of shared interest and trust. The convenience-sampling technique was used to recruit the participants. The participants were undergraduate students at Bournemouth University. Ages ranged between 20 and 26. The

adapted CAGE questionnaire was, also, used as a pre-selection test, see **Appendix 2 Part 1**. Participants were given an engaging task in which they had to comment on and construct different online peer group designs and interaction styles including the use of persuasive techniques to regulate addiction.

TABLE 13: THE BASIC DEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS

Participants	Age group	Gender	Home country	Field of study
P1	20-30	Male	India	Computing
P2	20-30	Male	India	Computing
P3	20-30	Male	Pakistan	Computing
P4	20-30	Female	UK	Business and Marketing
P5	20-30	Female	UK	Events management
P6	20-30	Female	UK	Marketing

The obtained data in the first session was used to come up with a new peer group design and used it as the subject of discussion in the next session. The same participants engaged as potential users of such online peer group aiming to regulate their addiction. However, one of the participants (participant 3), who could not participate, was replaced with another male participant, age group was 20-30, who also met the selection criteria and had good experience in 3D animation, which was advantageous to give some ideas on creative design. A sample of the questions of the focus group sessions can be found in **Appendix 3 Part 1**.

Finally, a survey study was performed to get further confirmation and insights through comments from a wider sample on the findings (a sample of the questions and answers in **Appendix 3 Part 2**). A total of 73 completed responses were returned from the sample of 42 males and 31 females, aged between 18 and 65, recruited through an open call via several academic mailing lists.

6.2.3 DATA ANALYSIS

In order to scope the analysis and as an initial template, this research used the Cialdini's six principles of influence (2009) to investigate the potential influential aspects in social settings from users' perspective as well as Fogg's behavioural model (2009) to focus on the technology-facilitated features that can maximise the persuasion of online peer groups.

6.3 RESULTS

Different aspects and areas of concerns about peer groups have been explored such as the study in (Dishion et al. 1999). This includes the personal characteristics that can heavily influence the effectiveness of ex-addicts and non-professional participation in counselling activities (Snowden and Cotler 1974). In online peer groups, such concerns need to be revisited by exploring what digital addicts prefer in terms designing online peer groups. **Figure 25** presents the main aspects of online peer groups for DA. This conceptual map reflects the areas of concerns that are considered important from users' perspective. Governance, Structuring and Moderation will be discussed in separate subsections while Risks will be discussed as a cross-cutting aspect through all subsections.

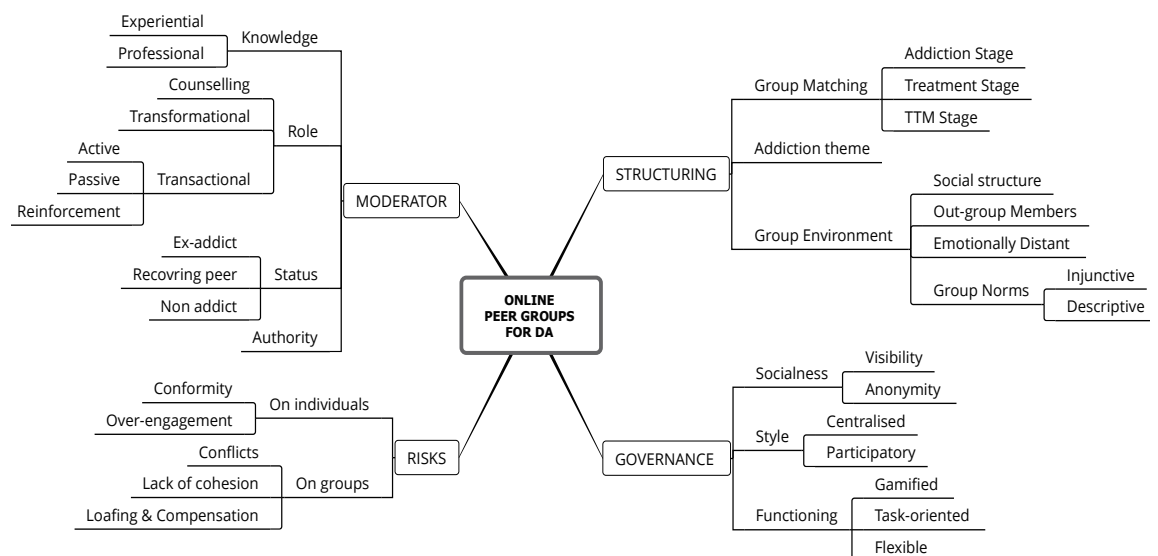


FIGURE 25: ONLINE PEER GROUPS FOR COMBATING DIGITAL ADDICTION

The next subsections present general findings including the usefulness of peer groups to regulate DA, users' motivations to join them and how group structuring is seen and preferred by the users. This will also include discussions of various concerns and design issues related to the role of groups' moderators and the application of behaviour change theories and persuasive techniques within social settings including social norms.

6.3.1 ATTITUDES TO THE OVERALL CONCEPT OF ONLINE PEER GROUPS

[This study assessed the perception of digital addicts of the usefulness of peer groups to regulate their usage. The overall impression was positive, and 71% felt that a peer group would be useful (26% certainly, 45% somehow). Participants liked the idea of technology-limiting technology and found *“online system to cure online addiction is an interesting concept”*. However, it had not escaped the authors, nor had it escaped some of the participants, that there is a paradox in supporting online addiction by inviting people to partake of online support, as part of another community. Perhaps one of the comments that highlight this best was one person who likened the approach *“inviting alcoholics down the pub to chat about their alcoholism”*. Of course, there are key differences here. Firstly, the medium, the online, is for many, something that they cannot choose to avoid. As such, being connected is a fundamental part of their life, or indeed, for many, their professional life. Secondly, digital addiction is a software-mediated behaviour. Hence, with the aid of software means, it is possible to actively monitor and intervene when necessary.

To identify the primary appealing characteristics of online peer groups, participants were asked about their motivation to join peer groups. Interestingly, most of the comments were clearly stating that providing moral support to others would be the main motivation. This motivation can be triggered by *reciprocity* norm (Cialdini 2009) which suggests that the equality of power and exchanging help are the essential ingredients to build effective groups. This is well understood in the *“helper therapy”* principle (Riessman 1965). That is, participants find it more motivating to be also useful for others, not only addicts who are seeking for help. This is perhaps the key element of peer groups.

Some other techniques used in persuasive systems seem not to be an important aspect for online peer groups used to assist the behavioural change for combating DA. For example, the Cialdini's Liking principle suggests that people are easily influenced by those who they admire, such as celebrities. That is to say, popular persuasive techniques may not be seen efficient and even accepted when applied for the behavioural change in addictive behaviours, such as DA, and they need to be revisited for that context of use.

6.3.2 THE MODERATION ROLE IN ONLINE PEER GROUPS

Participants highlighted the important role of having the human element such in software systems advocating techniques like peer groups to build a sense of trust and commitment to support long-term change. For example, one participant commented that in young age groups, having parental involvement would benefit more as they have a *sense of authority* to regulate the usage. For all of the individuals within the group, the role of the moderator was clearly understood as of paramount importance.

For example, there was a legitimate concern that there is a high-risk factor of peers developing deviant behaviours due to normative influence (Allen et al. 2011). This is one of the main reasons to introduce the *moderation* as an essential process in online peer groups. Moderator can also play other typical governance roles such as those related to memberships and rewards allocation as well as addressing the influence of the non-matched members such as grouping members who belong to different levels of change.

6.3.2.1 CHARACTERISTICS OF MODERATORS

Participants were asked to consider a range of potential characteristics for the crucial role of moderator. Of these, only one question gained greater than 50% agreement, 58% believing the moderator must be "*accredited/professional for [advanced digital] addiction*". The comment above appears to endorse the need for a 'professional' moderator, though an exception was highlighted when groups or moderators have "*successful support history*" regardless of their *professional knowledge*. Thus, the *experiential knowledge* was perceived as an appealing attribute of the moderation role. In addition, two further clear themes are clear from the comments.

The first observation is that the participants made a distinction between ‘light’ and ‘advanced stage’ digital addiction. That is, they suggest that for early stage addiction, friends or less qualified people might be helpful in a peer group, and this further suggests that such a peer group approach as an early, low cost, intervention is something that they consider to be useful even among genuine peers. Two comments exemplify this commonly stated view: 1) *“for groups with advanced addiction, moderator should be a therapist or a digital addict or an ex digital addict but with therapist expertise, so they know what to say and how to say it”*, and 2) *“For light addiction anyone really, does not matter, I would say the same for early addiction that means to prevent it first or to recover from it. I see difference”*.

The second observation is that the attitude or approach of the moderator is seen as paramount, friendliness and liberal styles being mentioned, one argued that *“friendliness in the group is a main requirement”*. However, again these comments being qualified by those cases where ‘professional treatment’, requires a therapist.

Finally, the question of whether moderators should themselves be ex-addicts drew far more mixed response. While some, 20% of the survey, considered that ex-addicts would have more empathy, a greater number suggested that the moderator should not be an ex-addict, *“addicts might dictate their opinion and be biased to their own experience”*.

6.3.2.2 THE ROLE OF MODERATORS

Participants wanted to have collaborative moderators, who have the ability to guide the behavioural change by providing inspirational motivation. For example, a participant commented that a moderator should be *“someone who is respectable and can take charge; but also sympathises”*. The most positive responses for activities of the moderator, were: create and suggest rules (of engagement) 58%, support motivation (55%), provide advice to members (54%), and create real life events (54%) – but of course this final suggestion contrasts with anonymity, and reward members for complaint behaviour/usage (though note this is taken on trust) 50%.

Hence, the moderator’s role was seen, as in other forms of addiction, as primarily about setting out and controlling how people interacted, suggesting rules, motivating members, and

giving advice. A perhaps surprising finding is that many wanted moderators to create real life events, contrasting with other questions for anonymity. Finally, while the moderator giving some kind of rewards was favoured by 50% of the survey respondents, penalties was, a much lower score, with only 30% believing that the moderator should give penalties. An interesting comment from the survey, which again tallied with other studies was: “*No penalty but probably confrontation with their status*”, since one of the perceived benefits is concrete evidence and heightened awareness of actual usage. These characteristics of the role of moderation align well with the *transformational* leadership paradigm (Bono and Judge 2004).

The use of “rational or economic means” to strengthen the probability of members’ compliance with group’s goals, suggests a moderation role that follows *transactional* leadership paradigm (Bono and Judge 2004). In this type of moderation, two approaches can be taken. The first is about active moderation and requires monitoring groups’ interaction to ensure continued enhancement of the performance through applying corrective actions. Second is a passive moderation in which a moderator intervenes and applies operant conditioning when group’s goals and standards are violated (Bono and Judge 2004). Other users preferred to have the moderator as a counsellor, so members request their interventions when needed. As such, no monitoring and direct intervening are required.

Using persuasive techniques for behavioural change might lead some design issues related to the moderator role in peer groups. Participants argued that in some groups a moderator should be enabled to guide the change through positive reinforcements and light penalties as persuasive techniques. For example, one participant commented: “*people may leave a peer group if too much penalty is enforced*”. Another one highlighted that if penalties must be implemented should take more influential approach such as “*confronting members with their status*”.

The careful implementation of persuasion techniques and moderation role will have profound impact on groups’ self-esteem. One of main components in Fogg’s model for persuasive design (Fogg 2009) is the ability to perform the targeted behaviour or to reduce negative behaviour. When reducing the negative behaviour is very challenging goal such as in

severe addiction, the design of online peer groups is expected to increase the motivational elements and apply the right triggers. This is to increase the probability of behavioural change to occur. For example, providing means to express the confidence in member's ability to change or applying the right social norm would increase the perceived self-efficiency which will act as a powerful motivational tool (Shamir et al. 1993). Peer group design should provide moderators with means to enact such policies and enable an effective persuasion to change behaviour.

6.3.2.3 STRUCTURING OF ONLINE PEER GROUPS

Professional involvement in severe addiction cases suggests that the stage of addiction, i.e. early, intermediate and advanced, has an influence on how to customise online peer groups. Thus, the design on online peer groups is expected to sense users' addiction status and adapt different facets of this mechanism accordingly to provide more persuasive effects.

Ultimately, each stage of addiction represents different level of self-control and distinct attitudes and behaviours. Regardless of the extent to which the object of addiction dominates decision-making processes, individuals with less severe addictive behaviour can be guided through the stage of change (Prochaska 2013). The stage of change, correspond to the stages of the Transtheoretical model (TTM) to behavioural change (Prochaska 2013).

A critical assumption is that persuasive software-mediated interactions are more suitable for those who are open to the change, honest and do not have denial of reality. On the other hand, users who exhibit severe addiction symptoms require different course of action and more comprehensive treatment regardless of the stage of change they are at (Prochaska 2013). However, peer groups can still play a role in different phases of that comprehensive treatment, e.g. pre-treatment phase to support problem recognition “*non-addicts have no idea but they may give a perspective and may learn how it feels*” and post-treatment phase to support relapse avoidance as highlighted in (Moos and Moos 2004). Structuring peer groups should also consider the theme of addiction. For example, addiction to online pornography would require certain degree of anonymity. This aspect will be discussed in the next section.

The social structure within online peer groups seems a very important aspect to be considered in the design. For example, a participant commented “*friends are not always the good thing here but unknown people with no direct contact or a friend of friend might be better and more relaxed*” and he continued, “*family members would be distracting in the group as I may need to behave differently*”. Only, 9% of the responses were in favour of having family members. However, another one commented: “*family members are fine to have in the online peer groups but not as moderators*”. This suggests that the design needs to consider the impact of including family and friends versus unknown individuals in the group. This could be linked to the severity and domain of DA. Thus, the design of online peer groups must also consider the domain of addictions, such as gambling and pornography, which would require higher level of anonymity.

The social norms approach has become a major focus of research in recent years and is widely adopted in different developmental sectors such as educational settings in the United States (McAlaney et al. 2011). The approach has been successfully used for behavioural change in the domain of addiction as well as a number of health and socially relevant behaviours (McAlaney et al. 2011).

As has been demonstrated extensively throughout social psychological research, individuals are strongly motivated to alter their own thoughts and behaviours to match the norms of the group (Kelman 2006). This can include *descriptive norms*, which refers to how often or extensively individuals perceive their peers to engage in a behaviour or *injunctive norms*, which refers to the attitudes individuals believe their peers to hold. In a case of reciprocal causality individuals will also seek out social groups whose behaviours and attitudes they perceive to reflect their own (Ennett and Bauman 1994). Explicit attempts to manipulate groups, particularly by *out-group members*, can lead what known as a reactance response in which individuals engage even more strongly in the original behaviour (Fuegen and Brehm 2004). However people also tend to underestimate how easily influenced they are by the groups they belong to (Darley 1992). As such by challenging the perceived norms within a group or encouraging the group to aspire towards a healthier norm behaviour change may be achieved.

Research into the use of peer networks to bring about behaviour change would suggest that they can indeed create new and more positive social norms (Wright et al. 2003). There is overall though a lack of research on how social norms may operate within online peer groups.

The degree to which social norms may operate differently in online groups could be expected to reflect the complexity of the social relationships between the members of the peer groups. In the case of peer groups where members feel *emotionally distant* from one another they are less likely to conform to the norm (Greene et al. 2001). However conformity to the social norm is more likely to occur in groups where there is a shared sense of a common goal and a belief that each member plays an important role in the achievement of this goal (Allen 1965). If peer groups are therefore to be used to address DA it is important that this is done in a way that engages the group, creates an agreed norm to aspire too and involve all the members of this group into the process. A participant commented, “*if a group of people I knew were all trying to cut down their phone usage then I think it would motivate me to cut down my usage*”.

6.3.2.4 GOVERNANCE AND SOCIAL ASPECTS IN ONLINE PEER GROUPS

Enabling computer-mediated interactions among peers raises several social-related concerns. Participants highlighted the level of *anonymity* as key motivation to join peer groups. Several participants commented that such platforms should be a “*safe space*” in which users can maintain certain level of anonymity not necessarily complete, as self-disclosure is a key aspect in such social software platforms. For example, anonymity might need to be maintained at the level of members’ interactions only, i.e. a member cannot be identified by other members but still identifiable by the system to monitor his progress over time. As such, online peer groups should accommodate various degrees of anonymity (Kobsa and Schreck 2003). The design of online peer groups is expected to consider the *addiction theme* as an important aspect in deciding the suitable levels of privacy. More work is still needed to look into how addicts perceive anonymity and the influential privacy aspects that plays a role in persuading them to join and sustain their participation.

The *experiential knowledge* attribute suggests *visibility* concept in groups functioning as an important persuasive feature to enhance the intra-group's trust. Participants used the visibility term to denote the notion of having accessible service history and overall performance of groups and moderators. In this sense, anonymity and visibility are not conflicting requirements as the latter revolves around participation visibility rather than participant's visibility. Other participants showed interest in sharing the role of moderator to maximise group's outcomes. The observation from the lack of having a particular trend in electing moderators is perhaps due to people in peer groups wanting a *participatory style* and to hear from peers rather than *authority* figures, such as parents, which take more *centralised style*.

As with the whole concept of using online to regulate DA drew some mixed views, and many noted the apparent paradox of having gamification and online approaches due to the risk from over-engagement. However, on the whole participants were positive about bringing some 'fun' to the peer group, and transfer of activities is often something useful within traditional addictions. On the whole, competition inside the group was seen as potentially problematic whereas they wanted to support rather than to compete with other members. However, from all stages of the research there was a mention of the possibility of the group having an overall usage, from all members, and that they might wish to see this as a collective goal, or even compete with other groups. Clearly, this is an often-used gamification tactic, call centre teams compete with each other, and often weight loss has been tackled with such an approach. Having the element of competition suggests that the group functioning can take *task-oriented approach* to either meet individuals' or collective goals. Other users wanted more flexible and supportive medium that is free from competition to "*support rather than beat each other*".

In terms of specific tactics, 53% wanted points for compliance with 'healthy' activity, whereas only 40% were happy with the idea of something like a leader board. Of course, one person noted the monitoring issue, stating "*points are good but how will you monitor off-line behaviour?*". Finally, and perhaps to be expected for peer support, the most desirable feature, (64%), was online chat, further reinforcing the impact of people in support.

6.4 DISCUSSION

This section reports core risks which were identified through users' experience with this technology. Also, it will explain the risks in relation to psychological theories aiming to inform the designs and testing methods of such technology to anticipate and minimise their negative impact.

6.4.1 RISK FACTORS

A further elaboration on the risks identified in **chapter 5 – Table 12** taking into account the online peer groups and the e-health interventions design. Ultimately, these risks can impact users' behaviours and hinder group performance. The risks were grouped into five main themes. These risks alongside their potential causes are outlined in **Figure 26**.

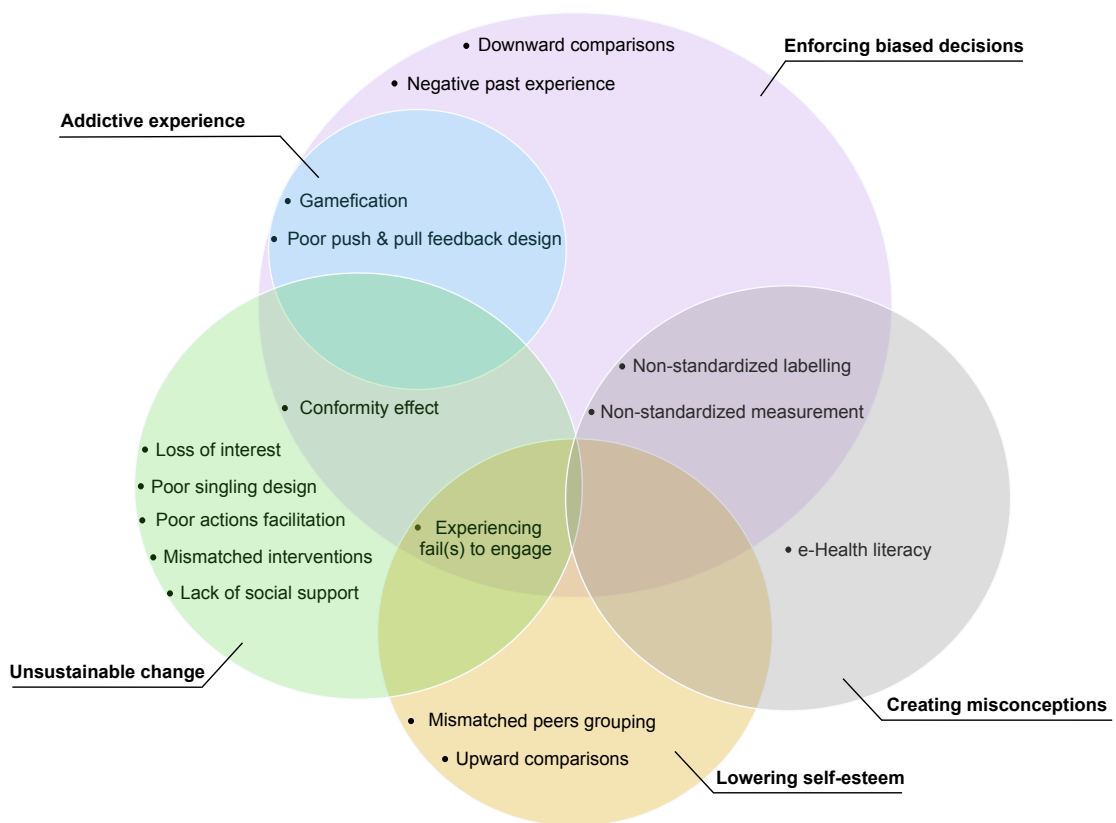


FIGURE 26: RISK FACTORS OF PIT INTERVENTION TO COMBAT DIGITAL ADDICTION

6.4.1.1 RISK ONE: UNSUSTAINABLE CHANGE

Behavioural change interventions aim to reduce the individuals' damaging behaviours.

Facilitating the initiation of that change through goal settings can be the first step in the process

of change, with subsequent tasks focusing on maintenance of that change (Gollwitzer and Sheeran 2006).

Locke and Latham (2006) explained the types of goals in goal setting theory. The first is learning goals, which are about increasing competency by focusing on skills and knowledge acquisition. For example, finding new healthy ways to cope with stress away from the excessive use of digital media can reflect the level of the performance. Second are performance goals, which focus on rewards to provide a sense of accomplishment to reflect the level of competency. For example, setting a goal to reduce unhealthy usage of mobile phone in order to be on the top list of a Leaderboard.

To sustain behavioural change, learning goals can be more effective than performance goals. Learning goals can motivate goal pursuit when dealing with failure (Seijts and Latham 2005). In DA, failure refers to returning briefly, i.e. lapse, to addiction behaviour or failing to apply the acquired skills in the treatment programme. This is because in the early stages of the treatment, addicts might experience initial difficulty or failure to mastering new skills. Therefore, learning goals can increase self-efficacy as users invest more time to discover appropriate strategies to achieve better quality performance, while attention is diverted away from the end results. As such, motivating users to explore what triggers engagement in addictive behaviours can be a critical asset in e-health intervention for regulating DA, and is therefore an important step in achieving behaviour change.

In the case of DA, users could be provided with the means to identify what applications contribute to their excessive usage. Ultimately, it is suggested that in an environment with minimal structure or guidance, metacognition is necessary (Locke and Latham 2006). The authors argue that metacognition which refers to “*planning, monitoring, and evaluating progress toward goal attainment*” can be enhanced through learning goals.

While the continuous and accurate monitoring of usage through e-health applications can provide such knowledge, this study indicated that this knowledge has as short-term influence to regulate the usage. For example, a participant commented that “*it just tracks usage, while*

usefulness depends on your willpower". Another participant commented that *"it has not changed my attitude towards my usage, only made me reduce the usage and manage the time spent on it"*. While this means a successful intervention, motivation may only be temporal and not yet embedded intrinsically in the user. Thus, the real challenge here is to empower self-control and sustain the motivation to encourage long-term change.

To sustain a behaviour change, one participant commented that they always like to *"compare if they have spent less time than their peers"*. This indicates the potential of the online peer pressure and social comparison which are typically used in peer groups (Alrobai et al. 2016a). However, some social influences, such as conformity effect, suggest the risk of adjusting the behaviours temporarily to conform with peers. As an edge case, one participant commented *"family members would be distracting in the online peer groups as I may feel I need to behave differently"*. This suggests the need for considering the social structure of peer groups, and how it should be set up to promote group cohesion and performance in such socio-technical system, and to sustain the positive change.

Loss of interest is another sustainability threat in these systems. During the diary study, most participants reported their interest in these applications, but none of them continued using them after one month from the end of the study. This is also supported by the comments of users in the forums related to these applications. Many participants criticised the obtrusiveness of some of the techniques *"annoying, but that is the purpose"* which still positively express their tolerance. However, they expressed their eventual loss of interest mainly due to the fact that the applications are measuring and trying to treat the usage but not the underlying reasons and context. This can be linked to the need for a preparation stage before using these applications to understand their limitations and what to expect from them.

Another highlighted threat is experiencing failure to engage. When an intervention is conducted in a socio-technical context, users may experience a negative feeling when they do not receive the expected support from peers. They may also fear violating group's norms, such as

indicating their depression state in a group that always praise positive stories to promote hope (Sandaunet 2008).

This risk is not only associated with e-health applications that utilise social aspects but could also be the ones that solely rely on the self-regulation rather than peers *“I am still over using my phone. Uninstalled”*. This is a classic case when users expect the application to be a remedy rather than a facilitator. Setting up the expectations of such applications would be essential for their success.

Loss of interest may be also caused by poor levelling design of the intervention. This mainly stems from the limited consideration of the stage of change, e.g. those of the Transtheoretical Model (TTM) (Prochaska 2013) or the level of addiction, i.e. early, intermediate and severe. As such, the system might deliver mismatched interactive interventions. Thus, users should be carefully assigned to each level without being confirmatory and without overlooking their contextual factors and also the open issues in judging stages and their linear and sequential nature, e.g. the issues with such assumptions in the TTM (Sutton 2001).

6.4.1.2 RISK TWO: LOWERING SELF-ESTEEM

Comparison techniques were evident in all the DA regulation applications that were investigated in this research. For instance, an application is expected to compare the current behaviour to the past-self, peers, or comparing to a self-set goal or a collective goal set by the group.

Comparing with peers' digital media usage is a social computing element that can be used in e-health interventions to enhance users' motivation and prompt behavioural change. While comparing self-performance with others can help to define the self, the approach may inadvertently also create competition. In this case, there is a possibility to impact self-esteem and self-efficacy (the research perception of how able individuals are to control and change their own behaviour). This is particularly if a user who is in the early stages of the change, e.g. contemplation, is compared to others in the advanced stages, e.g. maintenance.

Although an upward social comparison is suggested to inspire those who are in worse off condition (Taylor and Lobel 1989), it may also severely lower their self-esteem. For instance, a user commented that gamifying the systems can be effective but always with caution as “*fun [in using some point system] is needed but what about non-addicts appearing in a leader board?!?*”. In other words, having users with different degrees, types and perception of addiction in a comparison could have adverse effects. This also applies for those who are in the better off as they may use it as a defensive mechanism and ignore other symptoms of addiction such as salience, withdrawal symptoms and conflict, which may be more problematic than the time spent on digital media.

6.4.1.3 RISK THREE: CREATING MISCONCEPTIONS

Judging DA, e.g. via providing a score, could be perceived as an effective motivation “*I think it makes me want to improve and get a lower score sometimes*”. However, the methods to judge tend to be inherently partial, i.e. overlooking some factors such as the motivation of the usage, and subjective due to the complex network of factors describing an addictive behaviour. In calculating addiction score, tracking time on-screen was the predominant method in all the reviewed applications. Different applications were found to rely on different metrics to measure time on screen. Users commented that these applications had the risk of lacking intent identification. As such, all types of usage were included in the measurement models of these applications without considering users’ goals, needs and contextual factors.

Another common measure within the DA applications is the frequency of checking and using digital media. Some of the applications were reviewed in this study provided frequency-based statistics, such as number of screen unlocks and an application’s lunches. One of the reviewed applications took into account these stats with other unstated factors to calculate addiction scores using undeclared and possibly un-validated methods. There was also a feature of linking the usage to the geographical locations which could be seen a relevant factor. For example, if the usage is only increasing in certain places, e.g. workplace, this might indicate a temporal reason. These statistics can provide indications to the degree of resisting the urge to use digital media. However,

there is still a lack of standardised methods to collect and report these frequencies and utilise them to draw a conclusion, e.g. for pattern of addiction and effect of time and location as well as social context.

The use of such quantifying methods, i.e. time on-screen and frequency that are not validated could heighten the risks of providing false assertions. Some users doubted the scoring measurement, e.g. *“two hours and fifty-five minutes of phone use should not be counted as 100 points [which is the highest addiction score] in the addiction scoring”*. The same user then speculated that *“two hours should be like 85 points or 4 hours to be 100 points”*. This indicates that it was difficult to understand the rationale and perceptions of time and frequency and how they translated to a judgement (score) of addiction.

In fact, such misleading information might be abused by users to avoid having to engage in further treatment. This is by declaring that they have made a change in their behaviour and are therefore cured, despite the fact that their usage is still problematic. This known as the “flight into health” tactic (Frick 1999). For example, one user commented: *“I did not ever know how often I checked my phone, I was using it about 200 times a day. Now I check it about 200 times a week thanks to much for curing me”*. Part of the issue could be related to 1) the e-health literacy, i.e. the capacity of evaluating the credibility, quality and relevancy of health information, e.g. applications’ feedback messages, provided in the cyberspace (Stahl and Spatz 2003), 2) the lack of having standard labelling in this domain (Ali et al. 2015) or 3) users’ tendency to convince themselves that the change is sufficient and labelling is used as an evidence.

An objective measure, i.e., a factual one such as in the comment above, seems to be more effective to minimise risks of misconception. However, they might still need to be supported by careful feedback and reporting statements to avoid any deceptive assertions.

The designed levelling system can also lead to misconceptions as well. For example, one of the participants commented *“if I reached the highest level [of being a non-addict user], I will not probably use it anymore as I would think that I’m already cured since I got the final level”*. The

lack of theory-based DA judging and scoring systems makes any current system ad-hoc and misleading.

6.4.1.4 RISK FOUR: CREATING ALTERNATIVE ADDICTIVE EXPERIENCES

Interactive E-health interventions for regulating DA aim to help users regulate their digital usage. However, this study highlighted the risk of such intervention in becoming a basis for alternative addictive behaviours.

The design of feedback messages about digital usage, e.g. scores and comparison to others, can follow pull or push approaches (Franklin and Zdonik 1998). The former puts the responsibility on users to check their progress against their goals. The risk of this approach is that cognitive preoccupation is facilitated through the design, which might reinforce the feelings of anticipation. The latter approach puts the responsibility on the software to deliver the feedback messages reasonably and to facilitate monitoring the progress. This also has the risk of triggering unnecessary use after reading the messages and of users being preoccupied about the them.

The use of gamification mechanics to implement the element of fun can also lead to adverse effects (Callan et al. 2015), such as habitual checking behaviours. In one of the reviewed applications, where the experience was gamified through levels and points as well as avatars and epic meaning, the users liked to have more gaming elements to make the e-health application more engaging, and one of the participants commented that “*actually, it [the application] made me use my phone more because of these [the gaming elements] features*”.

Finally, this technology might be used as a coping strategy which may convey a positive aspect. However, the interviews revealed the risk of that. Using the app as a quick coping mechanism to escape the stress rather than mitigating its sources may lead to use this technology as a new addictive experience.

6.4.1.5 RISK FIVE: ENFORCING BIASED DECISIONS

Goal setting theory can offer users the flexibility to select their own goals in order to enhance self-efficacy and implement the element of ownership. However, in rehabilitation programmes,

setting SMART goals (Doran 1981) is not an easy task to perform (Bovend'Eerd et al. 2009). For instance, allowing users to decide the level of difficulty in the goal selection could slow the treatment progress. In fact, this might be perceived by users as an ineffective intervention option. Users may also be influenced by their past experiences, such as selecting a challenging goal which led to a failure. This could be due to the lack of guiding the users to decide the level of difficulty or due to a lack of proper system support to help the user to stick to the plan. Such negative experiences can influence future goals selection, which could lead users to continue to select goals that are easy to achieve.

When the behaviour change is facilitated within group settings, the complexity of tackling these negative aspects will be far more challenging. A common issue is that users have a tendency to change their behaviours to fit in with a group (Asch 1951). As such their selection of the goals could be biased as they are influenced, perhaps by the norms of the group. Even after becoming a part of the group, social recognition may influence the behaviour “*sharing my data with peers depends on how bad is my addiction score. If it was really bad, then probably not*”. Another, related issue is that users may also have a tendency to pick easy goals to achieve a higher rank within their social network.

In addition, when social comparisons are implemented, users may indirectly provoke one of two comparisons; downward or upward. Downward comparisons are where users compare themselves to those who are in worse condition. Focusing on others who have more problematic usage may create tendency to select easier goals. In other words, such comparisons may not induce users to exert incremental effort as they may feel it is more needed by those in worse condition.

6.4.2 REFLECTIONS ON THE DESIGN FOR PERSUASION

This chapter explored different aspects of online peer groups, as a motivational mechanism, from users' perspectives. Also, the prominent persuasive considerations for online peer groups was demonstrated. Although this motivational technique aims at supporting individuals to overcome DA, this research argues the need for careful re-evaluation of the design from the perspectives of

behavioural change theories. The research, also, argues that tailoring such social software platform to support those with advanced stage addiction would be a very challenging task. Users who exhibit severe addiction are more vulnerable to relatively unconscious distorted, conflicting, changing requirements and could be accompanied with denial of reality. The understanding of how social norms operate within peer groups is based primarily on offline interactions. Online environments may have unique characteristics that need to be better understood if change is to be achieved.

Ultimately, the partial overlap of these risks indicates the inherent complexity of designing such pervasive and interactive interventions. Unguided intervention designs may lead to considering certain aspects, e.g. increasing engagement, while neglecting others, e.g. enhancing self-esteem. This suggests that systematic engineering approaches and robust guide to build such socio-technical systems should be established. Systematic engineering emphasises the importance of establishing instructions and heuristics rather than relying on creativity during the design activities. However, different design facets should still be explained by social psychology science to create solutions that best support the different behaviours and abilities of users and groups.

In reference to Fogg's model (2009), which aims to categorise the understanding of the psychology of persuasion, digital addicts can be classified as having low ability to resist urges to addiction cues and low motivation to change the negative behaviours. As such, relying on signals, e.g., reminding alerts, as triggers to make a change is, at best, questionable. According to the model, a signalling approach is recommended when both, the motivation and ability to perform the target behaviour are high. In this study, the data indicates that these types of triggers, are typically considered to be annoying to users. Of course, the results cannot tell us whether the users' experiences were affected by the poor design of the signalling techniques, or whether this is correlated with the level of motivation, i.e., their willingness and readiness to change, which can be understood through the lenses of Transtheoretical Model. Hence, these models should consider the different levels of motivation and ability among users within online support groups. Yet, the results cannot confirm if users' experience affected by the poor design of the singling

techniques. Overall, while this type of applications is expected to implement such techniques, users' responses indicate that other triggering approaches, i.e. facilitator and spark, are needed to enhance self-efficacy at first to promote the readiness to change.

While E-health interventions for DA could be expected to implement signalling techniques, users' responses indicate the functional and motivational importance of other triggering approaches, i.e., facilitator and sparking triggers (Fogg 2009). Facilitators refer to triggering the behaviour by improving users' ability to perform it. For example, a participant commented that "*the application [e-health intervention] needs a strong mechanism to prevent users from simply turning off the [coercive] rule when they want to. Self-control is a limited resource that depletes as the day goes by*". Sparking, on the other hand, refers to triggering the behaviour by implementing motivational cues. For example, a participant commented "*I would love if I could add more interesting/motivating messages when I violate a rule!*". Clearly, these are needed to enhance self-efficacy to promote the readiness to change. Users always have different needs and preferences in terms of what techniques to be implemented. Yet, the research argues that this still needs to be guided in the design phase. By guidance, the research refers to the concept of best practices in the design of treatment programmes.

This demonstrates the need for a managed requirements and design personalisation process which involves a variety of stakeholders in addition to the users, who may tend to deny reality and have unconscious bias. This study is intended to shed light on the need for careful design and also the new challenges which arise when developing software for addictive behaviour where users' requirements have particular characteristics, e.g., being against their comfort and current desire to achieve a new behaviour in the long-term.

6.5 CHAPTER SUMMARY

This chapter highlighted that current efforts in PIT interventions are strictly addressed as a non-technical topic where the systems are just a telecommunication medium to deliver health interventions. The chapter also offers insights into the contribution can be made by the engineering discipline toward not only the management of the PIT development activities but also

the contribution of these systems to regulate DA. As such, the findings of this study are intended to inform the design decisions, testing, and usage instructions related to interactive e-health solutions for problematic and addictive digital media usage.

This chapter, also, explored some critical design risks associated with the development of E-health interventions for addictive digital usage. The research aided the identification of five main risks in these systems. For each risk, the chapter presented a discussion to illustrate how such design choices might have detrimental impacts to users. Overall, this research believes that understanding these risks and how they can be minimised will increase the likelihood of more effective e-health interventions.

7. CHAPTER 7: DESIGN PRINCIPLES FOR ONLINE PEER GROUPS

Online peer group approach is inherently a persuasive technique as it is centred on peer pressure and surveillance. For a greater motivation, they can be designed to infer and adjust their rewarding system to boost behaviour change and prevent relapse, e.g. through their real-time intelligent and adaptive feedback system and conditioning (Leth Jespersen et al. 2007). They can be then seen as persuasive social networks equipped with tools and facilities that enable the behaviour change.

Online peer groups exhibit their own characteristics which necessitate revisiting their design principles in comparison to general purpose social networks. For example, surveillance is a crux in online peer groups. Social surveillance differs from traditional surveillance in terms of the power, hierarchy, and reciprocity (Marwick 2012). Traditional surveillance involves, for example, corporations monitoring populations for the purposes of law enforcement, while social surveillance is the process of monitoring activities for the purpose of influencing individuals' behaviours, i.e. persuasion through "overt" observation (Fogg 2002) and it is usually done by peers not only authorities. Online social surveillance utilises digital traces left by users to investigate behaviours and activities, also known as "dataveillance" (Leth Jespersen et al. 2007). The tools that social software offers, e.g. sharing and commenting, are the functional utilities that facilitate online social surveillance but there is still lack theory-based solutions and best practices on how to employ such utilities. The high volume, speed, traceability and processability are all new features which necessitate a revision of the known principles and models for traditional social surveillance.

The Honeycomb framework was proposed by Keitzmann et al. (2011) to understand and classify social media platforms from a functional perspective. Previous work on social informatics reviewed and suggested adding extra blocks, e.g. social objects (Cetina 1997) and collaboration, to help designers shifting from Social Computing to Socially Aware Computing (Baranauskas 2009). Socially aware systems are supposed to be socially responsible, universal and entirely

satisfying users requirements (Baranauskas 2009). Pereira and Baranauskas (2010b) pointed out that social interactions are driven by or revolve around a shared “object(s)”, e.g. topic, idea, event or public figure. Social objects help to maintain the focus of a social interaction (Cetina 1997). This aligns with the use of social network for domain-specific purposes such as persuasive online peer groups where the group is driven by a specific goal and centred on main issue. However, despite this recognition, there is still lack enough practice and engineering principles on how to develop such platforms to boost positive behaviour and prevent side-effects (Alrobai et al. 2016a).

This thesis argues that the case for domain specific persuasive social networks that could aid members for certain behaviour change. The thesis will be focusing on the case of problematic and addictive behaviour change. To get insights on their design principles and constraints, a 4-month study was conducted in an addiction rehab centre. In this period, observational study was performed followed by practitioner interview. Then, report on the part of the findings concerning governing such groups, roles to be enabled and tasks to be performed. The Honeycomb framework proposed by Kietzmann et al. (2011) was revisited to comment on its building blocks with the purpose of highlighting points to consider when building domain specific social networks for such domain, i.e. online peer groups to combat addictive behaviour. This chapter will attempt to partially achieve **objective 4** which is focused on devising an engineering method for managing the design process of the online peer groups platforms to overcome digital addiction.

7.1 RESEARCH GOAL

The argument in this thesis is that social networks could be used as a medium for persuasion and behaviour change. Online support groups for changing addictive behaviour are an example. However, building such domain specific social networks through the traditional mind-set and concepts of a general-purpose network could lead to adverse effects, e.g. propagating negative behaviour, spreading anxiety, and lowering self-esteem. The study goal is to devise a process method that includes a set of considerations concerning the design and management of online platforms meant to guide the design of peer groups for addictive behaviour change. In this method,

the main framework that conceptualises social networks, known as the Honeycomb framework, will be adapted to cater for the peculiarities of these domain-specific social networks.

7.2 RESEARCH DESIGN

The study adopted several qualitative methods to understand the broad parameters of peer groups including the sessions' environment, norms, interaction styles occurring between groups' members and how such interactions are governed. A qualitative approach was adopted to generate the findings using observations, semi-structured interviews, and documents analysis.

7.3 RESEARCH METHOD

The researcher conducted two observational studies. The first study was on face-to-face peer groups for treating substance addiction and behavioural addiction, followed by an interview with an addiction counsellor to discuss the observations, confirm and enhance them. This study was complemented by a document analysis method mainly for the forms and diaries used in the daily practice. These three methods were applied in iterative style, i.e. after each observation session and its analysis, an interview was conducted. A referral to the documents and diaries used by the practitioners was also used when needed, before or after the observation sessions and the interviews to support the preparation and the analysis, respectively.

Since the first study was done in a traditional rehab centre and to get more insights from an online medium to handle addiction, behavioural addiction in particular, this study was complemented with additional study. The second study concerned the analysis of online peer groups designed for treating problematic gambling. Doing this study enabled contrasting and comparing the practices in both the actual and the cyberspace.

7.4 STUDY ONE: TRADITIONAL REHAB CENTRE

In this study, the researcher performed a 4-months observational study at an addiction treatment centre. The study was run over this period to allow observing clients while they pass through different stages of treatment. This is to enable collecting data related to individuals' behaviours, group's involvement and interactions as well as how addiction counsellors govern these groups

and react to different situations. The established practices in this domain would then provide a rich base for recommending how online platforms for peer groups should be constructed and operated.

7.4.1 SELECTING A SITE AND A GROUP OF INTEREST

The rehab centre which accommodated this study has over 25 years of experience in detoxification and intensive rehabilitation from traditional addictions, e.g. drugs and alcohol. They provide 24/7 support to clients. Treatments offered are based on the 12-steps of Alcoholics Anonymous, which provide guiding principles for recovery from addiction and other behavioural problems (VandenBos 2007).

The centre caters for most addiction types, e.g. alcohol and substance abuse as well as behavioural addiction, e.g. problem gambling and sex addiction. Peer groups were selected based on traditional addiction for pragmatic reasons—given the facilitated access to the treatment groups, and the availability of some of the behavioural addiction themes, e.g. problem gambling. Also, the knowledge and practices of these traditional addiction and problematic behaviours are well established and would provide a rich background to start building solutions for the new phenomenon of problematic cyber behaviour. Group therapy is offered as an integral part of all treatment plans the centre provides. This is to speed up the recovery process.

All group therapy sessions were facilitated by a qualified therapist, with over 13 years of experience in this field. The therapist was registered as a psychotherapist and accredited by the British Association for Counselling and Psychotherapy (MBACP) and possesses professional and experiential knowledge. The therapist's role is to listen and when appropriate confront clients on the issues and problems they raise, in a process known as reflective listening. The therapist facilitates and governs the communication amongst the group members. Knowing how the therapist role works and, also, the different interactions amongst clients would be a rich knowledge to come up with the online platform design principles.

7.4.2 FACE TO FACE GROUPS SESSIONS

In the rehab centre, therapeutic sessions had a minimum of 7 participants and a maximum of 15, mixed genders, aged between 19 and 56 years old. Some of the clients were experiencing parallel addiction, such as problem gambling and alcohol abuse. Participants in the peer groups were at different levels of addiction, i.e. some were at the prescribed medical detoxification stage arranged through official medical bodies to treat withdrawal symptoms, while others were in the advanced stage of the treatment. The stages of treatment were based on the model proposed by (Gorski 2009, 2013a), see **Table 14**.

The researcher did not recruit specific participants. In fact, the researcher had an official arrangement with rehab centre to nominate an established peer group where the researcher can join and conduct the study. As such, the characteristics mentioned earlier in this section were also applied to the studied group. It is worth mentioning that as an outsider to the group, the researcher avoided seeking clients' specific background information to avoid triggering any privacy concerns.

TABLE 14: STAGES OF RECOVERY (GORSKI, 2009; 2013)

Stages	Major theme	Description
Transition	Giving up the need to control alcohol and other types of drugs usage	Understanding and overcoming the ambivalence of recognising and personally admitting addiction
Stabilisation	Recuperating from the damage caused by addictive use	Regaining the biopsychosocial balance required to maintain abstinence, manage craving, and self-regulate thoughts and feelings
Early Recovery	Internal change which concerns the change of thinking, feeling, and acting related to alcohol and drug use	Developing the skills to identify and manage addictive and irresponsible behaviours that can cause unnecessary pain and problems in recovery
Middle Recovery	External change which concerns repairing the lifestyle damage caused by addictive use and developing a balanced lifestyle	Developing the relationships and lifestyle skills needed to support a meaningful, sober, and responsible way of life

Late Recovery	Growing beyond childhood limitations by recognising its effect on sobriety and changing lifestyle.	Learning to identify and manage core mistaken beliefs about self, others, and the world that interfere with developing and maintaining a sober and responsible way of life
Maintenance	Balanced living and continued growth and development	Learning the skills necessary for recognising and managing trigger events, early relapse warning signs, high-risk situations, craving, and addiction seeking behaviour

In this context, the observation study included 14 sessions at two different campuses of the centre, where each session lasted for an average of two hours, see **Table 15** for more details. The first branch provides residential intensive care where clients are offered 24-hour residential care, detoxification, a personalised treatment plan, group therapy, lectures and specialist therapies. The centre recommends spending 8-13 weeks in this residential branch. The second branch focuses on the support needed for aftercare, i.e. resettlement living skills and support. However, in this chapter, the reported results relate to the first branch. For that, the researcher observed two groups and enquired the specialists about the same observation in the other groups when clarity was needed.

A third group was observed in one session for observing how aftercare sessions work and cross-checking some of the observations made about predicted future behaviour. The clients were expected to attend the first group for a period of 12 weeks. On completion, the same clients started attending the second group, as an optional choice, for a period of five weeks. As such, the same people who moved between two groups were observed.

TABLE 15: OBSERVATIONS OF STUDY ONE (REHAB CENTER)

#	Months	Days
Group #1	July 2016	4 th , 11 th , 18 th , 23 rd , and 25 th
	August 2016	1 st and 22 nd
	September 2016	5 th
	All sessions took place in the same residential rehab centre. They were all from 11:15 till 13:00, except the social event day which was in a public park, and the sessions lasted six hours from 09:00 till 15:00.	

Group #2	September 2016	19 th and 26 th
	October 2016	3 rd , 10 th and 17 th
	All sessions took place in the same residential rehab unit. They were all from 11:15 till 13:00, except the social event day which was in a public park, and the sessions lasted six hours from 09:00 till 15:00.	
Group #3	October 2016	12 th
	One session was attended from 13:45 till 14:45.	

The treatment of the **first group** was based on Marlatt and Gordon's model (1978) for relapse prevention. The model explains the relapse process, which can occur as a result of the immediate determinants (e.g. high-risk situations and outcome expectancies) and covert antecedents (e.g. stress and urges). The setting of the therapy sessions followed a lecturing format with open discussions. The main goal of this group was to explain relapse mechanisms and prevention strategies. Eight sessions of this group were observed. The clients of all these sessions were almost the same, except the fifth session in which four new clients joined. One of them was on her 2nd day of the detoxification treatment. This allowed observing how a new client would behave and how the addiction therapist and senior clients interact with them. Overall, observing the same group of clients helped to observe their progress including performance and individual improvement as well.

The treatment of the **second group**, the therapist utilised The GORSKI-CENAPS Clinical Model (Miller 1983), particularly the Relapse Prevention Therapy (RPT) (Gorski 1986) for relapse prevention planning. The model focuses on relapse prevention through warning sign review, analysis, management and planning. These four phases are the main constructs of the model. The model assumes that if relapse occurs, it argues that the severity and duration can be minimised with preparation (e.g. through warning sign identification). This group followed a workshop format, in which clients were performing a considerable amount of self-evaluation exercises supported by some materials. These materials were used later for further document analysis. Five sessions were observed over a period of a month. The clients of all these sessions were the same as those that attended the first group sessions. The goals and flow of these exercises

will be detailed below. Also, these sessions will be mapped to the stages and processes of the Transtheoretical Model proposed by Prochaska and Velicer (1997). A necessary precondition for the participants to be eligible to be part in one of the session, it is their stage and their completion of the previous ones.

In session **one**, each client had to read a list of relapse warning signs carefully and tick the ones they have experienced. The session supported by a document titled as “Relapse Warning Signs for Chemical Dependency (developed by Terence T. Gorski)”. This document provided a list of relapse warning signs that have been developed to mainly help chemically dependent people to recognise the typical sequence of problems that lead them from a comfortable and stable recovery to chemical use. The list contains 11 phases of relapse detailed in **Table 16** (Gorski 2013b). These phases start from the initial internal changes and end with the full relapse. Each phase contains three to seven warning signs. The main goal of the session is to enhance relapse awareness.

It should be noted that this list needs to be adapted for digital addiction behaviours which would require first identification of the relapse stages, e.g. when withdrawing from social media altogether or when reshaping the online interaction style and profile to minimise peer expectations on responsiveness.

TABLE 16: WARNING SIGNS OF RELAPSE DEVELOPED BY TERENCE T. GORSKI (2013)

Phases	Description	Warning signs
Internal Change	“I look good on the outside, but I start using old addictive ways or thinking and managing feeling that makes me feel bad on the inside.”	Increased stress, change in thinking, change in feeling, change in behaviour.
Denial	“I stop paying attention to or honestly telling others what I am thinking.”	Worrying about myself, denying that I am worried
Avoidance and Defensiveness	“I try to avoid anyone or anything that will force me to be honest about how my thinking, feeling and behaviour have changed. If I am directly	Worrying about other instead of self, defensiveness, compulsive behaviour, impulsive behaviour, tendencies toward loneliness.

	confronted, I get defensive and cannot hear what others are trying to tell me.”	
Crisis Building	“I start having problems in sobriety that I do not understand. Even that I want to solve these problems and work hard at it.”	Tunnel vision, minor depression, loss of constructive planning, plans begin to fail.
Immobilisation	“I feel trapped in an endless stream of unmanageable problems and fell like giving up. I cannot seem to get started or make myself do things that I know I need to do.”	Daydreaming and wishful thinking, feeling that nothing can be solved. Immature wish to be happy.
Confusion and Overreaction	“I have trouble thinking clearly and managing my thoughts. And actions. I am irritated and tend to overreact to small things.”	Difficulty thinking clearly, difficulty in managing feeling and emotions, difficulty in remembering things, periods of confusion, difficulty in managing stress, irritation with friends, Easily Angered.
Depression	“I become so depressed that I cannot do things I normally do. At times, I feel that life is not worth living, and sometimes I think about killing myself or using alcohol or other drugs as a way to end the depression. I am so depressed that I cannot hide it from others.”	Irregular eating habits, lack of desire to take action, difficulty sleeping restfully, loss of daily structure, periods of deep depression.
Behavioural Loss of Control	“I cannot control my thoughts, feelings, and behaviour. I cannot stick to a productive daily schedule. I am still denying how dysfunctional I have become, and I am not willing to admit that I am out of control even though my life is chaotic, and I have serious problems.”	Irregular attendance at AA and treatment meetings, I got I do not care attitude, open rejection to help, dissatisfaction with life, feeling of powerlessness and helplessness.
Recognition of Loss of Control	“My denial breaks, and I suddenly recognise how severe my problems are, how unmanageable life has become, and how little power and control I have to solve any of the problems. This awareness is very painful and frightening. By this time, I have become so isolated that it seems that there is no one to turn to for help.”	The difficulty with physical coordination and accidents, self-pity, thoughts of social use, conscious lying, complete loss of self-confidence.
Option Reduction	“I feel trapped by the pain and inability to manage my life. I start to believe that there are only three ways out-insanity, suicide, or self-medication with alcohol or drugs. I no	Unreasonable resentment, discontinues all treatment and AA, overwhelming loneliness, loss of behavioural control.

	longer believe that anyone or anything can help me.”	
Alcohol and Drug Use	"I return to alcohol and drug use, try to control it, lose control, realise that my addiction is once again destroying my life.”	Attempting controlled use, disappointment, shame, guilt, loss of control, life and health problems.

In session **two**, each client had to list the top 10 warning signs ticked in document one, and then order them based on their relevance to each client individually. For this session, the clients had to use a document titled as “The Initial Warning Sign List”. Next, each client had to pick the top two warning signs. Then, they had to answer “why” to justify their selection. Followed by reading the description of each one of the top two warning sign and underline the most important word and phrase. Finally, they had to personalise the title and the description of those warning signs in words that will be easy for them to remember and relate. This session can be mapped to the Transtheoretical Model processes, i) “consciousness raising”, and ii) “self-reevaluation” (Prochaska 2013). This is to help clients shifting from the pre-contemplation to contemplation stage. While clients are considered to be in the contemplation stage by the time they join the centre, they are still considered in the pre-contemplation, in terms of the need to rethink the behaviours, reactions, contextual cues that may not be seen as problems. As such, this session supports the transition from pre-contemplation to contemplation stage as well as the preparation stage of the Transtheoretical Model.

Session **three** was focused on analysing the two warning signs selected in the previous exercise. This session was supported by a document titled as “Warning Sing Analysis”. It was mainly to guides the client during the analysis. This session can be mapped to the process self-re-evaluation which belongs to the contemplation and preparation stage of the Transtheoretical Model. Next, each client had to fill a form focused on cognitive processes when encountering that warning signs to teach how to analyse the situation and avoid them. In the final step, the clients had to read what they had written to find out the further hidden warning signs.

Session **four** was focused on helping clients to explore which signs they can begin to change when they happen. The main goals of this session were preparation and commitment. Also, the session focuses on conceptualising the perceived ability to gain control over the behaviour when warning signs appear. As such, this session can be mapped to self-efficacy increasing which support the preparation and action stages of the Transtheoretical Model. This session was supported by a document titled as “Critical Warning Sign”. The exercise focuses on helping clients to find out how they might handle the feelings, find out ways of acting to avoid creating more warning signs and to prevent that critical warning sign from happening. At the end, the client should come up with a plan for what skills needed to learn to make that plan successful. The goal of all these activities is to promote ownership. In other words, when they have to describe these signs in their own words, they may feel more loyal to the plan as they are, also, mentally prepared to encounter them.

Session **five** was focused on helping clients to learn how to stop their past warning signs from happening again. Each client had to specify the warning sign to find preventive strategies. Each client needed to list three management strategies. Then select the strategy that most likely to work. This session can be mapped to three processes, i) counter conditioning, ii) management and iii) stimulus control. These processes support three stages of the Transtheoretical Model, i) preparation, ii) action, and iii) maintenance stages.

The **third group** was based on another residential rehab unit. This session has been attended to explore how aftercare groups function. Only one session was attended since the sessions were not for rehab in the sense of treatment, but mainly to help with addressing aftercare goals, e.g. finding jobs and pursuing the study. The specialists advised that this kind of sessions follow the same format and usually encounter the same set of steps and discussions. This would minimise the risks of missing important information by not attending a number of such sessions. unit.

7.4.3 FACE TO FACE OBSERVATIONS PROCEDURES

Group’s members were asked to give their permission for the researcher to observe their interactions. They were informed of the main purpose which is to help understanding how in-

person groups interactions and governance work so that this can inform the design of online peer groups for online addictive behaviour. The researcher has been introduced to the group by the group's facilitator, and all necessary consents were obtained (see **Appendix 4 Part 1**).

The researcher's role in the study protocol was to observe, listen and take notes. However, the researcher was invited by both the rehab team and the group's clients to actively join the group's work. This reflects the researcher effort to build good relationships with people in this environment and gain trust. The researcher avoided taking his computing devices, especially smartphone, to the rehab centre during the period of the study to avoid triggering any concerns, e.g. taking pictures or audio recording. Also, the researcher shared some personal experience with some of his behaviours which can be seen to have a degree of addiction, and the effects of that experience on his life and people around him and, also, the challenges he faced when he tried to recover. These genuine communications helped the researcher to take a more active role in the group and helped to better understand the dynamics within the groups, the clients' needs, and their perspectives. Most importantly, his presence was welcomed by the group members and did not seem to affect the way they would communicate and behave without his presence. This assumption also confirmed by the expert facilitator.

Over the period of the study, the researcher accompanied the addiction therapist closely including the times of documenting the interactions that occurred and the planning of next stage. All research activities were carried out on the same group. This group was given the right to accept or reject recording their interactions. However, the rehab decided that no audio recording should be made during the sessions to ensure clients' privacy and comfort. As such, all notes and observations were written down during the sessions. Then, on the same day, the researcher transformed all collected and anonymised data into digital format. This also helped a better elaboration and adding some context data to the actual observations. A sample of the observation notes (**Appendix 4 Part 3**). For ethical reasons and to ensure a smooth end of his participation, the researcher avoided sudden pull out from the group and the rehab centre, especially after spending relatively long time with the clients and sharing personal views and experiences. The

researcher informed the group of his intention to leave in advance and offered to stay in touch should they require some information about his study in the future. Therefore, there was less risk of developing negative feeling due to stopping the attendance to the group sessions, e.g. the potential feeling of being utilised. The group members were also offered to be briefed about the results of the study.

7.4.4 THERAPISTS INTERVIEWS

The observation study results were contextualised, confirmed, elaborated, and, then, refined based on a set of interviews with the rehab centre specialists. The aim was to articulate common practices with a particular focus on the group activities, communications, and individuals' attitudes of clients.

After each group session, the research had a meeting with the therapist to elaborate on the collected observations, processes, and interactions between the therapist and the clients. This is in addition to the spontaneous quick conversations and clarification which the researcher had with the therapist during the sessions. All these research activities occurred in the rehab centre, except one session which was in a public park to observe clients during a recreational activity. On completion of the observational activities and ongoing interviews, a semi-structured interview with the addiction therapist took place.

7.4.4.1 INTERVIEW DESIGN

A semi-structured interview approach was adopted. This was to enable asking clarification questions on the observations made and add more questions based on the flow of the conversation. This was to help in getting more insights. The interview was guided by a series of questions derived from the fieldwork and covering aspects related to rules of the practices, governance, interactions, assessments and general questions related to the rehab environment. A sample of the interview questions (**Appendix 4 Part 4**).

7.4.5 DOCUMENT ANALYSIS

As part of the study methodology, the researcher analysed a set of documents as a complementary approach to help a more holistic view. Most of these documents were used in the second group mentioned in **Table 15**. These documents are:

- **The Initial Warning Sign List:** This document provides a comprehensive list of common warning signs which clients read through to identify the top 10 that apply to them the most. Then read the descriptions of each one and underlining the most important words. Finally, personalise each of those signs, i.e. write a personal title for each one.
- **Warning Sign Analysis:** This document guides clients during the analysis of the selected warning signs. The goal is to teach how to find out the internal reactions (thinking, feeling, urges and different actions when experiencing that specific warning signs) as well as what triggers them.
- **Critical Warning Sign:** Each client describes how this warning sign happens in the past and what was the thoughts and feelings when it happened. Also, what the client wants to do when it happens, what precautionary measures were not helpful, and what clients thought they should do to help when that warning sign take place.
- **Warning Sign Management:** The purpose of this document is to help clients to learn how to avoid and stop warning signs. Each client tries to image handling the critical signs identified using the previous document using old strategies and then with using the new healthy ways find healthy strategies for.
- **Warning Sign Planning:** The purpose of this document is to help clients learning how to create a plan that helps to stop identified warning signs. This includes how to manage related thoughts, feelings, urges, actions, and the enabling relationships. The latter focus on finding ways to invite people to provide help.

The purpose was to increase the researcher knowledge about the rehab practice. For example, how clients were asked to record their diaries and on what basis and how that was used to shape the client's treatment programmes.

7.4.6 DATA ANALYSIS

The data collected were textually analysed using qualitative content analysis technique, i.e. the priori coding technique. The contextual dimension, which focuses on the “*structural descriptions to various properties of the social, political or cultural context*” (Lupton 1992), was also considered in the analysis. Analysing the data textually and contextually is also known as discourse analysis (Lupton 1992). The focus was to understand the main processes and activities of online peer groups as an approach to overcome addictive behaviours and the motivation of each process and what considerations should be taken into account. The ultimate goal of the research was to get design principles for online platforms that host the processes and communication and governance styles of peer groups for addictive behaviours. Digital Addiction was an ideal domain for such platforms as both the behaviour and the behaviour change through online peer groups are in the cyberspace providing more traceability and transparency and real-time interactive nature.

7.4.7 RESULTS

This chapter will focus on the essential aspects related to peer groups as a modality for behavioural change in the domain of addiction. This includes interaction styles, group evolution and stages, membership management, governance aspects as well as tasks and activities performed within these groups and roles existing in such a social structure. This section will report the results derived from the study one and two. This includes the observation field notes, documents and form analysis, the interviews data, and the observation notes from the observations on the online.

The results are grouped into two main parts. The first part concerns the basic activities which were primary to all observed peer group sessions. The second part concerns the tasks, activities, and roles existing within the social structure of the rehab support groups, followed by

considerations for the online systems. Finally, the insights and observations collected from these two parts are utilised as a guide on how to setup and manage peer groups.

Peer groups method is a treatment modality that is applied to speed up the recovery process. From an engineering point of view, it is important to understand the underlining processes of this modality, its practices and requirements, and possible implications of alternative implementations. This is to provide a systematic engineering process to help to build software-assisted peer groups. The following sections present the findings related to the basic tasks and activities performed in this environment, the different roles can be played, and their implication on the proposed method for persuasive social software.

7.4.7.1 ASSESSMENT

In the assessment stage and before permitting patients into the peer group therapy and beside the close scrutiny in relation to assessing the problematic behaviour, patients are evaluated thoroughly against certain motivational conditions including the 1) desire to change, 2) readiness for that, 3) the stage of recovery and 4) the level of dependence. In substance addiction, part of these assessments is performed by a qualified medical doctor. Generally, patients should be joining peer groups on a voluntary basis to maximize the chance of their recovery and also to avoid disrupting others and creating negative group experience.

The assessment also covers the aspects that may influence the treatment programme, e.g. cross-addictions. For instance, a person with smartphone and social network obsessive usage could be replacing, or even having at the same time, other kinds of addictive experiences, such as problem gambling or compulsive online shopping.

In health behaviour change, it is a fundamental prerequisite that individuals are admitting their problematic behaviour and willing to receive help. Yet, there is criticism towards emphasising self-labelling of being addicted as a requirement for treatment, i.e. the absence of this condition should not be seen as an obstacle to optimal treatment (Miller 1983). However, it seems that in rehab programmes, counsellors utilise certain principles as an assessment of motivation. In the rehab centre, the addiction counsellor stated that “*the only way to help addicts*

is to convince them somehow to seek help. Unless they seek help, no one can help them at all".

This suggests that admitting the responsibility for the behaviour, both the problematic and the desired, is a key motivational principle. There is also what is called *dispositional attribution* in which a patient relates the responsibility to individual factors rather than external factors. Attributing the behaviour to external factors is perceived as a defensive mechanism in health behaviour change practices (Gorski 1999).

Miller (1983) lists four key motivational principles in the Motivational Interviewing approach: 1) "*individual responsibility*" to seek help, 2) placing the responsibility on "*internal attribution*", 3) recognising discrepancy between addictive behaviour and personal values, goals and beliefs, i.e. "*cognitive dissonance*", and 4) "*increase self-esteem*" via enhancing attributes that increase confidence in own abilities. These key principles are the main areas that counsellors work on to influence a behaviour in the Motivational Interviewing approach. Two important motivational indicators can be elicited from the observational study and Miller's principles.

- Individual responsibility to seek help.
- The individual perception that the change is not beyond personal control.

However, expecting individuals to easily accept the secondary nature of the external factors and the primary nature of personal attributes is often not realistic. The assessment of this level of admittance is essential. In addition, the education through the treatment programme should play an important role to help users minimising the belief on the role of external factors may increase the probability of having long-lasting change (Miller 1983).

In the case of online platforms for peer groups, it seems that a stage which deals with diagnosing the two motivational indicators shall be introduced and iteratively repeated. This is to avoid negative behavioural change which may require moving backwards into the stabilization stage where a user needs to be re-assessed to avoid emergent withdrawal symptoms.

The rehab centre used to apply assessment activities iteratively for the purposes of educating patients. This was through the use of self-governed instruments such as the Assessment of

Warning signs for Relapse (AWARE) scale (Miller and Harris 2000) which was designed to predict the occurrence of relapse (CASAA 2000). The AWARE scale can be found in (**Appendix 6 part 1**). This family of assessments aims at educating individuals through guiding them to explore past experiences, i.e. warning signs and internal reactions to them, and develop self-management strategies for them. For example, when a group member selects a warning sign like “Confusion and overreaction: difficulty in managing feeling and emotions”, then with the aid of the given materials, the member can find out their more refined and subtle signs and emotions such as: (1) “*I feel that nobody would care if I tried to explain what made me unhappy*”, (2) “*I feel scared to socialise*” (3) “*I isolate myself*” (4) “*I start bringing irrelevant problem to hide the main issue which was in that case, why nobody cares?*”. As such, this assessment exercise teaches members to identify the profound and preliminary signs before the main one takes place. The goal is to help patients to avoid relapse before it takes place. This indicates that self-help and confession are important design principles for the online platforms, where patients themselves should contemplate and state the signs. This active role of patients shall have a positive impact on their ownership of their recovery process and goals.

Interestingly, in response to the question of how to distinguish whether a client is just clean or completely recovered, addiction counsellor stated that “*experts never know but just judge that through behavioural patterns*”. Here, what it seems more important is having a growing amount of evidence that users have begun to develop and apply relapse prevention plans and strategies, and learn effective coping skills. This would help when addictive behaviours take place outside the system environment which makes monitorability more complex. In DA, this may be the evidence stage where the recovered people may take pictures of social activities and share them with the rest of the group and set up timeframes and usage targets, e.g. in terms of time, location, type and frequency, and adhere to them in a sustainable style.

It can be concluded that the assessment can be performed as a mixture of self-diagnosis, confession and help-seeking from the patient side and offering tools to facilitate that. The items listed in the AWARE scale proposed by Miller and Harris (2000) can help the relapse prediction

on online medium, e.g. having trouble in sleeping, self-pitying conversations, overreaction (e.g. through the use of Emoticons) and impulsivity, being always focused and engaged in one activity, and having no clear plans or targets.

7.4.7.2 MATCHING

In the treatment centre, patients with different addiction themes, e.g. gambling and substance addiction, were offered close principles and treatments. That was under the assumption that addictive behaviours share common variables in terms of initiation and maintenance as well as symptoms. However, there were parts of the programme which offered to target specific symptoms and behaviours. For example, anger and depression would need further therapeutic treatments, such as emotional support, anger management, changing thinking styles or even teaching some social skills. Such extra treatments can be offered in one-to-one counselling settings following Motivational Interviewing approach. This suggests that different behavioural themes may require different treatment approaches.

Procedures for permitting patients into a group seems to ensure having a *similar need(s)* among all members as an essential element for better group performance (Toseland and Rivas 2005). However, homogeneous groups can still provide further persuasion effects. *Homogeneity* refers to the demographic variables, e.g. gender, age, the ethnic group can help to increase receptivity to change and perhaps minimising denial. An important aspect of matching is the eventual move of users amongst different groups as they progress in the treatment, including the alternation of the participation in more than one group based on users' needs.

In the case of *relapsing*, a patient must be assigned to another group. In the rehab centre, the policy stresses the need for this procedure to ensure that other patients understand that relapsing is intolerable to avoid negative reinforcement for them. Overall, patients shall understand the importance of continuing working in their original groups as this typically provides them with more comfort and emotional support. As such, moving a relapsed member to another group can be perceived as an undesirable consequence.

To sum up, matching users to a group in the online medium may consider shared characteristics such as addiction theme, similar life experience, shared needs, demographic data, and treatment stage. This is to maximize the engagement and common interest in the group and also avoid heterogeneity effects such as misunderstanding and conflicts especially resolution strategies are limited in online platforms. Hence, members can easily leave if they feel discomfort or pressure.

7.4.7.3 PREPARATION

The rehabilitation centre divides treatments into *primary* and *secondary* classes. Primary treatment is for patients who are most vulnerable and where extra safety measures need to be applied. In the secondary treatment, patients are offered psychological counselling and complementary coping skills. This may include addressing different obstacles, e.g. lack of important social skills needed in group settings.

In the case of DA, this may be manifested through obstacles that may lower performance, such as lacking the experience of using certain features in online communication in the right style and failing to use a mutually accepted language when communicating with peers. The case of DA could also relate to avoidance through having peers who are living an online persona different from their actual self just to feel being accepted in some community. The primary and secondary treatments could also be offered based on the severity of the problematic behaviours. For example, stricter measures (e.g. consent monitoring for members' social network accounts as a part of the primary treatment protocol) are applied at the initial stages of the treatment.

Preparation is mainly concerned with preparing patients to join a group or to increase the performance after assigning them to groups. As explained in the matching stage **section (7.4.7.2)**, this may include additional treatments such as anger management and impulse control. This is mainly for paving the way for the underlying issues to be known and then addressed and rectified when possible. Detoxification, for example, can be seen as a part of the preparation as by the end of it, addicts can pinpoint more fundamental reasons for their addictive experience.

It is important to provide descriptions of these processes from peer groups perspective. In the preparation stage, a fundamental part is to provide and apply briefing procedures in which patients are formally informed about the rehab routines, rules and guidelines for the treatment. Also, at this stage, prescribed detox plans are designed. It was observed that patients in detox were joining group sessions. Generally, detoxification is not part of the group therapy, but it can be integrated to it based on the policy of counselling service providing the treatment as well as based on the level of dependency and withdrawal symptoms of a patient. This is in line with the fact that group therapy is a reinforcement and supportive tool rather than being itself a primary treatment. In other words, the patient who is in the detoxification phase can join the group therapy if that is not going to introduce the risks of sabotaging the group work and even environment.

Generally, mixing senior peers with new members who might be in the detoxification stage can provide good behavioural change opportunities for both. New members can benefit from being with their senior peers who passed the detoxification stage (i.e. hope installation). It can also introduce them to the norms and good practices in the forthcoming stages of their treatment. However, in terms of designing online platforms for peer groups, this may suggest allowing controlled interactions for such users, e.g. giving them read-only permission in the group. Senior peers can also benefit from such setting as helping others can reduce and resolve behavioural ambivalence (Petri and Govern, 2012).

7.4.7.4 ONGOING-ASSESSMENT

The treatment provided in the observed groups followed a nonlinear approach and was a subject to ongoing evaluation to address next treatment requirements and corrective measures. Ongoing assessments seem to look at both distal and proximal goals.

Distal goals are more focused on the long-term progress mainly toward a balanced lifestyle. As addiction is about losing balance in daily life, the degree of recovery can be assessed based on the level of gaining that balance which is a main indicative measure. In recovery performance assessment, it seems it is more appropriate to consider this aspect as a distal goal since reaching to balanced daily life is an advanced stage of recovery.

Proximal goals are also part of the recurrent assessment. Patients in the rehab centre decide their own specific, measurable, agreed upon, realistic and time-based (SMART) goals on a weekly basis. The selected goals can be simple ones, such as going to the gym or reading a book. An important aspect of goals selection is that goals should encourage the performance of the healthy and balanced lifestyle tasks addicts used to neglect or avoid. There are two main purposes of setting proximal goals. The first is to *“teach members that they need to have the right goals, learn how to decide them and to be achievable in a week”*. The second is *“to enhance their self-esteem [through the accumulation of success]”*. The activity of goals selection is done collectively where each group member can have only one goal. Typically, a therapist guides this process to ensure selecting the right goals. However, in the case of peer-led groups, i.e. where no therapist is involved, the group should help a member in selecting a goal *“because the group may know better than what an individual addict knows as the addict will be stuck in his/her own behaviours”*. There is a risk here of some members being stigmatised after repetitive failure or indeed accepting being little efficient if the process of the group is not observed.

7.4.7.5 MEMBERSHIP DURATION

The patients of the centre are recommended to stay in the treatment for three to six months. This indicates that behaviours of people with severe cases may need an extended period to be influenced, i.e. moving from awareness stage to adopt new healthy behaviours and maintaining them. This should inform assessment processes and to and feedback messages to avoid any deceptive labels related to the progress of the treatment.

The counsellor highlighted an important consideration in which behavioural change applications are not expected to maintain positive change in severe addiction cases without helping patients to participate in the wider community beyond the peer group, for example, through employment opportunities to sustain positive outcomes. Therefore, such part should be addressed in aftercare treatment where proper group sessions are less essential compared to semi-formal sessions to help patients finding and defining a focus as a purpose in their life to maintain recovery. This may suggest extending the membership to the aftercare stage, where joining group

sessions is less important, but monitoring may still be needed. This also suggests that online platforms for peer groups shall be seen a temporary platform and a part of a more holistic socio-technical process involving other stakeholders, e.g. schools for children with compulsive gaming experiences to integrate them again in class activities and after-school clubs.

7.4.7.6 MODERATION

In peer groups, some forms of interactions should be highly controlled. Private communications are generally discouraged during the primary treatment. The treatment centre strives to prevent patients from staying alone without having one of the staff around during the formal sessions and even after that. In addition, intimacy and deep relation are also discouraged to avoid distraction from the main goal and creating a parallel experience. Patients in the residential rehab are *“expected to meet in the café and other public areas and not allowed to go to each other rooms”*. In conclusion, the relation between members has to be moderated to prevent both isolation and deep intimacy and keep the focus on the treatment and behaviour change. On the other hand, during the secondary treatment, members are encouraged to attend self-help groups and make friendship relations to help support them after treatment.

Moderation shall also be concerned about the possibility of relapse. The counsellor explained that one of the warning signs of relapse is “avoidance and defensiveness” (**Table 16**) in which an addict feels worried about others instead of self. That was also found in the materials used in the exercises performed in the observation study conducted in the residential rehab centre. Regardless whether avoidance is intentional or not, it is still seen as a risk factor and should be avoided and addressed by moderators.

Also, socialisation with people who are not part of the treatment may not be advised in the initial stage of the treatment again for the same purpose of helping members to gain more focus on the recovery goals and treatment journey. The counsellor pointed out that this rule is mainly in primary treatment to ensure the safety of the patients as they are under the centre responsibility. The counsellor also highlighted that such policy is often applied by centres whose treatment programmes are based on the 12th steps programme of Alcoholic Anonymous (AA). The AA is

a programme that provides a set of addiction recovery principles which includes admitting being powerless over addiction, examining past errors, and personal inventory of defects and successes (Alcoholics Anonymous 1939). This shows that residential treatment centres require a high level of moderation which may be difficult to replicate on the online medium. This is another reason for limiting the applicability of our proposed method to the cases where people suffer moderate problematic online usage and in a status where they already admit the issue and voluntarily seek for help.

The observations also suggest that enabling peers to judge and confront each other during groups interaction can create a healthy environment. Yet, this needs the moderators' skills to use these situations to energise group work rather than being primarily about the subject of the argument. As a cost of this openness, the moderator shall enforce a rule that no one crosses the boundaries and hurts peers' feelings. In face to face interactions, the role of the moderator is very important to govern the interaction and elevate any negative interactions that may occur. The interviewed counsellor pointed out that addicts may pay limited attention to the boundaries and norms typically observed by their society. Therefore, part of the treatment is helping them recognize boundaries mainly from the perspective of respects others.

7.4.7.7 GROUP DEVELOPMENT AND INTERACTION

Based on the observational study in the rehab centre, it was found that Tuckman's model (1977) shown in **chapter 2 – Figure 5** was applied. To help new clients reaching performing stage in a shorter period, they were introduced to the groups already at that stage. While this strategy seems to require a high level of moderation, it helps to maintain established norms where new clients can start “performing” after a couple of days.

It was also observed that group work follows a specific pattern of engagement. This pattern is illustrated in **Figure 27**. This suggests that online peer groups would have a unique attribute different from normal social networking medium, e.g. Facebook. Unlike online peer groups, Facebook, for example, is designed to encourage an increased participation and networking activities. On the other hand, social networking in online peer groups is deliberately reduced to

start focusing more on the self, then proceeds to the discharging stage. This participation patterned suggest the need to introduce the concept of ethical discharge to the design processes of online peer groups. Ethical discharge refers to the best practice to disconnect the user from the system without causing negative emotions due to the possible attachment to the treatment environment.

The researcher did not observe interactions that indicate any social hierarchy, i.e. status and power, within the group peers. The counsellor commented, "*I am glad you did not notice that*". It seems that it is the moderators' role to prevent any emergence social hierarchy. The social hierarchy may emerge when a group includes new and senior peers. Senior peers refer to those who spent a longer period in the group. The social hierarchy may, also, naturally emerge from interactions such as in the case of dominant peers.

Such social properties should not provide peers with any privileged position or status my naturally earned. In other words, the informal social position which implicitly emerged from the nature of group development should not influence social interactions. This suggests that equity is a fundamental concept among members and should be reflected on different design facets of this social system. In fact, if this is considered as a simple form of hierarchy, senior peers will be expected to hold more responsibility as they are considered role models. For example, as the counsellor commented: "*sleeping during the session [for a senior member] will not be tolerated like someone who just started the treatment*". Also, commented that "*they [those who have been in treatment for six to eight weeks] would be more challenged compared to someone who is just coming to the door*".

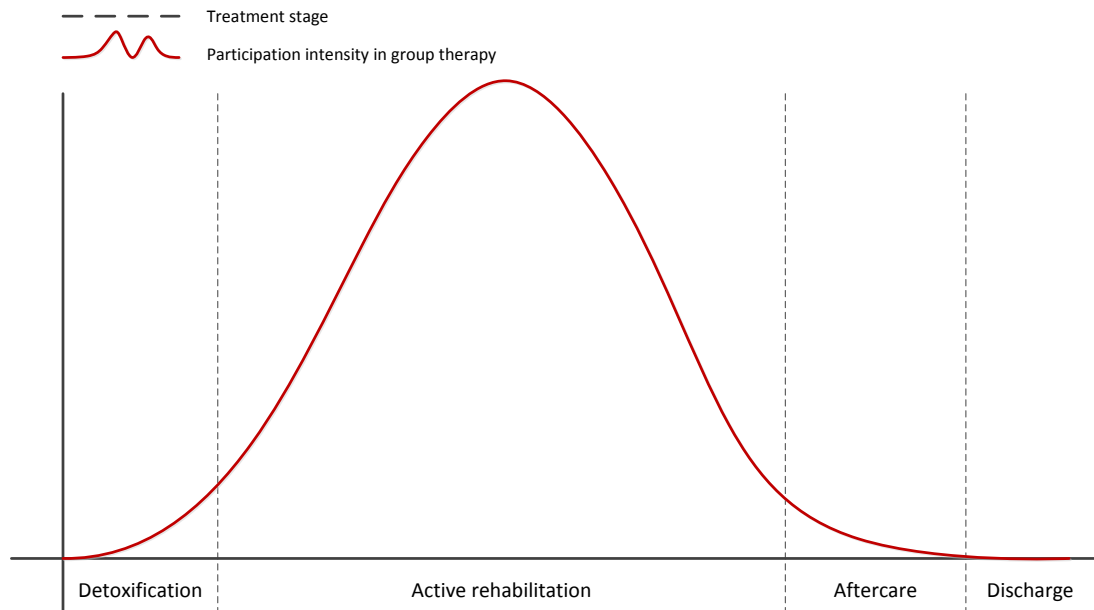


FIGURE 27: INDIVIDUAL PARTICIPATION IN GROUP WORK OVER TIME

Clients are normally happy to play the role of helper, but they tend to stay reserved and avoid opening up when the group is not closed. The addiction counsellor was asked whether clients would welcome opening the group so that non-members can join to observe and learn from peer interactions. The answer was yes, but providing that members of the group can play the role of helper. Yet they will have the tendency to take themselves away from being the centre of observation by avoiding the pattern of interactions associated with self-disclosure. This observation suggests the need to identify and perhaps eliminate the features that could minimise important interaction patterns such as self- disclosure.

Figure 28 is proposed to provide an overall picture of group therapy in terms of the group development and the change in the interaction scope over time. This model highlights five main stages constitutes the rehabilitation path. These are:

- The pre-contemplation stage: users are in the active addiction with the lack of perceived need or intention to change.

- Stabilisation stage: users are supported to “*regaining the biopsychosocial balance required to maintain abstinence*” (Gorski 2009, 2013a), and obtaining healthy coping skills to manage thoughts and feelings.
- Active rehab stage: users are supported to understand and recognised addiction symptoms, promote and build a balanced lifestyle, learning management strategies and how to create a plan and maintain it.
- Aftercare stage: users are provided with additional support to build self-esteem and stay motivated while facing real life challenges. It also involves follow-up meetings and perhaps taking an active role in support groups to help others. The main goal is to stay focused on the recovery.
- Discharge stage: in this stage, the discharge plan is created which is focused on addressing urgent practical problems and attending regular education meetings to maintain the recovery.

During the rehabilitation, users pass four transition points as shown in **Figure 28**. Also, the focus of the treatment changes as users proceed through these points. In terms of the focus, users remain engaged with group facilitated activities once joining the group and continues even the aftercare stage by taking a couple of follow-up group sessions. However, users’ participation in group work is expected to decrease over time. So, they can focus on the self as they proceed to the discharge stage. In the active rehab stage, after passing more than half of the treatment programme, it enters the mixed phase. In this phase, users are actively engaged with group work and are also offered opportunities to do a variety of self-care and self-assessment tasks which increases over time.

Figure 28 is meant to provide designers of online peer group platforms with a high-level guide to how the system should operate and what features and functionalities need to consider for different stages (e.g. what persuasive techniques would be more effective to move users through these transition points and what different techniques each one of them would require).

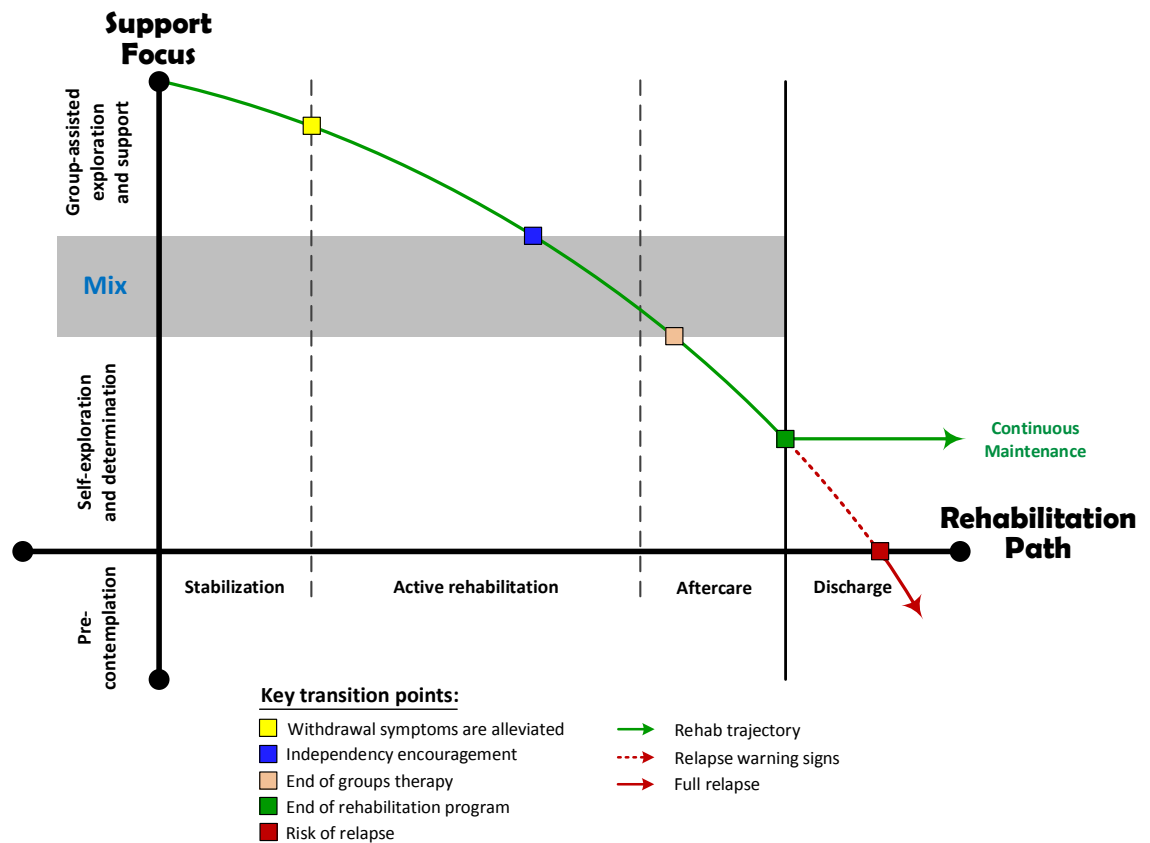


FIGURE 28: GROUP EVOLVEMENT OVER TIME

7.4.7.8 TASKS CONSIDERATIONS (SOCIAL OBJECTS)

This section presents the findings that relate to the tasks and activities performed in this environment and their implication on the proposed framework for persuasive social software.

The analysis of the data collected through the observation study indicated three dimensions of tasks performed in the rehab centre. First is the immediate motivators of the assigned task or activity, e.g. ice breaking, hope installation, and norms maintenance. Second is the interaction orientation that mediates planned purposes, i.e. the mode of delivery, e.g. discussion, confrontation, competition, and collaboration. The third is the functional activities that support achieving planned purpose(s), i.e. the method of delivery, e.g. problem solving, diaries, and groups versus individuals' competition. More details will be presented in **chapter 8 – section (8.2.2)**.

Over the period of the observation study, it was noticed that all sessions start with *check-in* activity. In this activity, each client was given a chance to describe the current emotional state.

The addiction counsellor pointed out that this is "*to ensure that clients focus on [addressing negative emotions] where they currently are and what they intend to do*". The counsellor, also, explained that "*addiction, in a way, is running from painful emotions*". By performing this activity, clients are taught to recognise their actual emotional state and given a chance to voice it. Throughout the observation study, addicts seemed, normally, willing to talk about what makes them happy but hide and avoid talking about their negative emotions, e.g. sadness, shyness, being upset and worried because they do not know how to express that. Being able to express that is a way of coping. As such, regular practising of this simple activity will address this side of addicts' personality. Based on this, the motivators of this task which are emotion expression and enhancement of coping skills can be identified. Also, while some purposes are decided based on the group or individual needs, some tasks such as "check-in" is compulsory.

As the peer groups in the rehab centre were based on the 12th steps programme of Alcoholic Anonymous (AA), group's interactions also revolve around those 12 principles. For example, the rehab centre was applying the step 4 of the Gorski's model (1986) for relapse prevention planning. In this step, clients are required to write a list of their personal warning signs that could lead to a relapse. This can be mapped to the step 12 of the AA which reads: "Continue to take personal inventory and when we were wrong promptly admitted it". Both the 12th steps programme of the AA and Gorski's model are mainly focussed on relapse prevention.

In the rehab centre, the last 30 days of the treatment were focused on step four of Gorski's model (1986). After that, clients are gradually moved to the aftercare treatment by attending more and more sessions in the aftercare groups. The clients of these groups were almost the same which seems an important aspect to maintaining group cohesion in the aftercare sessions.

It is worth mentioning that steps 11th and 12th of the AA are focused on spiritual practices that can be performed outside the rehab centre. What is mentioned above suggests the need to consider the steps from 1 to 10 when designing the tasks of peer groups activities as well as paying attention to the sequential order of these steps. This will ensure a logical evolution of group envelopment. For example, asking clients in the early stages of the treatment to write personal

inventory will not yield any improvement as clients are still in their biased perception. Another example is the step 1 of the Alcoholic Anonymous which read: “we admitted we were powerless over alcohol - that our lives had become unmanageable”. Each client performs this step individually with the counsellor through writing examples of bad personal behaviours. In a way, this seems to be one of the most crucial preconditions to be admitted into the treatment programme. This suggests that the 12th steps of the AA are staged-based.

Overall, online peer group should support these activities to assist in the ultimate goal of group therapy which is to overcome denial and resistance to change.

7.4.7.9 ROLES CONSIDERATIONS

The observation study also revealed different types of roles that can exist within small groups for behavioural change. Bastes (1956) defined the term *role* as a part of social status within a social structure. A social structure consists of distinguishable behavioural expectations, i.e. norms. Here, the researcher refers to the roles that define the self (Callero 1994) and are associated with a set of expectations, such as in acted roles, e.g. group ‘*facilitator*’. However, Callero (1994) pointed out some roles are not formal and hard to be fully understood with regard to expectations only, such as the roles that can evoke complex feelings and can be unconsciously played. Some of these roles are subject to behavioural impulses and arise during the course of interaction, such as most of the roles addicts may play, e.g. ‘*relapsed*’.

Hare (1994) proposed a set of guidelines to classify roles within small groups. These guidelines suggest that roles should be either *functional*, *communication-based*, *emotional* or *dramaturgical*. For the case of online peer groups, the researcher instantiated these categories for changing addictive behaviours, e.g. introducing gatekeeper and facilitator as functional roles. Furthermore, this research introduces *stage-related roles* as a new family of roles related to the stages of treatment, e.g. senior and relapsed. This list of roles, which were derived from the observation notes, seems to be an important aspect in the design of online peer groups as it will be explained below. **Table 17** presents examples of these roles, while the full and validated list can be found in **chapter 8 – Table 23**.

TABLE 17: ROLES TO BE SUPPORTED WITHIN ONLINE PEER GROUPS

Functional Roles: they refer to roles involving status, control and access to resources	
Facilitator	Assigned person who is expected lead, guide and provide knowledge
Peer	A person who shares similar behavioural issues and experience
Stage-related Roles: they refer to roles associated with stage of treatment	
Recovered	A peer who can be described as recovered based on the current behaviours (e.g. having balanced lifestyle)
Senior	A peer who has spent longer time in the treatment programme adopted healthier behaviours and already started practising them
Communication Roles: they refer to roles associated with interaction process	
Scapegoating	A peer who is deliberately excluded on the group basis and usually blamed when things go wrong
Dominant	A peer who attain high degree of influence in a group and wants to have the control
Emotional Roles: they refer to roles representing emotional themes	
Victim	A peer who believes that he is always treated unfairly or taken advantage of and consequently isolate him/herself
Fixer	A peer who prevent other peers from expressing their emotions by saying words such as "do not worry, you will be alright."

Each one of these roles can have a different influence on group work. For example, the ‘*dominant*’ peer, who is often self-assured and self-confident, normally attains a high degree of influence in a group and could consistently challenge the group’s moderator. These roles can be shareable, i.e. they are not tied to a particular member of the group. In some scenarios, this could heavily impact a group. For example, a recently ‘*relapsed*’ user may also be a ‘*dominant*’ which can be a very risky case, especially in peer-led groups. This indicates the importance of analysing combined roles and the overall its influence. Combined roles refer to an addict how might play two or more roles at the same time. In addition, group members may unite to play a role, e.g. two

starters who resist the group norm may support each other in disrupting the regular flow of the group.

Some role-related problems should be addressed in the re-evaluation processes to evaluate not only the suitability to a particular group but to the group therapy approach in general such as the *'isolates'* role. During the observation period, caregivers were always stressing the fact that *"personal isolation is a strong aspect of addiction"*. As such, refusing the interaction with peers violates the basic principles of peer groups as an initial effort to community re-integration. The *'crises'* role may be fulfilled by those who have a life crisis, and their negative interactions are beyond their control. In this case, group therapy may not suit them as they normally require more support and emotional attention than a group may provide. As such, some preparation would be required before joining a group. The *'rejected'*, *'scapegoating'* and *'isolates'* roles should be subject to group re-matching. Those who play this role are prone to extreme discomfort and painful experience which could cause more damage to users.

The *'leader'* role is played by all senior clients to integrate leadership skills into their personal experience. This role enables clients to practice reasoning, judging, facilitating skills. Each senior client is assigned to this role for the maximum of two weeks. For each group, the addiction counsellor assigns two senior clients to play this role at the same time. This is to enable extra basic skills to be practised such as listening, respecting, negotiation and collaboration. This role is an example where two roles or even more can be played at the same time without having conflicting characteristics. For example, the counsellor commented that the assigned leaders *"have to be role models, supporting other peers and they have to make sure that the house rules and expectations are adhered"*, i.e. leader, helper and role model. In general, the *'leader'* role seems to be entirely supporting the one playing it while in reality it could be also inspiring to those just started.

Generally, these roles can help or hinder group performance. Some roles may convey positive meaning to group work, e.g. *'helper'* and *'sociable'*, while others the opposite, e.g. *'dominant'* and *'scapegoating'*. However, all these roles maybe, eventually, needed for

practitioners to create more effective group functioning. **Table 18** lists examples of potential risks may result from combined roles or contradictory design attributes.

TABLE 18: POTENTIAL SITUATIONS OF NEGATIVE ROLES EFFECTS

Role	Contradictory Role/design aspect	Potential effect
Helper	Fresher/in-Detox (Role)	Helper Avoidance of self
Disrupting	Interaction features	Risk of misuse
Competing	Collaboration tasks	Disrupting work environment
Isolate/Crises	Peer group approach	Strategic Hopelessness
Disrupting/Dominant	Relapsed (Role)	Disrupting group environment
Attention seeker/Crisis	Emotional expression	Negative emotion aggravation
Fresher/in-Detox/Relapsed	Competition tasks	Lowering self-esteem
Rejected/Scapegoating/Isolates	Lack of re-matching	Lowering self-esteem

7.5 STUDY TWO: ONLINE PEER GROUPS

In this study, the researcher performed another observational study on an online peer group facilitated by an expert therapist to deal with problematic gambling behaviour. The aim of this study was to explore the practices in handling addiction in the online space. Gambling addiction is a behavioural addiction as well which part of the generic theme of digital addiction. The scope of this second study differs from the previous one. This study is focused on the general practices and communication styles and facilities, both those done by the therapist and those which can be facilitated through the online platform, rather than the group evolution over time. The study was conducted over the period of two-months to enable capturing practices.

7.5.1 SELECTING A WEBSITE AND ONLINE GROUPS OF INTEREST

The study was conducted on an online forum for a gambling addiction treatment charity that provides emotional support and practical advice on gambling to people affected by problem gambling throughout the world. The therapy provides text-based live support forum and

consultations in addition to the wide verity of online support groups. These support groups run at various times of the day and facilitated by trained members of the therapy.

Users can participate online, and their identity is kept anonymous if they choose to. They do not have strong commitment to attend sessions. It is, also, hard to verify the truthfulness of what they say about the degree and stage of addiction and also whether they adhere to the protocol advised to them. These characteristics fit very well the DA and its online peer groups.

This system was designed to host 11 types of groups. These groups focus on two types of users: 1) those with problem gambling issues and 2) those who live with someone with problem gambling. As this thesis focuses on the first type of users, five groups were eliminated from the study. As such, seven groups were observed as outlined in **Table 19**. All this information was already presented to users before they join. The access time shown in the table below refers to the time where users are permitted to join. Anytime means that users can join at random times throughout the period of the session. First 15 minutes means that the system will not allow users to join if more that 15 minutes passed, except those who joined during the first 15 minutes then have to leave for any reason then re-join.

TABLE 19: TYPES OF GROUPS OBSERVED IN THE ONLINE THERAPY SYSTEM

Type	Run by	Access time
New Members	A Facilitator	anytime
Drop in	A Facilitator	anytime
Problem Gamblers Peer Support	A recovered problem gambler	anytime
Problem Gamblers Therapy Group	Counsellors	First 15 minutes
Community Therapy Group	Counsellor	First 15 minutes
Topic Groups	Facilitator	First 15 minutes
Open Group	Peers	anytime

7.5.2 ONLINE GROUP SESSIONS

The observed online sessions had a minimum of three participants and a maximum of 12. Gender and age information were not identifiable due to the level of privacy and anonymity in the system.

The researcher observed seven sessions as shown in **Table 20**.

TABLE 20: OBSERVATIONS OF STUDY TWO (ONLINE REHAB SYSTEM)

#	Type	Day	Time
1	Drop in	Wednesday	20:00 – 21:00
2	Problem Gamblers Therapy Group	Wednesday	21:00 – 21:50
3	Problem Gamblers Peer Support	Friday	18:00 – 19:00
4	Topic Groups	Friday	19:00 – 20:00
5	Open Group	Saturday	22:00 – 23:00
6	New Members	Monday	21:00 – 22:00
7	Community Therapy Group	Tuesday	19:00 – 20:00

7.5.3 ONLINE OBSERVATION PROCEDURES

The study followed non-participant observation to avoid any potential effect on the users' interactions and to avoid disrupting group work. The members of the group were informed that the researcher is joining with the aim of observing the conversations and findings ways to enhance peer groups for addictive and problematic behaviour (**Appendix 4 Part 2**). As such, the researcher's role in the study was to observe and listen only. The terms and conditions of the forum stated that the service provided is free and public to everyone. Also, all information disclosed in the forum is public information. Disclosing the identity of the participants was left to the participants themselves. Participants used nicknames rather than actual names. The researcher did not engage in interactions with users in order to adhere to the forum policies and not to affect how an interaction would happen in natural settings.

7.5.4 DATA ANALYSIS

This study followed the same analysis strategy of study one conducted in the rehab centre. However, the analysis used the priori coding technique to utilise the knowledge generated from the study conducted in the traditional rehab centre and then look for emergent aspects. The analysis study was focused on the general practices and how the online system influences the communication within the groups. Overall, based on the analysis results of study one and two, a method to guide building online peer groups to overcome addictive behaviours will be presented.

7.5.5 RESULTS

The aim of this study was to identify some differences on how these sessions are governed, and how communication occurs rather than observing behavioural change over time. As an online medium, issues relevant to privacy and identity management seem to be an important aspect that needs to be addressed carefully. Overall, online support can provide more access to help by removing time, costs, and personal barriers, such as reluctance to seek help, stigmatisation and confidentiality concerns. The following subsection highlights some aspects relevant to the online medium. The following subsection will focus on the practical differences with face to face peer groups.

7.5.5.1 REGISTRATION

There were not software-based assessment and matching techniques applied during the registration. The only advice is that the service is suitable for those above 17 years old. In the registration phase, the required information was the email address, country, language, gender, date of birth. User were also asked to select a nickname and password and use a given space to write some biography information. All personally identifiable information, e.g. email, was not made visible to other users.

Users can also specify their type; e.g. gambler, friend and family of a gambler, staff or volunteer. However, there was not control over this phase, i.e. trust-based process. Based on the selection from user types, extra features were offered accordingly. For example, when users register as an authorised staff or volunteer, they can join as group moderators.

Through the observed session, there was not any spam incident. It seems that having profiling system helped to reduce such common practice in open online venues. Keeping the registering the minimum information also seems to help reducing privacy concerns.

7.5.5.2 ONLINE SUPPORT

Unlike the observed face to face peer groups, there was a different type of groups and users were free to join as much as they like without progressive protocol that control the process. **Table 21** provides a list of different aspects of help these groups provide. Overall, the support was more

concerned with informing users and helping them to decide goals and provide environment for social enforcement. Some types of the groups had more than one session on the same day but at a different time. However, a meeting scope would be the same. Users were free to join different as many sessions as they like for the same type.

TABLE 21: HELP PROVIDED IN DIFFERENT GROUPS

Type of groups	Aspects of help
New Members	Emotional support and practical tips
Drop in	Emotional support, practical advices and chatting peers or a member of the forum about recovery or general issues related to the behaviour
Problem Gamblers Peer Support	Interacting with recovered peers who have personal experience with overcoming the gambling behaviour
Problem Gamblers Therapy	Understating causes and consequences of the behaviour with aid of qualified counsellor
Community Therapy	Understating causes of the behaviour
Topic Groups	Structured discussions around a suggested topic, e.g. specific aspect of the recovery
Open Group	Interacting with peers without any moderation.

The system was mainly for post-residential support and outreach for clients. Users can only use the system to interact with each other during the pre-arranged meetings. In other words, the observed groups were more support groups than therapy group, in terms of having highly structured treatment protocols designed to provide progressive monitored therapeutic change.

Overall, online support groups were not intended to substitute for intensive psychological treatment; but more into complementing therapy by helping users who are less motivated to start the therapy, and perhaps need support. It could be also helpful for after-care treatment to avoid relapse. The pillars of the online support within the observed platform can be outlined as follows:

- Not judgemental
- Less confronting
- Comforting, “You are not alone!”
- Practical information
- Requires help-seeking attitude
- Focused on awareness building

7.5.5.3 *INTERACTION ENVIRONMENT*

The interface was very simple in terms of the features and functionalities, see **Figure 29**. It offered the main view that shows actual live conversation. A text box for typing a chat message which was able to take up to 1040 character long including white-spaces. It also offers a limited amount of pictorial representation of facial expressions, which is also known as emoticons. It seems that the interfaces were designed in a way that avoids providing users with immersive experience. The interface facilitates finding out who is online during the group meeting as well as who moderates the session.

The group’s interactions were facilitated using synchronous text-based communication. The system was mainly designed as a group chatting service. Users were not allowed to create their own chat rooms, and no private communication features were offered, which shows the extent of control in this communication environment. For example, the following features were not offered: “*poking, who is viewing my profile and private chatting*” including what is called *whispering* feature which enables a user to communicate to another user without a publicly visible dialogue. The platform was, also, discouraging in-person communication, and all interactions must be mediated using the online system. This can be opposite to the case of digital media addiction, where offline communication is better to be encouraged to works against DA common

behaviours, e.g. immerse in virtual and boost isolation. Being off-the-grid is less important in some other addictive behaviours unless the addictive behaviour is heavily influenced by the online medium.

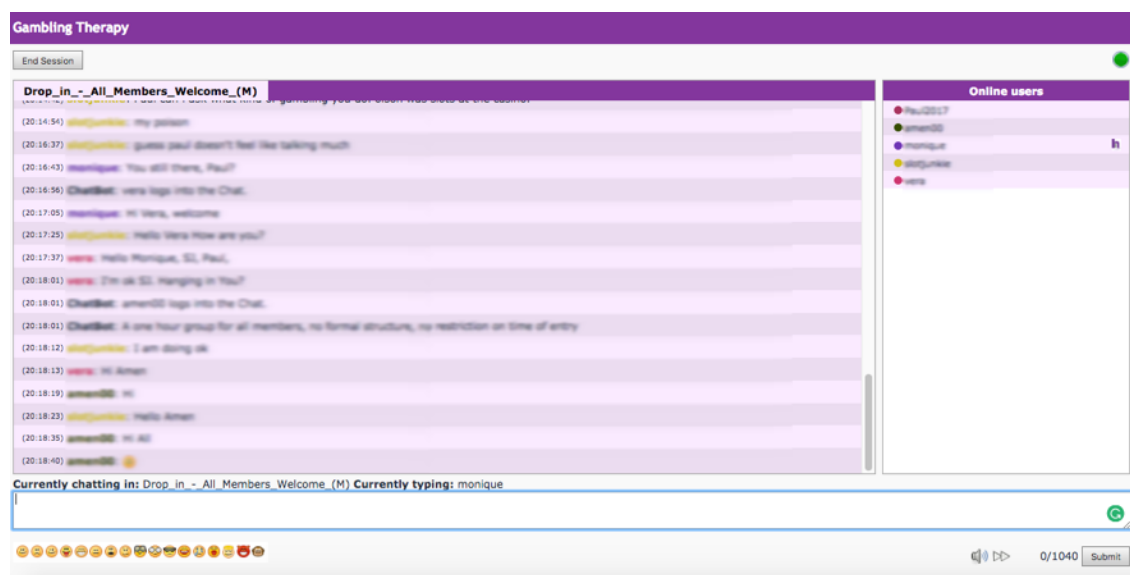


FIGURE 29: ONLINE GAMBLING SYSTEM INTERFACE

7.5.5.4 GROUP COMMUNICATIONS

The interactions among peers were topic-centric, e.g. share personal experience, ask questions, and provide/seek emotional support. In some of the groups, the meeting topics and agenda were already decided. These were also some groups that are peer-led communications, e.g. open groups.

It seems that there were communication norms followed in this environment. For example, the use of capital letter which were perceived as shouting and aggressive behaviour. This depends on the context. These seem important to ensure friendly environment. Occasionally, it was acceptable to be used just to emphasise the importance of an idea. Other types of communications include *actions* by adding words between brackets or stars, e.g. *thumbs up*. However, users were reminded that this is a support service rather than a medium for social networking. Hence, these must be used with moderation.

Peer pressure seems to be less problematic in these groups as they do not maintain its structure in all sessions. Also, the moderators seem to try to reduce the pace of interactions to

reduce any potential pressure users may feel if they need more time to reflect on their feeling and emotions. This would help to make the environment less intimidating.

The platform was also supported with discussion forums as an extra important modality for online support. Individuals can use this asynchronous communication service to post thoughts, questions, and discuss relevant issues at different times. It seems that greater involvement of moderators is necessary to prevent maladaptive behaviours, such as exchanging wrong information or information that acts against the main purpose of the service.

Anonymity seems to encourage self-disclosure and then trust which in turn increase group cohesion. However, quick reactions to posts and communications such as in real-time text-based may increase pressure and then decrease self-disclosure.

7.5.5.5 INTERVENTION

Registration can be utilised better as a component of an online intervention. Enabling users to track their progress through the program, e.g. track completed modules, and behavioural diaries, would provide positive reinforcement for accomplishments, and maintain the motivation for change. Behavioural diaries may include information related to the healthy habits, such as the days a user has not gambled, money saved, and what healthy activities done during the day or the week. Also, it may include healthy habits, such as with whom a user gambled, where, and how many time, etc. Such information can help users to identify and assess risky situations and inform future treatments as well. Such diaries can be in the form of multiple choice to enhance the ease of use.

However, while interventions seem to be structured in terms of decided topics and repeated sessions, the platform was not applying a systematic intervention and assessment on the individual level. This was reflected on the difficulty to provide tailored and comprehend messages relevant to users individually. In fact, the system does not claim to provide such comprehensive treatment.

7.5.5.6 MODERATION

As a special form of social software, online peer groups have a unique set of characteristics that influence the formulation of tasks. For example, the purposes of interactions, e.g. ice breaking, among peers should be pre-determined and highly moderated. In general, the platform seems to be more focused on mild cases as severe cases are always in need for crisis support, e.g. depression, anxiety, relationship problems, and financial issues.

The platform had credibility attributes that made the system more persuasive. For example, the professional qualification of therapists was available online.

7.5.6 DISCUSSIONS

As a result of analysing the data, this section presents further discussions in a set of reflections, challenges, and recommendations to design online peer groups to regulate DA.

7.5.6.1 HARNESSING INTELLIGENT SYSTEMS FOR BEHAVIOURAL CHANGE

An important point related to these tasks is what evidence or data exists in social interaction. In the case of digital addiction, intelligent systems can collect and measure simple features, such as usage-related data in real-time, e.g. frequency and duration. This approach seems to heavily influence most of the persuasive applications that exist in the market to regulate digital media usage (Alrobai et al. 2016). On the other hand, the data analysed revealed that addiction therapists through observing groups collect a unique set of interaction patterns. These patterns provide evidence that can indicate the existence of problematic behaviours as well possibly, as the severity of the issue. Examples of these interaction patterns include deflecting, blaming, gossiping, manipulation, justifying usage, tone rising, glamorising, denying, self-centred thoughts, task switching, using shortcuts and tendency towards isolation. The addiction therapist referred to these patterns as “relapsing traits”.

The analysis of these “relapsing traits” would enable designers of online peer groups to decide which persuasive techniques could be used as countermeasures. For example, in the ‘task switching’ issue which can be seen as a very negative behaviour as it shows a lack of commitment, the design should consider tunnelling technology, i.e. guided persuasion. This is to permit certain

tasks in a sequential manner and limiting the access to other tasks. In essence, and as Fogg suggests, the design should enable “confronting” such controlled environment in (Fogg 2002). This could be in certain scenarios where a member can negotiate the assigned task(s) or goal(s) to avoid enforcing biased decisions due to “negative past performance or experience” (Alrobai et al. 2016).

Online peer groups systems should be able to capture the above-mentioned family of evidence, i.e. “relapsing traits”, to make better decisions. As this type of data can be obtained from group’s interactions, intelligent systems can utilise sentiment analysis techniques using natural language processing to identify and extract such important indications which can be used to determine a users’ attitude. Also, addiction therapists in the rehabilitation programmes devise certain social activities for assessment purposes. For example, complementary therapies, e.g. body image group therapy, and recreational activities, e.g. sports competition. The family of evidence discussed above can be obtained through such activities.

7.5.6.2 *ONLINE PEER GROUPS AS A SOCIAL SOFTWARE*

In the light of the two conducted observational studies, this section introduces a revision to the Honeycomb framework to understand the functional requirements of online peer groups for addictive behaviours. The following subsection will elaborate that further and discuss the rationale behind the proposed modifications.

In online peer groups, the *group* block is an integral basic attribute, i.e. part and parcel of this social context. As such, the analyses of the persuasive mechanisms should always consider group dynamics and social psychology influences as a central perspective in these systems. Providing this type of users with the means to form communities can be very risky to the individuals and to the group performance. For example, in the treatment practice for addictive behaviours, forming a clique as a relationship pattern within a rehab community can easily mediate adverse behaviours, such as gossiping and negative normative influence. As such, this research suggests removing this functional block.

Typically, forming *relationships* between users during intensive rehab treatment is discouraged, unless it is defined and moderated by addiction therapists. Personal relationships could lead to intimacy which may create a risky situation in the recovery process. The literature of computer-mediated communication already points out that visual anonymity and self-disclosure are likely reciprocated and could lead to high level of intimacy (Joinson 2001). Combining that with the opportunities the system may provide to form one-to-one relationship in online space can be very negative. This does not entail that relationships will not exist in such online social spaces, but the system should not emphasise it. For example, in more liberal governance styles of peer groups (Alrobai et al. 2016a), relationships might be allowed with precautionary measures, such as implementing auditing features to emphasise the element of authoritative surveillance.

According to the honeycomb framework, voting features such as “like”, “re-tweet” and “share” aggregate counts to reflect the *reputation* of social entities, e.g. firms and individuals. This is the implicit representation of the honeycomb framework blocks. In the above given scenario, reputation is made implicit in a given platform. However, these voting features, also, convey personal approval toward these social entities. This approval entails objective or intention assessment towards certain values. Similar assessments can also be found in current practices within social media websites. For example, users are provided with “Flagging” tools to report offensive and harming digital materials. This is a kind of governance mechanism to support social responsibility in dealing with the massive collections of user-generated content. “Flagging” in this sense is not a technical feature only, but a socio-technical mechanism that enable users to express their concerns. Individuals values, social norms and community guidelines play a role in setting standards to assess content and actions according to these body of values (Crawford and Gillespie 2016).

In peer groups, assigning users to different groups is based on assessment procedures. This entails commencing with user assessment through personal interviewing for severe cases or screening questions for moderate ones. Then, assessment for the suitability for a particular user

to a specific group. As such, this research argues the need for introducing the *assessment* block to the framework.

Users in such systems are expected to collaborate with each other to progress in the rehab treatment. As such, the *collaboration* block should be considered. In peer groups, collaboration, which was suggested in (Pereira and Baranauskas 2010b), is a critical element to help boosting group performance. *Sharing* as another standalone block, can be seen as a functional trait within the collaboration block in online peer groups. Peers are expected to collaborate by sharing information, e.g. self-disclosing, playing certain roles, and adhering to group's norms and rules. Unlike groups in open forums, the avoidance of sharing, e.g. self-disclosing, in small groups is seen as a form of resistance. Yet, sharing should be handled with care.

The *identity* block is an important aspect in this type of platform. The block as Kietzmann et al. (2011) explains revolves around self-disclosure. However, in peer groups, this block should be less emphasised over time as a member approaches the aftercare stage and then to be completely removed, i.e. the member profile, after their discharge. In the case of relapsing after the discharge, a new identity would need to be created. This is because relapsing is a process that could start with negative behaviours and then moving to many critical warning signs before a full relapse. It means a relapsed user should re-start the rehab programme as a new member.

Peers' accomplishment, goals progress and the overall treatment progress would have direct influence on the users' *self-awareness*. This can positively cause greater adherence to the treatment programme goals. Hence, that would influence how users should manage other functional features of the online platform. Another example is when implementing features that help users assessing what aspects, e.g. content, time and location, are greatly associated with the online addictive behaviours. These features can have an influence on the users' self-awareness as well. Other features that can help building *social awareness*. For example, if a system shows accomplishments other members have achieved based on their competence in certain tasks, this may create opportunity for collaboration, e.g. other peers would be more inclined to seek help from those who have specific skills.

Other simple features that shows the current status, e.g. busy with family, can influence social awareness as well, i.e. other members would avoid communicate with that peer via online to avoid impacting the offline activity which should be a good sign regulating digital usage. This feature would also have a reflection on the social *presence*.

Self-disclosure, communication and encouraging people to open up are important aspects of the peer groups environments. Isolation is a “personal isolation is a strong aspect of addiction” as a therapist highlighted in the first study, i.e. treatment centre. All these indicate the importance to consider the *conversation* block in the online platform. However, the features that would have an influence on this building block should be handled with care. For example, some social roles, e.g. distracting, dominant and those with overly attention seeking traits might cause negative impact to them.

In the light of the results obtained from the conducted observational studies and the findings from (Ali et al. 2015, Alrobai et al. 2016, Alrobai et al. 2016a, Alrobai et al. 2016b), this study concluded the eight essential building blocks for such platforms: conversation, sharing, reputation, identity, presence, collaboration, awareness and assessment. The first five blocks exist in the original honeycomb framework, while (collaboration, assessment and awareness) are the added ones. The blocks (groups and relationships) were excluded for reasons related to behavioural aspects within peer groups. These building blocks should be configured based on four parameters which are the heart of the proposed framework that will be presented in **chapter 8** –

Figure 32:

- Shared goals
- Group factors, e.g. moderation, governance aspects and group structuring.
- Individual factors, e.g. personal traits, attitudes, preferences and risks.
- Social objects (Cetina 1997), e.g. topics, ideas and events.

7.5.6.3 ONLINE PEER GROUPS AND ADAPTIVE ECOLOGY

This thesis argues that designers of persuasive social software need to be aware of these social roles as they can have different influence not only on the social structure of the group and how the group is governed but also on the ecology formation (i.e. what interactive features should be offered). For example, “hope installation” as a task purpose (**chapter 8 – Table 24**) may require some social roles, such as ‘*senior*’ peers to be introduced to the group in order to increase the persuasiveness of the systems. Those peers are expected to have started gaining control over their use. The system may, also, need to apply some constraints on other roles, such as limiting the sharing features for a ‘*relapsed*’ role especially when the user who plays that role also plays a ‘*dominant*’ or ‘*crisis*’ roles. It should be noted, that some roles are not primary, but emerge from other existing roles, e.g. the ‘*withdrawing*’ role may be a result of having dominant users in a group. They may also emerge due to the formulation of the task. For example, in a very competitive task, where there might be a user taking the ‘*in-Detox*’ role, the other members of the group may start blaming that peer for poor performance. Consequentially, the ‘*scapegoating*’ role emerges. Generally, these roles can help or hinder group performance. Some roles may convey positive meaning to group work, e.g. ‘*helper*’ and ‘*sociable*’, while others convey the opposite, e.g. ‘*dominant*’ and ‘*scapegoating*’. However, all these roles might be, eventually, needed for counsellors to create more effective group functioning.

These dimensions place different emphases on the interaction styles within the rehabilitation activities. In addition, they also influence what functionalities could support different tasks and purposes. This suggests that the ecology of the online peer groups should be adaptive to emphasise different functional settings during the lifetime of the peer group. This could be achieved by applying different configurations of the honeycomb framework based on the specifications of the tasks, i.e. task purposes, qualities, and functionalities. For example, some tasks and activities run on a rolling basis over the period of three months. After that, the platform should adapt to the expected changes in the individual behaviours and group performance.

In online peer groups, certain building blocks need to be emphasised based on the four parameters in the heart of the model in **chapter 8 – Figure 32**. For a particular activity, the development team of the online version of peer groups, which may include, for example, therapists, software engineers, developers and stakeholders, should emphasise certain blocks but not others to boost the persuasiveness effect. For example, it was observed in the study that over a period of 6 weeks, the activities performed in the second group in the face-to-face rehab centre require a minimum opportunity and length of conversations. In online peer group platforms, if a system was highly emphasised by the conversation block in **chapter 8 – Figure 32** through the implemented features, the members' performance would be negatively influenced, and facilitators would not be able to obtain optimum outcomes. In this particular scenario, the design of online platforms for peer groups should have the ability to reconfigure the ecology and adapt to different activities requirements which change as the treatment progress. As such, applying a static ecology approach, such as in traditional social networking services, e.g. Facebook and LinkedIn, may hinder the outcomes of the whole system and create rather a negative experience, e.g. a fake sense of achievement, lack of interest and digression.

7.5.6.4 *ONLINE PEER GROUPS AS A TUNNELLING-BASED PERSUASIVE TECHNIQUE*

Tunnelling is a persuasive technique that aims at “*using computing technology to guide users through a process or experience provides opportunities to persuade along the way*” (Fogg 2002).

Fogg (2002) indicates some characteristics of this persuasive technique. These are:

- Tunnelling requires having high control over the interaction environment where the persuasion expected to occur.
- The level of uncertainties should be decreased along the way of the tunnel.
- The user experience should be controlled and guided through a designed staged-based process. Fogg (2002) refers to this principle as commitment and consistency.
- People voluntarily enter the tunnel, i.e. people in online peer groups are characterised as help-seekers.

In peer groups, tunnelling can be useful persuasion strategy as people who give up “a certain level of self-determination” are exposed to predetermined experience that increases the opportunities for persuasion. The online peer groups platform can lead users through various steps to analyse their behaviour, setting up goals, and decide the plans to achieve these goals. It could also guide users through a series of questions designed to identify problematic triggers, personal traits and habits, and make tailored suggestions to improve them. This thesis proposes **Figure 30** as a reference model for how online peer groups should look like when view it through the lenses of tunnelling persuasive technology.

In the case of DA, it seems to be also useful to look at other addictive behaviours if exist. Because the problematic behaviour may be associated underlying issues and profound reasons which manifest themselves through different forms. For example, within DA itself, one may recover from addiction to games and replace it with another addictive behaviour, e.g. social media or gambling.

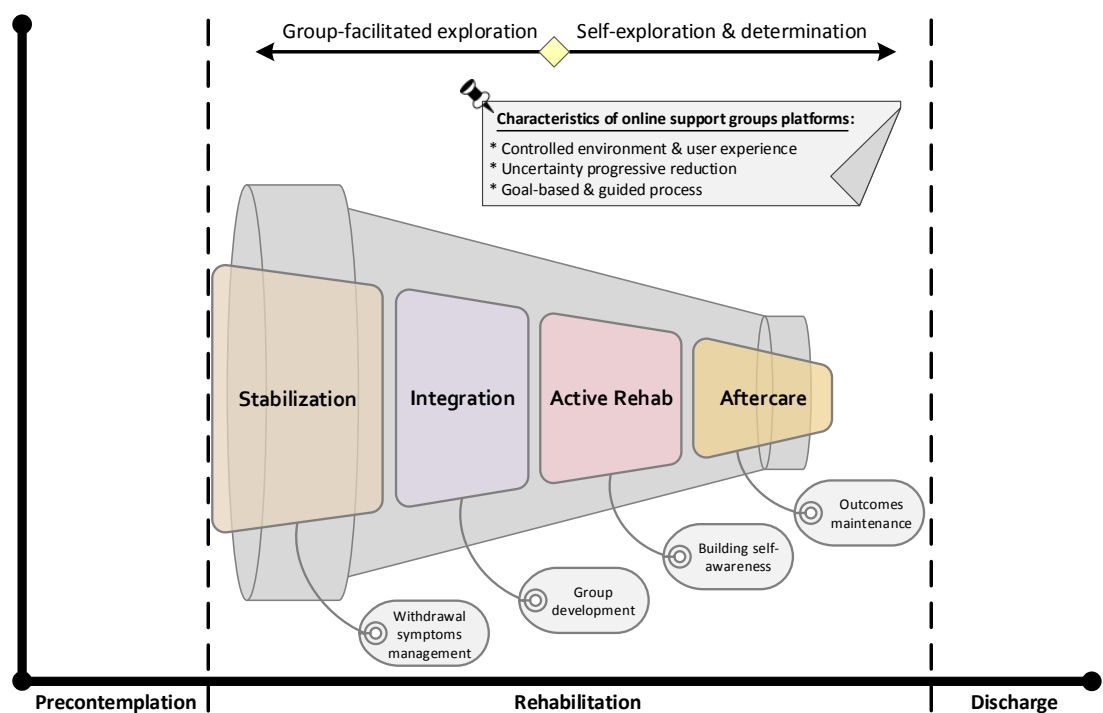


FIGURE 30: ONLINE PEER GROUPS IS AS TUNNELLING-BASED TECHNOLOGY

The interactive environment of the observed online groups would provide better behavioural change if interactive exercise were provided, e.g. quizzes, checklists, and self-assessments. For

example, the platform may allow users to assess the benefits of changing their behaviours. The system may then enable users to share generated knowledge including the behavioural outcomes with their peers if they performed the tailored advices.

7.6 CHAPTER SUMMARY

This chapter reported the results of the observational studies conducted to derive design principles for designing online peer groups. In this chapter, two studies were carried out. The first study was for a face-to-face peer group in a rehab centre that treats both substance and behavioural addiction. The second study was a netnography for online peer groups to treat problematic gambling as a behavioural addiction. A set observations, guidelines, and considerations were concluded and presented.

8. CHAPTER 8: CUSTOMISABLE ONLINE PERSUASIVE ECOLOGY: A PARTICIPATORY APPROACH METHOD

This chapter starts with an introduction to the COPE.er method, then continues with describing its supported artefacts, followed by the method workflow. It should be noted that this chapter presents the final version of the method. In other words, the evaluation outcomes presented in **chapter 9** are already reflected in this chapter. Also, this chapter builds on the top of **chapter 7** to help achieving **objective 4** by proposing the engineering method and how it can be used.

The COPE.er is a participatory method that aims at building **Customisable Online Persuasive Ecology by Engineering Rehabilitation** strategies for peer groups, see **Table 22**. The acronym COPE.er is used to provide a comprehensive definition of the method. The method brings focus, clear structure and logic to the relationships between design decisions and intended functionality. It also promotes participatory decision making by involving end-users in the design activities.

TABLE 22: THE COPE.ER METHOD ACRONYM

C	Customisable: Flexibility in altering scope and functionality to support group evolvement. Customisability includes adaptability (human) and adaptivity (system).
O	Online: Online context encompasses diverse opportunities, constraints and threats that influence how individuals behave within treatment groups.
P	Persuasive: Embedding persuasive techniques to enhance group communication, improve performance and increase motivation.
E	Ecology: Groups environments inherent the above characteristics and form a unique ecology that balances between treatment and engagement needs.
E	Engineering: Following disciplined and systematic approach for designing customisable online persuasive ecology to enable forecasting potentials and threats.
R	Rehab: The design should understand rehabilitation needs that can be gathered with the active involvement of domain experts and end-user.

Customisable ecology in this context is an enabler to the online social medium that supports the adaptation of its scope and functionality including persuasive strategies that helps to adequately cope with different group aspects, e.g. groups' needs and progress in the rehab programme as well as governance management for groups. Media Ecology was formally introduced by Postman (1980) as a way of looking into: *“how media of communication affect human perception, understanding, feeling, and value; and how our interaction with media facilitates or impedes our chances of survival. The word ecology implies the study of environments: their structure, content, and impact on people”*.

The goal of the COPE.er method is to address the challenges in designing such social networking platforms meant for combatting addictive behaviour in general and DA in particular. The COPE.er method is grounded in an extensive empirical research effort carried out through the stages of this thesis which was itself informed by established theories in behaviour awareness and behaviour change and addictive. The findings need to be further validated to be useful in creating effective online peer groups platforms as COPE.er is not meant to give a full specification and sharp rules on how to design the platforms and how to run the groups. Instead, it is meant to highlight phases and constituents to consider and to further customize and engineer through a participatory process. However, when evidence was obtained, we were also in the position to provide certain heuristics and best practices without a claim of completeness in that aspect.

8.1 A REFERENCE ARCHITECTURE FOR ONLINE PEER GROUPS

This section presents our deduced reference architecture (**Figure 31**) that outlines the main components needed to be considered when designing online peer groups to regulate DA. These components are the main findings in **chapters 5, 6, 7** and **9**. **Chapter 5** explored different design aspects related to the “technology space” and mainly for persuasive techniques for E-health systems.

Chapter 6 investigated online peer groups in terms of the moderation roles (e.g. transformational and transactional), and characteristics of the moderators (e.g. professional and experiential knowledge). Also, this chapter looked at group structuring and governance and

provided a conceptual map for the related aspects in **chapter 6 – Figure 25**. These parts are highlighted as “group space” in the reference architecture.

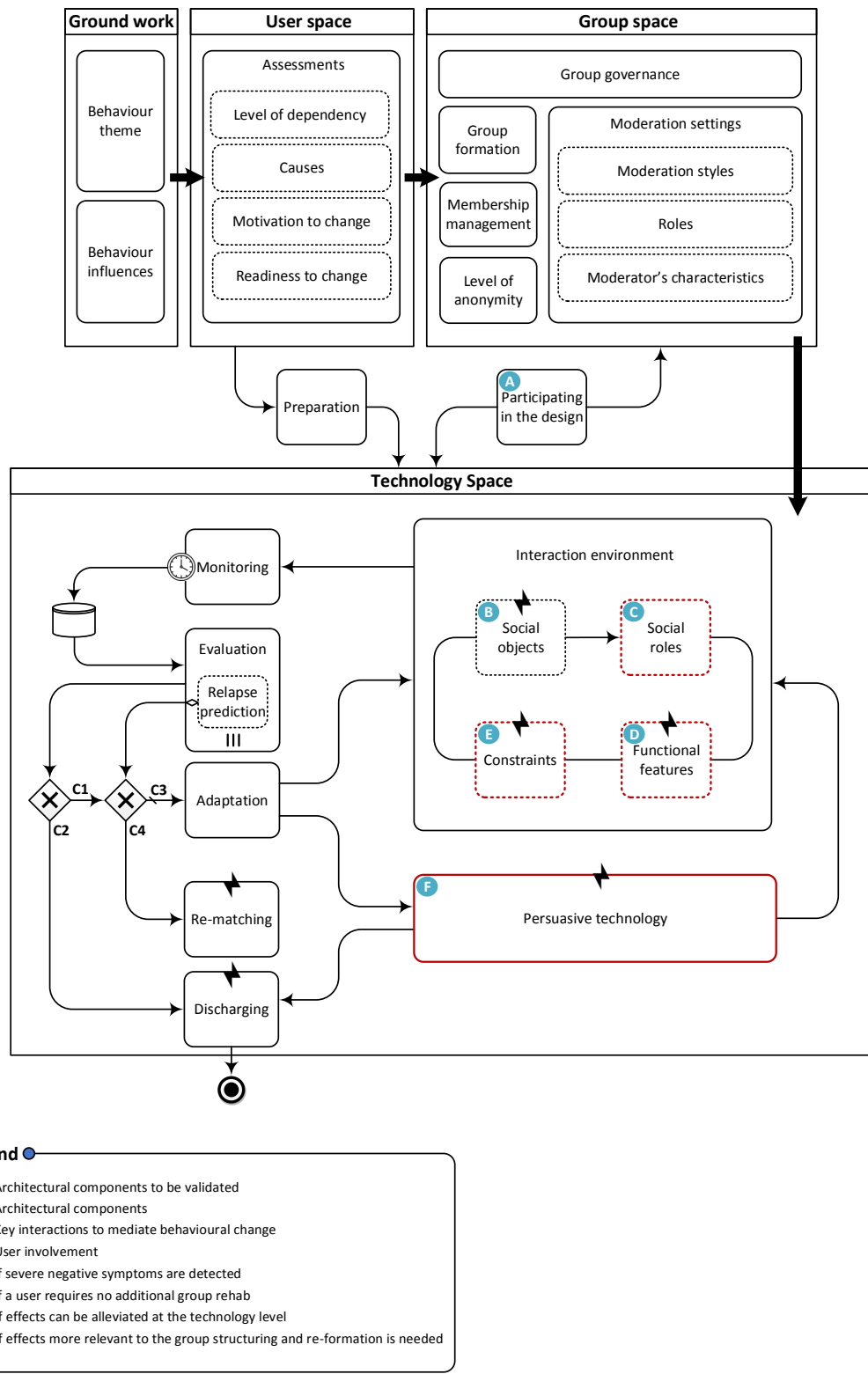


FIGURE 31: ONLINE PEER GROUPS REFERENCE ARCHITECTURE

Chapter 7 looked at further aspects related to the rehab practices, social structure, and interaction styles in peer groups. These aspects mainly cover the “user space” and the *interaction environment* in the “technology space”. **Chapter 7**, also, provided a set of preliminary insights related to other components such as *monitoring, evaluation, adaptation* and *discharge*. However, more studies are still needed to provide more knowledge and also devise some artefacts guide their design.

The evaluation of the COPE.er method (i.e. **chapter 9**) looked at other components mainly related to the “technology space” and also the component labelled as “participating in the design” which mainly provides insight about user’ involvement in the design process.

As discussed above, the thesis looked at some parts of the reference architecture. However, further work is still needed to devise systematic methods that guide other components of the reference architecture. More information will be presented in the future work of the thesis in **chapter 10**.

8.2 THE COPE.ER METHOD ARTEFACTS

8.2.1 SOCIAL ROLES

This thesis concluded different social roles can exist within peer support groups for addictive behaviours, see **Table 23**. These roles represent social status and behavioural patterns, and they are meant to inform the design process and management of the online platforms for peer groups.

Social roles can be defined as a social status within a social structure. Different roles might have an implication on the design of the online platform. In other words, each role may influence what features should be offered. Roles can be i) **Acted** which can be associated with a set of expectations, rights, and skills (e.g. group facilitator), and ii) **Accidental** which can be unconsciously played, evoke complex feelings and sometimes arise during the course of interaction, (e.g. victim).

Classifying social relationships and behaviours into a smaller set of roles reduces the complexity to design and manage social systems. Thus, the identification of different roles and

mapping users to them is a critical step to facilitate the design activity. The following is four types of effects social roles may have on the group work:

- The (+) effect suggests that the role is *likely* to provide *positive* outcomes for group work.
- The (–) effect suggests that the role is *likely* to provide *negative* effects to group work, but it may create opportunities for positive outcomes.
- The (±) effect suggests that the role *may* provide *positive* and *negative* outcomes to group work.
- The (⊗) effect role that *always* provides *negative* outcomes to group work and requires urgent action.

The negative effect of a particular role does not always entail negative outcomes to a group. In fact, some negative effects can create opportunities that will lead to a good outcome. In other words, the negative sign (–) only indicates the importance to address the implication of that role. For example, having a peer who is in the stabilisation stage may disrupt group work, but it may also provide senior peers with a sense of purpose. Senior peers will try to offer help and care to those peers. Therefore, negative effects may require specific customisation to make them useful to group work.

TABLE 23: SOCIAL ROLES ORGANISED INTO FOUR CLASSES

Functional Roles: they refer to roles involving status, control and access to recourses. Each member of the group can play one role only, except the role “peer” who can be temporally assigned as a “leader”.		
Gatekeeper	A person who has the authority and control over particular resources	+
Facilitator	Assigned person who is expected lead, guide and provide knowledge	+
Co-Facilitator	Assigned person who is expected help and support the facilitator. (One co-facilitator is recommended as a maximum)	+

Peer	A person who shares similar behavioural issues and experience	+
Observer	A person who is permitted to join temporarily for observational learning. Positive unless peers start to avoid self-disclosure	±
Leader	A temporary role played by all senior clients	+
Stage-related Roles: they refer to roles associated with stage of treatment. Each peer in the group can play one role only, except the role “new peer” who can also be “in-Detox” as well.		
Recovered	A peer who can be described as recovered based on the current behaviours (e.g. having balanced lifestyle)	+
Senior	A peer who has spent longer time in the treatment programme adopted healthier behaviours and already started practising them	+
New peer	A peer who is new to the group	+
in-Detox	A peer who is in the process of medical remodelling (e.g. removal of toxic substances). No more than 3 in a group of ~12	±
Relapsed	A peer who experienced very recent relapse episode	⊖
Communication Roles: they refer to the roles associated with interaction process. Each peer in the group can play multiple roles at once.		
Role model	A peer who is expected to be an example to be imitated and inspire others	+
Isolates	A peer who refuses/has not developed the ability to interact with others. The isolation can be emotionally and/or physically	–
Sociable	A peer who is willing to talk, engage and collaborate with others	+
Complying	A peer who adhere to rules and norms only to achieve personal goals rather than to recover	±
Scapegoat	A peer who is deliberately excluded on the group basis and usually blamed when things go wrong	–
Rejected	A peer who is deliberately excluded on the individual basis.	–
Withdrawing	A peer who tends to withdraw from activities or participate passively (e.g. only listening)	–

Competing	A peer who tends to compete in different tasks for the sake of having power.	–
Disrupting	A peer who disrupt group natural development and prevents process from continuing as expected	⊖
Dominant	A peer who attain high degree of influence in a group and wants to have the control	–
Denying	A peer who is in extreme conscious denial to avoid consequences	–
Victim	A peer who believe that he is always treated unfairly or taken advantage of and consequently isolate him/herself	–
Emotional Roles: they refer to roles representing emotional themes. Each peer in the group can play multiple roles at once		
Attention seeker	A peer who wants to be the centre of attention in the group. Positive with moderation and it should not affect group performance	±
Avoidant	A peer who has a false feeling of inadequacy, social rejection, and uses avoidance as a conscious coping mechanism	–
Victim	A peer who believes that he is always treated unfairly or taken advantage of and consequently isolate him/her self	–
Crisis	A peer who is always expressing negative thoughts. Positive unless using aggression and blaming tone	±
Follower	A peer who admires a particular person or believes in system of ideas	±
Fixer	A peer who prevent other peers from expressing their emotions by saying words such as "do not worry, you will be alright."	⊖
Helper	A peer who supports other peers and encourage a positive behaviour	+

8.2.2 SOCIAL OBJECTS

Different activities and tasks can be introduced to the online groups. The method labels these activities as *social objects* which help to maintain the focus of social interactions. Social objects are expected to be selected by group's facilitators and negotiated with representative groups' members. **Table 24** lists different activities that can be introduced to peer groups. Social objects encapsulate three aspects:

- **Purposes:** the immediate motivator(s) of the assigned task or activity, e.g. ice breaking, goals setting, hope installation, and emotional support.
- **Qualities:** the interaction orientation that mediates the planned purpose(s), i.e. the mode of delivery which can include socialisation, confrontation, competition and collaboration.
- **Functionalities:** the functional activities that support achieving planned purpose(s), i.e. the method of delivery which can include problem-solving, diaries, stories sharing, and peer pressure such as self-monitoring or surveillance.

Within the development team, practitioner(s) and end-users can negotiate the treatment plan and decide what tasks and activities would be suitable to be introduced to the group. For the DA behaviours, usage monitoring and surveillance are core social objects for online peer groups platforms.

The practitioner can communicate the characterises of the planned social objects to the designers using **Table 24**. The goal of this table is to provide the designers with insights related to what features and functionalities needed to be included. A practitioner can tick (✓) from column (A), then use columns (B) and (C) to decide the qualities and functionality of the selected element. **Table 25** demonstrates an example. The designers may use symbols only, e.g. for the purpose of *goals selection*, Q2, Q6 and F6 will be applied.

TABLE 24: SOCIAL OBJECTS FOR ONLINE PEER GROUPS

	A	B	C
Tick	Purposes: the immediate motivator(s) of the social object	Qualities	Functionalities
	Ice breaking		
	Goals setting		
	Goals selection		
	Role play situations		
	Identifying warning signs		
	Relapse prevention		
	Hope installation		
	Maintaining norms		
	Enhancing self-confidence		
	Enhancing coping skills (e.g. anger management)		
	Emotional support		
	Building trust (via mutual respect, understanding, and empathy)		
	Encouraging openness (i.e. self-disclosing)		
	Identifying seemingly irrelevant decisions		
	Enhancing emotional expression		
	Enhancing communication skills		
	Self-discovery (i.e. explore feelings, perceptions and abilities)		
	Awareness enhancement of behavioural and psychological state		
Qualities (What is the mode of delivery?) Q1. Socialisation Q2. Discussion Q3. Confrontation Q4. Listening Q5. Competition Q6. Collaboration Q7. Negotiation Q8. Caring Q9. Self-interest Q10. Befriending Q11. Online activity-based, e.g. educational games (AKA game with purpose)		Functionalities (What is the method of delivery?) F1. Problem solving F2. Diaries F3. Group competition F4. Individual competition F5. Peer pressure (monitoring) F6. Open discussions F7. Stories sharing F8. Session check-in and check-out	

TABLE 25: EXAMPLE TO DEMONSTRATE HOW SOCIAL OBJECTS SHOULD BE USED

Tick	Purposes:	Qualities	Functionalities
✓	Goals selection	Q2 (Discussion), Q6 (Collaboration)	F6 (Open discussions)
✓	Enhancing self-confidence	Q3 (Confrontation), Q5 (Competition)	F3 (Group competition), F5 (Peer pressure via monitoring)

8.2.3 THE COPE.ER METHOD BUILDING BLOCKS

The COPE.er views online peer groups as a unique form of social networking medium. Thus, the classical Honeycomb framework proposed by Kietzmann et al. (2011) lacks some concepts required for this type of mediums. The COPE.er model is proposed as a modification to this classical framework to transform it into socially aware computing framework. This thesis argues that online peers support groups should be built upon the COPE.er eighth building blocks depicted in **Figure 32**. The new model is devised to help building platforms for online support groups.

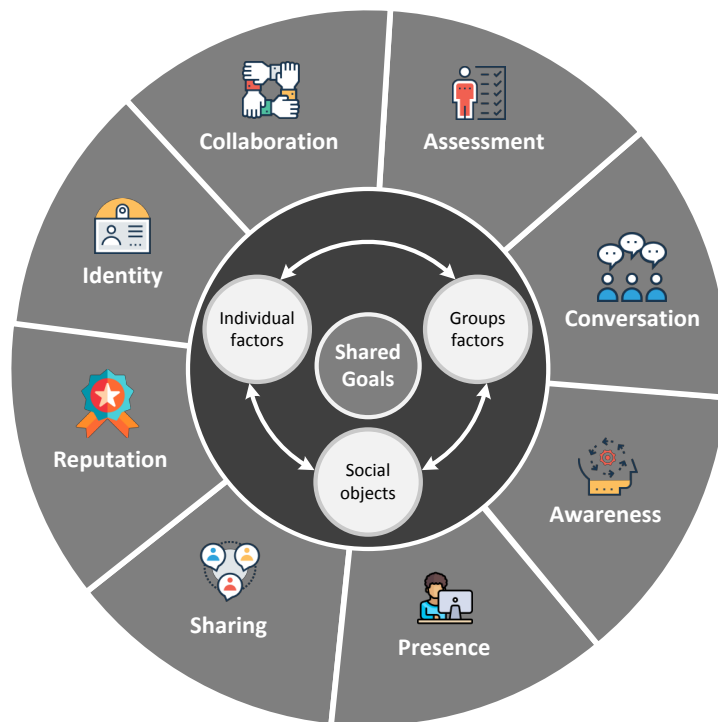


FIGURE 32: THE COPE.ER MODEL BUILDING BLOCKS

Table 27 provides a brief definition for each block. The components that should guide the customisation of the eighth blocks are placed in the heart of the model. These components are described in **Table 26**.

TABLE 26: COPE.ER CUSTOMISATION FACTORS

Customisation factors	Description
Group factors	The collective characteristics that define a group, e.g. norms, needs and goals
Individual factors	The attributes that define an individual, e.g. qualities and vulnerabilities
Shared goals	The goals that are defining the focus of social interactions within a group
Social objects	The tasks maintaining the focus of social interactions within a group

TABLE 27: DESCRIPTIONS FOR THE COPE.ER MODEL BUILDING BLOCKS

Building blocks	Description
Assessment	The tools people can use to rate interactions and content
Awareness	The aspects that increase users' knowledge and perception
Collaboration	The ways users use to enhance their ability to collaboration
Identity	The ways users present and profile themselves
Conversations	The degree and type of communication amongst members
Reputation	The tools enabling and describing the social standing of user
Presence	The ways people can use to express their availability and status
Sharing	The scale and facilities offered to users to exchange digital content

8.2.4 FUNCTIONAL FEATURES

This artefact is created to help designers defining the interaction environment of the online platform. It includes a list of interactions features (**Table 29**) that can be customised and offered for different groups. This section is entirely focused on describing **Tables 29** and how it can be utilised. The interactions features listed in the table were obtained from two main sources. The first source is the applications analysed in **chapter 5 – Table 9**. The second source is social and functional features of a set of conventional social networking websites, e.g. Twitter, Facebook, Instagram etc.

The features selection activity should consider the identified social roles and the decided social objects. The building blocks are already mapped to each feature using three colour codes, i) dark grey, ii) light grey, and iii) white. These codes are described with examples in **Table 28**

TABLE 28: IMPLICATIONS ON THE COPE.ER BUILDING BLOCKS




 Dark grey	A feature with <i>great</i> implication on a given building block. (E.g. Announcing location has a <i>greater</i> implication on the <i>Presence</i> block)
 Light grey	A feature with less/indirect implication on a given building block. (E.g. Announcing location has <i>an indirect</i> implication on the <i>Reputation</i> block)
 White	A feature with insignificant implication on a given building block. (E.g. Announcing location has <i>an insignificant</i> implication on the <i>Conversation</i> block)

TABLE 29: INTERACTION ENVIRONMENT CUSTOMISATION TABLE

#	Features	Tick to include																
		Visibility		Limit.			Building blocks											
		Friends & families	All peers	Specific peers	Practitioner	User	Time frame	Informational limitations	Usage Restrictions	Awareness (Self & Social)	Collaboration	Conversation	Assessment	Presence	Sharing	Reputation	Identity	
Main features of online peer groups platform																		
1	Setup goals: it includes specifying other parameters (e.g. type, duration, steps, status)																	
2	Goals progress: display the progress of specific goals																	
3	Treatment progress: display the overall progress of treatment programme																	
4	Accomplishment: an area on a personal profile where collected points and badges are listed																	
5	Compare my usage: allow users to compare their performance with other peers																	
6	Contextualised usage tracking: associate time/location to the usage																	
7	Contextualised content tracking: associate time/location to consumed/generated content																	
8	Self-assessment: enable a peer to access featured questionnaires to evaluate the self																	
9	Addiction scoring: use valid and reliable addiction measure and show users their scores																	
10	Leaderboard: scoreboard showing the names and current scores of the leading peers																	
11	Group dashboard: an area on a group profile to view overall limiting states of members																	

#	Features	Building blocks								Limit.			Visibility						
		Awareness (Self & Social)	Collaboration	Conversation	Assessment	Presence	Sharing	Reputation	Identity	Time frame	Informational limitations	Usage Restrictions	Friends & families	All peers	Specific peers	Practitioner	User		
12	Enforce rule: apply coercive measures (e.g. Locking screen)																		
13	My mood: express feeling or current state of mind																		
14	Reminders: remind users about personal goals, tasks or usage once exceeds its limit																		
15	Auto-responding: returning a prewritten message to inform peers about current status																		
16	Mute: hide the communication a specific peer(s)																		
17	Posting: e.g. posting status, suggesting rules, photos or videos, or discussion topics																		
18	Ask a question: navigate through topics where the question belongs. Peers can answer																		
19	Private messaging: allow a user to send messages and interact with selected peers																		
20	Create personal group: allow a user to create a personal group																		
21	Group chatting: enable group members to chat together																		
22	Create relationships: e.g. adding or following a peer																		

#	Features	Visibility					Limit.			Building blocks							
		User	Practitioner	Specific peers	All peers	Friends & families	Usage Restrictions	Informational limitations	Time frame	Identity	Reputation	Sharing	Presence	Assessment	Conversation	Collaboration	Awareness (Self & Social)
23	Creating events: a calendar-based tool used to allow users notify their peers of upcoming events																
24	Wall: a personal area where a user and his/her peers can post thoughts to be seen by everyone																
25	Live streaming: broadcasting real-time video																
26	Creating a page: Unlike personal profile, <i>page</i> aims at getting fans rather than friends																
27	Announcing current location: share real physical location (e.g. Enjoying tea –at Green Tea)																
28	Poke: a way of saying hello to get others' attention. The poked peer will be notified																
Options that can be embedded to some of the main features																	
29	Post activity: find out how viewers engaged with a post																
30	Comment: an option to enable users to comment on posts																
31	Sharing others' content																
32	Hashtagging: labelling technique to identify messages on a specific topic																

#	Features	Visibility		Limit.		Building blocks												
		Friends & families	All peers	Specific peers	Practitioner	User	Time frame	Informational limitations	Usage Restrictions	Identity	Reputation	Sharing	Presence	Assessment	Conversation	Collaboration	Awareness (Self & Social)	
33	React to content: allow peers to rate how they feel towards content (e.g. by using emoticons)																	
34	Follow discussion: allow a peer to receive updates notifications on a specific post																	
35	Mention: attach names of peers to a post to get attention (e.g. @Amen see this video)																	
36	Poll option: Add poll option to posts so peers can determine their opinions																	
37	Updates notifications: prompt users about content (e.g. achievements, goals or posts of others)																	
38	Tagging: allow attaching peers to a post. It involves ownership (e.g. was at club –with @Amen)																	
Personal profile related features																		
39	Personal profile picture																	
40	Personal skills																	
41	Personal biography																	
42	Showing number of supporters																	

For each feature, there are four constraints that can be applied, visibility levels, usage restrictions, informational limitations and time frame. The visibility levels are embedded into the interaction environment specification table (i.e. **Table 29**), i.e. the bank of features document. The designers are, also, encouraged to create another three supplementary documents to specify how the rest of the constraints should be implemented.

- **Visibility levels:** Recognition and control are two opposing outcomes of visibility (Brighenti 2007). Visibility refers to negotiating the boundary between what can be private and public and who can view online social activities, such as posting content. Social activities are facilitated through functional features of the online platform. The set of visibility levels in online peer groups is, *user, practitioner, specific peers, all peers, family and friends*.

The development team can consider all possible combinations of the 5 elements which can be assigned to different features. For example, *posting content* can be visible to the user only, the user and the practitioner or maybe to all group members. Considering the group is formed for younger age users, *goal progress* as another feature may need to be visible to the user and practitioner as well as one of the parents which refer to the family and friends' visibility level.

- **Usage restrictions:** This refers to applying usage limitations to the frequency and duration of the features. The designers can assign the values ***F*** for frequency, ***D*** for duration or ***DF*** for both in **Table 29**, and then provide more details in a separate specification document. **Table 30** illustrates two examples.

TABLE 30: EXAMPLES FOR SPECIFYING FREQUENCY AND DURATION

Features	<i>Frequency</i>	<i>Duration</i>
My mood	- 3 times a day (7 hours gap between each)	N/A
Group chatting	- Only during formal group meetings	- Free floating mode during the first 30 minutes. - Round robin mode during the rest of the session.

- **Informational limitations:** This refers to what information can be accessed by a specific feature. For example, the *addiction scoring* may only consider certain applications in the calculation method. Also, the feature may only report the type of content a user comments on, rather than the actual content, if *contextualising content tracking* was assigned to be visible to all group members. The designers can tick (✓) as shown in **Table 29** and provide more details in a separate specification document. **Table 31** illustrates an example of this.

TABLE 31: AN EXAMPLE FOR SPECIFYING INFORMATIONAL LIMITATIONS

Features	Informational limitations
Addiction scoring	Include: Facebook, Twitter and Instagram Exclude: LinkedIn, the calendar and the COPE.er app

- **Time frame:** this refers to when a feature can be enabled based on the stage of the treatment. For example, while *Leaderboard* is not advisable, a practitioner may suggest enable it only in the last month of the treatment programme. The designers can tick (✓) in **Table 29**, and then provide more details in a separate specification document. **Table 32** illustrates an example. The time frame constraint utilises the transitions provided in **chapter 7 – Figure 28**.

TABLE 32: EXAMPLES FOR SPECIFYING TIME FRAMES

Features	Time frame
My mood	Starts: Day 1 of the treatment programme Ends: Independency encouragement transition
Leaderboard	Starts: End of group therapy transition Ends: End of the rehabilitation programme transition

8.3 THE COPE.ER METHOD ACTIVITIES

The COPE.er method follows participatory approach to support stakeholders' active involvement. These stakeholders are: (i) designers, (ii) practitioner(s), and (iii) end-users. **Figure 33** illustrates the proposed method using Business Process Model and Notation (BPMN).

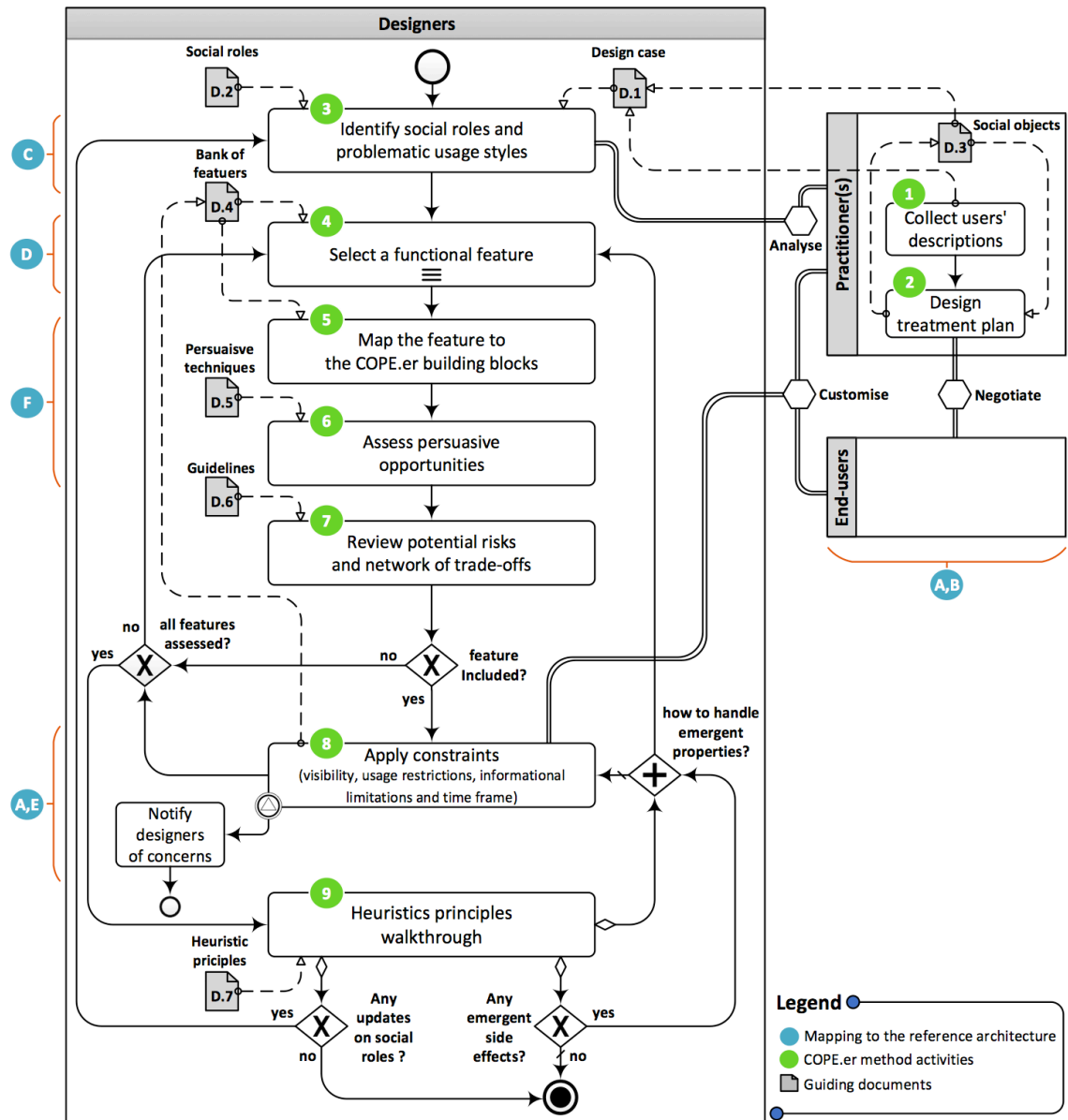


FIGURE 33: THE COPE.ER METHOD WORKFLOW

The COPE.er encompasses nine activities and supported by seven documents (hereafter “D.1”, “D.2”, etc.) to guide these activities. These documents are:

- **Behaviours repository (D.1):** a document where a counsellor stores all insights about groups' members behaviours of a given group of peers.

- **Social roles list (D.2):** a document listing the roles can exist in the social structure of small groups.
 - **Social objects list (D.3):** a document listing the social objects (e.g. topics for discussions, events and activities) that interactions are driven by or revolve around.
 - **Interactive features repository (D.4):** a bank of interactive features that can be implemented to online peer groups platforms.
 - **Persuasive techniques list (D.5):** a document contains a list of persuasive techniques which were adopted from (Torning and Oinas-Kukkonen, 2009) and supported by tailored exemplar implementations for online peer groups.
 - **Potential risks and network of trade-offs checklist (D.6):** the list of potential risks listed in.
- Heuristics guidelines (D.7):** a list of heuristics used to inspect online peer group platforms designs.

It should be highlighted that COPE.er method prevents assigning tasks to be performed by end-users themselves without a counsellor involvement or supervision. Therefore, in **Figure 33**, the **end-users' box** was made empty. End-users can only participate in tasks already assigned to: i) a counsellor to negotiate the design treatment, and ii) the designers to voice their thoughts in the activity (8) where the all stakeholders collaboratively customize the interaction environments in terms of how constraints should be applied. The following part presents the method activities.

Activity (1): A practitioner creates a document to briefly describe each member in the group. These descriptions are stored in the card shown in **Table 33** and then added to the behaviours repository (i.e. D.1). Each member should have a separate card.

TABLE 33: CLIENTS' DESCRIPTION CARD

Client's name	Assigned pseudonym
General background	Job, age and the date of joining the treatment centre
Digital usage	Information about the usage styles of the client including the technology being used, general motivations, and how the user describe her/his feeling towards the usage
Practitioner's Notes	Practitioners' reflection about the member's social behaviour during the induction week

Activity (2): The counsellor decides what tasks and activities should be introduced to the group during the period of the treatment and then negotiates different aspects of the treatment with the group members. The counsellor uses the social objects list (i.e. D.3), to better describe the treatment plan to the designers. The members' cards and the selected social objects should be added to the behaviours repository (i.e. D.1) which is the main document designers need to consider for the rest of the following activities.

Activity (3): The designers use the social roles list (i.e. D.2) to analyse the design case (i.e. the behaviours repository document) and identify all social roles and problematic usage styles that need to be catered for. While the designers may perform this activity alone, it is recommended to involve the counsellor. The outcomes of this activity will be reflected in the selection and customisation of the functional features of the online platform.

Activity (4): The designers use the interactive features repository (i.e. **Table 29**) to collaboratively specify the interaction environment of the online platform. In this activity, both the behaviours repository and the social roles list should be considered to enable further informed design decisions. The interactive features repository provides a bank of features and functionalities that can be implemented to the online peer group design.

Activity (5): The designers use the COPE.er building blocks provided in **Figure 32** to decide whether to include or exclude the features being evaluated. In **Table 29**, all features are already mapped to the COPE.er building blocks using the colour coding provided in **Table 28**. However, the mapping can be revisited by the design team based on the way a feature will be implemented or combined with other features. For example, in **Table 29**, *accomplishment* has a direct influence on the self-awareness and less influence on the social awareness. Consequently, the feature is most unlikely to create an opportunity for collaboration. However, associating *badges* as a form of accomplishment to certain tasks that require working with peers rather than self-control can indirectly influence social awareness (i.e. light grey). Hence, this can provide opportunities for collaborations.

Activity (6): The mapping of the features provided in **Table 29** is to signal any persuasive opportunities that need to be considered. For each feature, the designers may review the persuasive techniques list in **Table 36**. The document contains a list of persuasive techniques that are defined and explained with examples tailored for online peer groups.

Activity (7): The designers use the guidelines provided in the potential risks and network of trade-offs checklist (i.e. D.6) to analyse each feature and then decide how to eliminate or reduce its side-effects. The decision as to whether to include a feature or not depends on the evaluation of its impact, i.e. persuasive effect versus side-effects.

Activity (8): If the decision is not to include the feature, the designers assess the next item in **Table 29** and then repeat the activities 5, 6 and 7. If the designers decide to include the feature, the development team (i.e. designers, a counsellor(s), and end-users) work collaboratively to customise this feature. The customisation focuses on applying the adequate constraints that can ultimately reduce side-effects and increase persuasion effect. The constraints encompass four types that are mentioned earlier; visibility levels, usage restrictions, informational limitations, and time frame, see **section (8.2.4)** for more details.

Activity (9): This activity starts when all items in Table 7 are assessed. The designers use the nine heuristics principles in Table 8 to inspect the design of online peer groups and identify problems. Each principle has a definition and some explanatory examples.

If the problem is found in the design stage or the runtime (i.e. during actual use of the online platform such as emergent side-effects), the development team address it either by revisiting activity (8) to modify the constraints or by revisiting activity (4) to check if there is a feature that may reduce the problem negative effect. For example, if the design features and functionalities were found to encourage private relationships, some auditing features may need to be added to provide moderators with oversight. Overall, the development team should address as many problems as possible. Then, rate the compliance to each principle on a scale of 1-5 (1 being the lowest and 5 being the highest).

Adding or removing members from a group in the runtime is likely to cause changes in group dynamics. As such, the activity (3) should be revisited and only design decisions made on the basis of the social roles are to be reviewed. For example, there might be some features were eliminated due to the existence of specific peers in the design stage. These decisions can be re-assisted and perhaps enabled if they are found to be useful.

8.3.1 GUIDELINES

This section provides sets of guidelines that assist stakeholders to design platforms for online peer groups. Stakeholders might decide to address identified problems at two levels:

- Functional features level by adding, removing or replacing a feature. Also, by modifying the level of visibility.
- Group moderation level by utilising human elements, e.g. one-to-one counselling or adopting stricter governance style.

8.3.1.1 NETWORK OF TRADE-OFFS

This section provides a list of trade-offs related to some design concepts (**Table 34**). It is the role of the development team to handle these trade-offs based on their importance and their level of negative or positive impact on group work.

TABLE 34: NETWORK OF TRADE-OFFS

Anonymity		
facilitates	Building trust	+
encourages	Self-disclosure and emotional expression	+
increases	Alternative addictive experience (e.g. Negative habit forming)	-
increases	Romantic intimacy (acting out when separating online actions from identity)	-
Digital rewards/Gamification		
improve	User engagement	+

increases	Alternative addictive experience	-
usedAs	Quick fix to negative emotions	-
lowers	Self-esteem if competition element is used with users starting the rehab	-
Usage measurement		
discourages	Denial and refusal to admit the reality	+
leadsTo	False assertions if biased and non-standardised methods used	-
The power within a group (i.e. social status, which may refer here to longer period in a group)		
increases	Responsibility of senior peers to be role models	+
introduces	Social hierarchy within a group	-
violates	Equity Principle	-
Facilitating emotion expression		
reduces	Denial and defensiveness	+
abusedBy	Self-pitying individuals	-
Self-presentation (digital persona)		
improves	Gamified experience by enabling users to build online reputation	+
encourages	Persona maintenance	-
encourages	Self-promotion	-
provides	False self-esteem	-
Self-disclosure		
facilitates	Building trust	+
increases	Friendship intimacy	+
leadsTo	Romantic intimacy	-
Personal selection of goals		
increases	Commitment and consistency	+

leadsTo	Biased selection of goals (e.g. selecting easy goals)	-
Open and public groups (i.e. highest level of visibility)		
activates	Helper role (peers try to help those who join to learn, e.g. in contemplation stage)	+
leadsTo	Avoidance (focusing on others rather than self, which may lead to relapse)	-
discourages	Self-disclosure	-
Integrating users who are in the stabilisation stage to join group therapy		
provides	Emotional support environment for those in the stabilisation stage	+
provides	Hope installation and inspiring to those in stabilisation stage	+
provides	Norms maintenance (new peers follow established norms via observing senior peers)	+
activates	Helper role (senior peers feel empathy and try to support those in stabilisation stage)	+
leadsTo	Sabotaging group work if more than three peers in the stabilisation stage	-
reduces	Sense of belonging (new peers may feel less important and impact their self-esteem)	-
Enabling recovered addicts to join groups		
facilitate	Hope installation and inspiring recovering peers	+
encourages	Positive empathy of recovered addicts which help behavioural maintenance	+
initiates	Opinion dictation (controlling how others must behave causing intimidation)	-
Advocate and promote Helper role		
facilitate	Behavioural change maintenance for peers who provide help	+
encourages	Reciprocity (exchange help and support)	+
leadsTo	Avoidance (focusing on others rather than self, which triggers relapse symptoms)	-
canBe	Intimidating by making others nervous and less confident	-
Different customization based on social objects, treatment stages, etc.		
improves	The quality of different tasks and activities	+
violates	Consistency & standards heuristic principle	+

8.3.1.2 SOURCES OF SIDE-EFFECTS

Table 35 provides further guidelines that focus on highlighting sources of side-effects which designers need to eliminate. The designers take each source of concern and then skim through the functional features in **Table 29**.

TABLE 35: SOURCES OF SIDE EFFECTS

Design concerns	Sources of concerns
Lack of interest	Experience fails to engage (e.g. Leaderboard)
	Ineffective rewarding system
	Poor levelling design
	Willingness and readiness to change
Biased decisions	Downward social comparisons
	Self-set goals
	Denial of reality
	Past experience and performance influence
	Flight into health
Lowering self-esteem	Peer-pressure
	Upward social comparisons
	Low sense of self-efficacy
	Assigning to non-matched groups
Creating misconceptions	Unreliable addiction scoring
	Minimising the seriousness of the addiction
	Providing non-stage matched interventions
Lack of trust	Unreliable addiction scoring
	Lack of transparency
	Lack of verifiability
Creating addictive experience	Pull and push feedback approaches
	Gamified experience
	Creating pre-occupation
	Poor stimulus control
User	Obtrusiveness

experience impact	Distraction
	Coercive techniques
	Affecting workflow
	Lack of requirements negotiations
	Neglect personalised experience
Unsustainable change	Social elements (e.g. conformity effect)
	Losing interest
Self-image impact	Labelling as addict
	Experiencing relapse

8.3.1.3 *PERSUASIVE TECHNIQUES*

This section provides a list of persuasive techniques which can be tailored and implemented in the design of the online peer support group. The persuasive techniques list in **Table 36** was adopted from (Oinas-Kukkonen and Harjumaa 2009). Some of the exemplar implementations were tailored for online peer groups.

The thesis starts from a main premise which argues that all persuasive techniques may appear to be positive regardless any side-effects may emerge at run-time. In other words, there might be no clear criteria for a development team to decide what should be implemented in a system and, also, what are the things needed to be made customizable. Therefore, as a general benchmark, it is recommended that persuasive techniques should be decided later when a better understanding of the system environment is formed.

TABLE 36: PERSUASIVE TECHNIQUES ADOPTED FROM (OINAS-KUKKONEN AND HARJUMAA 2009)

Principle	Exemplar implementation
Primary Task Support	
Reduction: “A system that reduces complex behaviour into simple tasks helps users to perform the target behaviour, and it may increase the benefit/cost ratio of behaviour”	A system monitor usage and lists most addictive social software features. E.g. most excessively used features on Facebook.
Tunnelling: “Using the system to guide users through a process or experience provides opportunities to persuade along the way”	A system offers information about treatment opportunities after a user has taken an interactive test to measure addiction level to digital technology.
Tailoring: “Information provided by the system will be more persuasive if it is tailored to the potential needs, interests, personality, usage context, or other factors relevant to a user group”	A system provides different information content for different user groups. E.g. a senior peer may receive content differs from what new peers may receive.
Personalization: “A system that offers personalised content or services has a greater capability for persuasion”	A system presents most relevant arguments first rather than in random order.
Self-monitoring: “A system that keeps tracking performance or status will support a user in achieving goals”	A system presents smartphone usage statistics.
Simulation: “A system that provides simulations can persuade by enabling users to observe immediately the link between cause and effect”	Before-and-after stories of people who have gained control over their urges.
Rehearsal: “A system providing means with which to rehearse a behaviour can enable users to change their attitudes or behaviour in the real world”	A simulator to help a user practising how to deal with seemingly irrelevant decisions (SIDs). SID’s are the poor judgements addicts make which lead them to sabotage their recovery. For example: Going to the local supermarket without deciding what to buy, so an addict is carrying too much money. Then, using checkout where the alcohol is sold, and then being triggered, developing an urge to purchase.
Dialogue Support	
Praise: “By offering praise, a system can make users more open to persuasion”	A system aims at motivating users to reduce their usage praises top three users in the Leaderboard.
Rewards: “Systems that reward target behaviours may have great persuasive powers”	A system gives users a virtual trophy or avatars if they follow their program or achieved their goals.
Reminders: “If a system reminds users of their target behaviour, the users will more likely achieve their goals”	A system sends text messages to remind users about their daily usage limit.
Suggestion: “Systems offering fitting suggestions will have greater persuasive powers”	A system suggests relevant activities instead of spending leisure time social media.
Similarity: “People are more readily persuaded through systems that remind them of themselves in meaningful way”	Slang names are used in a system which aims at motivating teenagers to exercise or engage in more healthy habits.

Liking: “A system that is visually attractive for its users is likely to be more persuasive”	A system that aims at encouraging parents to spend more time with their kids rather than on social media may use attractive pictures of kids playing at parks.
Social role: “If a system adopts a social role, users will more likely use it for persuasive purposes”	A system has a virtual specialist to support communication between users and health specialists.
Social support	
Social learning: “A person will be more motivated to perform a target behaviour if (s)he can use a system to observe others performing the behaviour”	A system can help users to observe how recovered peers are planning their goals and managing their digital life.
Social comparison: “System users will have a greater motivation to perform the target behaviour if they can compare their performance with the performance of others.”	Users can share and compare information related to their digital usage.
Normative influence: “A system can leverage normative influence or peer pressure to increase the likelihood that a person will adopt a target behaviour”	A system enables peer monitoring, i.e. surveillance.
Social facilitation: “System users are more likely to perform target behaviour if they discern via the system that others are performing the behaviour along with them”	A system can help users to recognise how many peers are doing shared computer-based activities at the same time.
Cooperation: “A system can motivate users to adopt a target attitude or behaviour by leveraging human beings’ natural drive to cooperate”	A system enables users to collaborate in order suggest SMART goal for a user instead of self-selection
Competition: “A system can motivate users to adopt a target attitude or behaviour by leveraging human beings’ natural drive to compete”	Online competition, such as Quit and Win (reduce usage to a challenging limit for a month and win a prize)
Recognition: “By offering public recognition for an individual or group, a system can increase the likelihood that a person/group will adopt a target behaviour”	Names of awarded people, such as “a user of the week” are published on the system. Or, Personal stories of the people who have succeeded in their goal behaviour are published on the system.
System Credibility Support	
Trustworthiness: “A system that is viewed as trustworthy will have increased powers of persuasion”	A system provides information related the risks of some social media applications rather than simply providing biased advertising or marketing information of other apps.
Expertise: “A system that is viewed as incorporating expertise will have increased powers of persuasion”	A system provides information about the moderators’ level of experience.
Surface credibility: “People make initial assessments of the system credibility based on a first-hand inspection”	A system should have a limited number of advertisements on the system and for logical reasons only.
Real-world feel: “A system that highlights people or organization behind its content or services will have more credibility”	A system provides possibilities to contact specific people through sending feedback or asking questions.
Authority: “A system that leverages roles of authority will have enhanced powers of persuasion”	A system quotes an authoritative body, such as a statement by government health officials.

Third-party endorsements: “Third-party endorsements, especially from well-known and respected sources, boost perceptions on system credibility”	A system shows a logo of a certificate that assures that they use secure connections or refers to its reward for high usability and privacy.
Verifiability: “Credibility perceptions will be enhanced if a system makes it easy to verify the accuracy of site content via outside sources”	Claims on the system are supported by offering links to creditable websites.

8.3.1.4 HEURISTIC PRINCIPLES

This section list nine heuristic principles proposed for designing effective online peer groups platforms for addictive behaviours (see **Table 37**). Each principle includes a definition and exemplar cases. These principles are used to inspect the design by identifying problems. A development team is expected to walk through the design decisions using these principles to identify violations of the heuristics and to assess their severity.

TABLE 37: HEURISTIC PRINCIPLES FOR INSPECTING ONLINE PEER GROUPS DESIGNS

Principles
<p>Principle 1: Social equality rather than hierarchy</p> <p>Users enjoy a more democratic atmosphere where privileged positions are not explicit in group interactions. The system should boost the equity principle and give users the freedom to interact without pressure from higher-status peers.</p> <ul style="list-style-type: none"> • Avoid implementing features for earning social status, e.g. number of “followers” which leads to social hierarchy.
<p>Principle 2: Instinct to survive</p> <p>Confrontational communication is an inherent feature of any addiction rehab modality. However, the system should minimise triggering justification, defensiveness and denial attitude which are universal traits among addicts.</p> <ul style="list-style-type: none"> • Take objective stance by providing fact-based messages (e.g. usage frequency) to break through denial. • Use plural pronouns "We" in messages that have negative connotations to reduce fear and to give a sense of belonging, support and empathy. The singular pronoun "I" may be used for self-judgment. • Avoid sharp loss of points may trigger the feeling of "nothing is working!" or “this is not for me!”.

Principle 3: Encourage collaborative decision making

Users might experience unconscious bias in selecting among alternatives that require willpower. The system should facilitate group's collaborative decision to balance ownership and productivity.

- Enable users to choose visualisation format of their performance. However, goals setting is better to be selected by group members.

Principle 4: Focus on the self

The system should help users to focus on the self rather than walking others' programme. Also, avoid interactions that change priorities and shift the focus away from self-improvement.

- The system should be a mechanism to focus on the self rather than to socialise with others
- Economise surveillance.
- Do not emphasise peers' evaluation to reduce self-avoidance as users more reluctant to discuss personal issues.
- Allow users to comment on others' tasks if they are relevant to their group work only.

Principle 5: Prevent selective and optimised self-presentation

On social situations, users often try to showcase themselves to influence others perception and to aim a specific impression. The system should discourage the motive of self-presentation and use the true-self.

- Profile feature in Twitter has less emphasis on self-presentation. Facebook, on the other hand, enables associating pictures and attitude statements to the personal profile.
- While groups can be provided with more freedom to feature their positive ideology, individuals should not be encouraged to do so.
- Avoid enabling users to keep updating their profile pictures.

Principle 6: Eliminate private relationships and subgroups

Users worry about others more than the self to escape personal feeling and thoughts. The system should avoid interactions that facilitate one-to-one relationships.

- The system should detect users who intentionally like posts of a specific person when it is a tactic to drag attention. Such interaction may lead to romance as a way of easing the pain.
- Avoid private communication which may lead to one-to-one relationships (e.g. add friend and poke).
- Users should not be enabled to self-select who they would like to see their progress, goals, badges, etc.

Principle 7: Learning before doing

Users require reasonable time and tasks that match their current treatment level. The system should always start with learning-oriented tasks, goals, and actions.

- The system may add competition elements only in the later stages of treatment. This is to allow time for individual stabilisation, and group development, norms and cohesion. In the early stages, users may also lack adequate coping skills.

Principle 8: Encourage user self-labelling and personalization

The system should use self-labelling for behaviours that their effect remains within the individual level to increase relevance and memorability.

- Offer options for users to re-phrase messages in the way that describe their behaviours.
- For behaviours that will be seen by others, self-labelling may be manipulated to maintain reputation and self-image.

Principle 9: Emphasis dispositional attribution

The system should persuade users to always relate the responsibility to individual factors rather than external factors.

- “Consequences” as a term stresses personal choice, while “punishment” diverts the attention away from self-responsibility.
- Assessment of an individual’s low-quality performance should start with addressing personal causes, while user relocation can be the last remedy.
- Evaluating what members add to a group rather than what the group adds to them. For example, the system may reduce the features users can use to judge qualities of the activity (e.g. suitability and difficulty) and focus on evaluating members' performance in that activity.

8.4 CHAPTER SUMMARY

This chapter presents COPE.er method and describes its reference architecture which outlines the main components needed when designing online peer group platforms to regulate DA. The chapter also presents the supported artefacts, followed by the method workflow. The proposed method provides a systematic approach to the design of online peer groups platforms to combat DA and minimize the potential for negative counterproductive interactions and group governance styles. The solution deals with users who are willing to adjust their usage style and still at the stage of moderate addiction.

9. CHAPTER 9: COPE.ER EVALUATION

The COPE.er is a method that provides a guide to design and customise online peer groups platforms. A method can be defined as “*an approach to perform a systems development project, based on a specific way of thinking, consisting of directions and rules, structured in a systematic way in development activities with corresponding development products*” (Brinkkemper 1996).

The COPE.er aims at increasing the probability of having successful design management for online platforms that host peer groups. Given the limited knowledge and practical experience in designing for regulating addictive behaviours, creating an effective design would be a challenging aim to achieve. Also, this would require longitudinal experimental studies, i.e. repeated observations on the same subjects to assess long-term changes and whether to attribute that to the design. For the scope of this thesis, the method will be evaluated from the perspective of its role in guiding and facilitating the design process and supporting it with questions, principles and heuristics to enrich frame of reference of the design team. The evaluation is based on a qualitative case study and is focussed on building a confidence on the method constructs and assessing if the method covers what stakeholders require to manage the design process and the extent COPE.er enrich their decisions and design stages. This chapter will attempt to achieve **objective 5** by evaluating the proposed engineering method.

9.1 RESEARCH STUDY AIM

The aim of the study is to assess the extent to which the method provides an enhanced customisation process for designing such online platforms. Also, to identify the strength and weakness of the method in terms of the:

- **Understandability** by assessing the extent the method is easy to grasp whether the provided tools are useful and straightforward to understand.
- **Comprehensiveness** by assessing the extent to which the method covers different activities needed in the design process.

- *Appropriateness* by assessing the applicability of the method to the process of designing for the online space for peer groups and its ability to support the design team to incorporate various good practises.
- *Usefulness* by evaluating how the method facilitates and enhances the communication and exchange of information during the design process and how it regulates the involvement of the end-users who potentially experience problematic usage of digital media as well as the participation and role of the practitioners.

9.2 RESEARCH STUDY STRATEGY

The thesis consulted the literature to seek further understanding of the classification of the design methods to identify the evaluation perspective and the required evaluation activities.

9.2.1 METHODS STAGES

Jones (1992) provided a classification to understand the stages of the design methods. A design method goes through three stages:

- **Divergence:** at this stage, the boundary of a design situation is still open, objectives are still not fixed, evaluation can be delayed, such as in "brainstorming". Also, efforts are still required to explore limitations and paradoxes, and to escape conventional assumptions.
- **Transformation:** at this stage, most of the uncertainties in the previous stage are addressed. The focus will be more about the secondary goals and selecting features with more mature understanding of the consequences may arise from that.
- **Convergence:** at this advanced stage, the problem is expected to be defined, and the variables to be identified. The next goal is to reduce the secondary uncertainties.

The COPE.er method incorporates the space of alternatives and design choices which would emerge in the first and second stage and offers the mechanisms and the process required to

converge them. As such, the method processes are mainly for the last stage. Thus, the evaluation section will concern mainly the third and partially the second stage.

At the third stage, all critical sub-problems are expected to be anticipated and addressed (Jones 1992). In this thesis, such problems refer to the critical side-effects which may not only fail to enhance users' awareness but could also cause further harm. In convergence stage, models should be less abstract and more detailed. As such, the COPE.er aims at providing the development teams with step-by-step instructions on how the customisation should be performed and what questions should be answered.

Two opposed strategies can be applied in the convergence stage: *out-in* and *in-out*. The *out-in* strategy is when a designer proceeds from external to internal attributes, meaning that generic forms and tools are filtered out and personalised to fit the local phenomenon within a particular setting (group) to which the method is applied (Jones 1992). Also, the COPE.er method encourages the design process to consider aspects relevant to the design environment (*out-in*), e.g. treatment stages, potential negative triggers, and group involvement to tailor the design. Also, the COPE.er offers a guide on how the interaction environment should be tailored to the groups' needs, attitudes and limitations in addition to a set of tools to evaluate that (*in-out*). As such, COPE.er is taking into account both the *in-out* and *out-in* strategy.

Jones (1992) provided some example methods that belong to the convergence stage. Among these methods, COPE.er shares the same aims of *Checklists* and *Selecting Criteria* methods. Checklists aim at helping designers to utilise the documented knowledge about the requirements of similar design situations. The documented knowledge can be formulated in a list of questions to guide the evaluation of the design or the design thinking in general. Typically, methods belong to the *Checklists* strategy are expected to direct the designers thinking towards a specific way of thinking. This may be perceived as a danger when a large margin of creativity is required. However, this is not the case with the situation that COPE.er addresses where users should be exposed to a similar interaction environment but with more constraints and guidance as a way of encouraging self-improvement, i.e. similar to the tunnelling technique in persuasive technology

(Fogg 2002). In addition, COPE.er utilises the well-established model of Gorski and summarises good practices from the traditional relapse treatments so such checklist is expected to be sufficient enough and the margin for creativity and out-of-box thinking would be minimal and perhaps discouraged for such a domain unless for research purposes.

The *Selecting Criteria* methods, on the other hand, aims to evaluate the extent to which a design is acceptable based on given criteria. In this category of methods, objectives should be stated, and then the provided criteria should help to assess if a design can satisfy those objectives. Trading-off between objectives is a common analysis in approaches belong to the *selecting criteria* methods.

In the light of the above discussions, certain evaluation plans to collect descriptive answers, such as recruiting experts in a focus group session to walk them through the method (moderator-led) to refine it with a set of prepared questions would be avoided. Such methods rely on the opinions of experts who inspect the proposed method to draw some conclusions.

In fact, taking into account the methods the belong to the convergence stage, e.g. *Checklists* and *Selecting Criteria* (Jones 1992), the COPE.er should be evaluated taking evaluative strand. In other words, the proposed method should be evaluated while it is used to design and assess a given “case” (designers-led). This will help to evaluate the overall quality of the method and to synthesise data collected from the evaluation activity.

9.2.2 METHODS TYPES

Kitchenham et al. (1997) classified methods into a **generic** “*paradigm for some aspects of software development*”, a **specific** such as “*an approach within a generic paradigm*”, and a **tool** which is “*an application that supports a well-defined activity*”.

At the paradigm level, the COPE.er method follows a participatory approach. Hence, it can be seen as a specific method that belongs to participatory design (PD) which is considered a generic methodological framework. As outlined in **chapter 2 – section (2.5.7.2)** of, PD has three stages *exploration, discovery* and *prototyping*:

- **Exploration** by taking a bottom-up approach. The researcher made frequent visits to the treatment centre and conducted observational and interviews exercises during the normal work day.
- Heavily interactive **discovery** activities. It was performed with the clients and the addiction counsellors of the treatment centre to identify principal concepts in the peer groups.
- **Iterative prototyping**. This stage will be performed in the actual evaluation of the COPE.er method to iteratively shaping the design artefacts in terms of having a proof of principle to capture and refine users' needs in the operational context, assess the appropriateness of the design decisions, and explore design issues. All these activities will be performed in a way to promote communication between those involved in the design activity.

The COPE.er can be mapped to the prototyping stage where a design is expected to be iteratively revised on three levels: i) while reviewing the network-of-trade-offs, ii) while analysing user experience concerns, and iii) while walking through the heuristic principles.

The first two stages of the PD were already done while devising the COPE.er and then embedded in the proposed artefacts to cover the possible variability space. However, the additions and refinement that may emerge in the prototyping stage will not be excluded.

9.2.3 EVALUATION TYPES FOR ENGINEERING METHODS

Evaluations can lead to different conclusions based on the context of the evaluation activity itself (Kitchenham 1996). The context here refers to wide range of factors including the properties of the organisation and those who will participate in the evaluation process, i.e. different people have different knowledge and understanding. Based on the research approaches (i.e. inductive and deductive), Kitchenham et al. (1996) classified the evaluation activity into three main types:

- **Objective evaluation:** Identifying the benefits to the design activity by measuring effects quantitatively, e.g. reducing time and cost.
- **Subjective evaluation:** Qualitatively assessing the fitness of the method and its features to the needs and the environment of the organisation, e.g. training requirements.
- **Hybrid evaluation:** utilising both objective and subjective evaluations in the assessment exercises.

Also, Kitchenham et al. (1996) proposed another dimension to the evaluation which focuses on the methods that will be used in the evaluation exercise. These methods can be applied to both objectives and subjective evaluations.

- **Formal experiment:** Participants perform task(s) using the features of the method and the collected data to be statistically analysed usually in a comparative way or to verify hypotheses.
- **Case Study:** The method is applied to a real project in a real-world context and the outcomes to be evaluated using the standards and procedures of the same project.
- **Survey:** Collect statistical inferences from organisations that have used other methods or tools and have experience in the domain where the method is meant to work.

9.3 THE RATIONALE OF THE EVALUATION STUDY DESIGN

The thesis will conduct a case study to try the method in a natural setting in terms of the design process and the types of stakeholders involved, i.e. end-users, practitioners and designers with a relevant professional background. The case study approach will enable the evaluation team:

- To apply a holistic analysis – in the sense of multidisciplinary view – on the method. The evaluation team will include participants from different disciplines.

- To collect reactions and reflections on the use of the developed artefacts by putting them in practice. This is to find out how they can be improved and whether more materials are needed to increase their quality.
- To investigate how the participatory approach will contribute to the outcomes of the design process itself. The thesis hypothesises that the method will yield better results when it is utilised in a collaborative environment, e.g. focus group. Also, to understand the dilemma of involving end-users in the design process and the concerns may arise due to the potential biased choices.

The case study approach would yield concrete hypothesis and knowledge to be tested on more quantitative approaches in future work. As a new method, the case study strategy would help to gain a rich understanding of the context of the design process and various aspects that could hinder or facilitate applying the method activities to the given case. The sacrifice made here is the limited depth such method enables the evaluation to be at. However, as a first evaluation, the knowledge obtained will be the basis for narrower and more focused testing of particular aspects of the method and their optimisation. Hence, the evaluation will focus on the labelled parts of the reference architecture provided in **chapter 8 – Figure 31**. These are:

- (A) **Participating in the design**: How will the method and its artefacts guide the involvement of users in the design activity?
- (B) **Social objects**: How will the social objects influence the decision-making processes?
- (C) **Social roles**: How will the list of social roles influence the decision-making processes?
- (D) **Functional features**: How will the previous parts (i.e. A, B and C) influence the customisation activity of the features and functionalities of the interaction environment?

- (E) **Constraints**: How the provided guidelines influence design decisions?
- (F) **Persuasive technology**: How will the development team utilise the persuasive techniques when using the method and its artefacts?

9.4 RESEARCH STUDY METHOD

The evaluation study was divided into two stages:

- **Stage one**: validate the findings and the materials developed after performing the observational studies in **chapter 7**.
- **Stage two**: this stage consists of two phases. These phases are comparative, meaning that they had the same goals but with different tools to facilitate comparison analysis.
 - Phase one: evaluate the design process without the aid of the COPE.er method.
 - Phase two: re-design the online platform with the guide of the COPE.er method.

9.4.1 STAGE 1: EXPERT CHECKING

This stage was focused on the verification of the concepts collected from the observation studies. The researcher utilised an expert's knowledge by walking a subject matter expert through the findings obtained to verify and refine the concepts and to draw some conclusions. The aim of this stage was to find out if the artefacts are ready to be evaluated and to address flaws before starting the case study.

The study recruited an expert to perform the validation for two reasons. Firstly, the study is more concerned with the addiction counsellor knowledge who will be needed to interpret the findings. Secondly, recruiting the clients who were observed in the rehab centre to 'member-check' the findings may result in potential discrepancies if the evaluation exercise was repeated with other members. Therefore, the researcher recruited the addiction counsellor who was

moderating all the observed sessions to ‘expert-check’ the findings. Expert-checking, in this case, still belongs to the member checking method as the counsellor was a member of all the observed sessions.

The addiction counsellor (i.e. the expert member) had 13 years of experience in different rehab centres and also possesses a professional and experiential knowledge in this field. This is to ensure that the results are valid, reliable and can be replicated. Also, that threat of potential discrepancies is highly associated with validating interpretations of personal reactions, perceptions, attitudes, goals and perhaps social judgements. However, these aspects were not the focus of the research.

9.4.1.1 EXERCISE STEPS

The addiction counsellor was provided with a document that outlined all concepts relevant to the observation study of the face-to-face peer groups. This document had four artefacts:

- *Artefact 1*: The *roles* users may play within peer groups (**chapter 8 – Table 23**).
- *Artefact 2*: The *social objects* users may perform within peer groups (**chapter 8 – Table 24**).
- *Artefact 3*: The *network of trade-offs* which include design and behavioural concepts, and their paradoxical effects on different aspects of the groups (**chapter 8 – Tables 34 and 35**).
- *Artefact 4*: The *heuristic principles* to consider when designing online peer groups (**chapter 8 – Table 37**).

The *Artefact 5*, which is the COPE.er building blocks, which guide and remind designers of the influence of the software features on users’ interactions, was not included as this requires software engineering expertise and dialogue between software engineers and rehab experts. Hence, it was validated in the second phase of stage two, see **section (9.4.2.6)**.

For each artefact, the addiction counsellor was asked to declare the level of agreement by evaluating each given item using a 3-point Likert scale (agree, neutral and disagree). During this walkthrough exercise, the counsellor was asked to follow the think-aloud protocol to allow prompting additional information and to gather more objective insights. This also helped to evaluate the language used to describe each item in the given materials. The data collected from the observational study of the online peer groups were also embedded in the above-mentioned artefacts for a more comprehensive validation.

9.4.2 STAGE 2: CASE STUDY

The researcher performed a *comparative* evaluation by dividing this stage into two phases.

- **Phase one** involves designing an online platform for peer groups for the case study. The goal of this phase was to investigate how the participants collaborate to design a valid and an adequate platform for the given clients in the case study. The participants during this phase were not provided with the COPE.er method.
- **Phase two** has the same goal of phase one but with the aid of the COPE.er method.

9.4.2.1 SAMPLING

This study required a specific set of participants who can play different roles in the case study. In general, the COPE.er method is expected to be used by development teams that are consisting of three types of stakeholders, i) designers who are experts in the technical side including social software design, software development and HCI, ii) a practitioner who possess the needed psychological background, and iii) representative set of people with DA who would like to use the technology when developed.

As such, the study adopted the convenience sampling technique via announcing the study through the mailing list of students and staff within the research group (involving both Computing and Psychology departments) and also through communicating with two addiction recovery charities in the UK. For participants who were to play the role of peer groups members, an adapted version of the CAGE questionnaire (Ewing 1984) which fits the properties and remit of DA was

utilised as a screening tool. For end-users to be selected, the research required having two affirmative responses out of six as an inclusion criterion. The designers and counsellors were invited based on their expertise via a convince sampling. **Tables 38** and **39**, show the characteristics of the research study sample. The ethical documents can be found in (**Appendix 5 Part 2**).

TABLE 38: THE BACKGROUND OF THE PARTICIPANTS

Participants	Age group	Gender	Field of study	Years of experience	Assigned Role
P1	30-40	Male	Computing	13	Designer
P2	30-40	Male	Computing	8	Designer
P3	30-40	Male	Computing	5	Designer
P4	30-40	Female	Computing	5	Designer
P5	40-50	Male	Psychology	17	Practitioner
P6	20-30	Male	Computing	-	End-user
P7	20-30	Male	Computing	-	End-user
P8	20-30	Female	Computing	-	End-user

TABLE 39: THE PARTICIPANTS' FAMILIARITY WITH RELEVANT TOPICS

Participant s	Designing for behavioural change					Behavioural addiction					Human Computer Interaction					Social informatics					User involvement				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
P1				•					•						•					•					•
P2					•					•					•					•					•
P3				•				•						•					•					•	
P4			•						•					•				•						•	
P5					•				•				•						•					•	
P6				•					•						•				•						•
P7			•						•						•				•						•
P8		•						•					•					•					•		

The questionnaire was based on the Likert scale which can be interpreted as follows:
 (1) Very Poor (2) Poor (3) Fair (4) Good (5) Very Good. These cells represent the 5-points Likert scale,
 and the dots show the participants' responses.

9.4.2.2 CASE STUDY SCENARIO

The case study was conducted jointly with a residential rehab centre in the UK. For more information about the centre refer to **chapter 7 – section 7.4.1**. The Rehabscene (a fictional name) is a rehabilitation centre that offers inpatient residential care for patients suffering from substance addiction (including drugs and alcohol) and behavioural addiction (including gambling and sex). The centre provides face-to-face groups support and counselling. The management of the centre wants to extend their outreach to offer online help. Their goal is to increase treatment options by offering online help to those suffering from a problematic use of digital media as well. This is, also, to extend their help and offer online support to those in remote areas. This new service is based on four premises:

- Help seekers with such issue can get help via similar technological means, i.e. an online social platform.
- The major difference in the services that will be offered online is the characteristics of the potential clients. In the rehab centre, services are normally offered to those with severe cases. The severity here refers to the extent of consequences on the individuals' life and people around them. In the online platform, the services will be limited to those with moderate and mild issues as severe cases require more inpatient care.
- It is unrealistic to assume that help seekers will completely go off-the-grid and function without the support of digital technology. Indeed, it is more effective to provide them with a learning platform that has similar digital nature. Thus, help seekers are carefully exposed to similar technology that is designed with care to help them gradually gaining control over the behaviour in comparable settings.
- It is an inexpensive approach in comparison to the centre residential and intensive care.

The Rehabscene centre strategy is to open a new unit where clients can register to join face-to-face induction sessions for one week first. Then, they will be registered to join an online

programme and carry on the treatment via the online platform. This research assumes that the centre will design an induction programme for potential clients. During the induction programme which can take a week, the treatment team is expected to run some assessments and tutorials to teach their clients and prepare them for using the online system. The induction week will also provide the Rehabscene with an opportunity to form a good understanding about the clients' behaviours within groups before assigning them to an online group which should be carefully customised to suits their needs, usage styles and other group aspects.

Delivering their services via computer-based systems may yield different types of challenges. The scope of this study was narrowed down to the design challenges the method tries to address and what refinement can be applied.

9.4.2.3 THE DESCRIPTION OF PEER GROUP MEMBERS

The participants were given a peer group of six fictional patients of a rehab centre with DA problem to create a prototype that caters for their treatment needs. These six fictional patients were created to act as personas that encapsulate different types of behaviours of users who might use the system. Personas are typically defined as a representation of fictional characters that are developed depending on actual users' data to represent different types of users in the design process (Lidwell et al. 2010).

The given six fictional group members (personas) were developed based on the actual data obtained from the qualitative studies conducted throughout this thesis, and they mainly cover the aspects and roles described in **chapter 8 –Table 23**.

Client one (Adam): Adam is a company worker and 27-years-old. He joined Rehabscene six weeks ago. **The Digital usage:** Adam spends many hours on Facebook. He updates his status and profile picture regularly. He feels anxious waiting for his friends' positive reactions to his updates. He acknowledged that on the social media he tries to look sociable and a happy person regardless of the real feelings. He believes his usage is at an acceptable level. His parents criticise his usage, and therefore he tends to decrease that only when they are home. He describes his primary motivations as self-presentation, passing time and maintaining old ties. **The practitioner's notes**

based on the induction week: *“Adam is a quiet person. He tends to stay in his room and avoid his peers and the group work. He gets angry and very annoyed when he is criticised about his behaviours including digital usage in general”*.

Client Two (Tim): Tim is a college student and 20-years-old. He joined Rehabscene two months ago. **The Digital usage:** Tim’s university grades are very unsatisfactory. One reason could be the considerable amount of time he spends on the social media. He rarely leaves his mobile and describes it as a huge part of his daily life. Tim spends many hours chatting with his friends on the Instagram and Twitter. His habitual checking behaviours affect his sleeping pattern. He often feels that he cannot control his usage and always feels guilty as it affects his academic performance. He has very few friends in real life and rarely hangs out with them. However, he has more than five thousand followers on Twitter and hundreds on Instagram. He spends most of his time tweeting and replying to his followers. Time describes his primary motivations as online companionship and self-expression. He has pointed that he has preoccupation issues even when doing normal household chores. **The practitioner’s notes based on the induction week:** *“Tim is a very kind person with his peers in the group. He cannot see his peers going emotional or crying without trying to calm them down immediately”*.

Client Three (Emily): Emily is a school teacher and 42-years-old. She joined Rehabscene four days ago. **The Digital usage:** Emily describes herself as a social media addict. She spends most of her free time on Facebook. She thinks life without Facebook would be a bit boring. She describes her primary motivations as forming relationships and meeting new people. She agrees with her friends and family that she suffers a loss of concentration. She believes that her overuse of Facebook plays a role. As such, she seeks professional help. **The practitioner’s notes based on the induction week:** *“Emily is a shy person and quickly become depressed. Although her main account was monitored as a part of the treatment protocol, her practitioner discovered that she had faked another Facebook account for relationship adventures”*.

Client Four (Katie): Katie is a university student and 23-years-old. She joined Rehabscene two weeks ago. **The Digital usage:** Katie spends most of her time on the Internet. To share her daily

activities, she uses Instagram more than any other application. She feels thrilled right after posting things waiting for reactions, especially cheering comments). She jumps from application to another, e.g. Facebook, Snapchat and YouTube for entertainment. She describes her primary motivations as social comparisons, photographs, and social presence. Katie feels uncomfortable around others and always try to stay alone with her mobile. **The practitioner's notes based on the induction week:** *“Katie has some preoccupation issues and apparent withdrawal symptoms. Katie always overwhelmed when interacting with peers in the group. She mentioned in the one-to-one counselling that the Internet used to be a quick fix to her emotions. Katie has an issue of comparing herself with others negatively. Thus, she needs to focus on building self-confidence”*.

Client Five (Matthew): Matthew is a self-employed and 33-years-old. He joined Rehabscene four days ago. **The Digital usage:** Matthew is an excessive user of online gaming especially Massively Multiplayer Role-Playing Games (MMORPGs). His social interactions are very limited to those he meets while playing online. Most of the games he plays involve a high level of participation as well as building up a virtual character. Those two factors demand time and commitment. He prefers meeting his friends via this medium. He gets intimidated when someone criticises his usage. **The practitioner's notes based on the induction week:** *“Matthew is having some withdrawal symptoms. He believes that no one likes him in the group. Sometimes, he provokes confrontational discussions with his peers. He resists accepting his responsibility to the problems he is involved in. He always points the finger at others. He always starts paying attention once the group starts playing games and some activities. He also gets into the winning mood and sometimes he gets angry and nervous”*.

Client Six (Sophia): She is a mother and works as a nurse. She is 46-years-old. She joined Rehabscene six weeks ago. **The Digital usage:** Sophia describes herself as a social media addict. She usually posts a few numbers of tweets but excessively retweets others' posts. She is heavily engaged in discussions with others' topics. She has a very few number of followers but following hundreds on the Twitter. She cannot resist the urge to keep checking her twitter account. She has developed Fear of Missing Out (FOMO) behaviours. **The practitioner's notes based on the**

induction week: *“Sophia is progressing well in her treatment. She is a sociable person. In the rehab group, she likes to lead more than to follow. She usually offers help to others. At times, she can be argumentative and does not quite listen to others’ opinions. She always asks others about their feelings and how they progress in the treatment and judge others’ behaviours as well”.*

9.4.2.4 GENERAL PROCEDURES FOR THE EVALUATION

In both phases, the researcher provided a set of six general guidelines to collect better insights on how decisions are made with and without the COPE.er method. These guidelines are:

- The participants are required to read the description of each client in **section 9.4.2.3**) and try to identify social roles, usage styles, general behaviours and any other aspects may have an influence on the design in terms of what features should/should not be offered to the group and how to configure them.
- The COPE.er method is expected to be mainly used by designers with the involvement of end-users and practitioner(s), i.e. a designer-led activity.
- All participants were informed about who will be involved in the session and what are the assigned roles.
- In the first phase, the designers are expected to lead the process and try to involve and utilise other participants the way the designers see appropriate. In the second phase, some guidance on how to involve and utilise them will be offered, see **Appendix 5 Part 2**.
- Participants who were assigned to play the role of end-users were given the six members stories three days in advance. They were asked to read the description of each client and select one to role play it in both phases. They were also asked to read the descriptions of the selected members and try to simulate the effects that the addiction had on their daily life. They were also asked to be prepared for any question the designers or the practitioner may ask.

- The participants were provided with interfaces mock-ups (see **Figure 34**) to facilitate the discussions. The interfaces depicted an initial prototype for an online peer groups platform (the rest of the mock-ups can be found in **Appendix 5 Part 4**).

During the evaluation, the following set of questions were examined. Some of them were asked during the sessions and others were utilised as a guide for the researcher to try to find answers during the actual evaluation.

- In what way did the method impact the design process? Why?
- What challenges did participants face when using the method? Why?
- How did the participants find the sequence and transition between the steps of the method?
- Are there steps/situations where participants felt the involvement of the practitioner and end-users were needed? What were they? Why?
- What do participants suggest to improve the method and its artefacts?

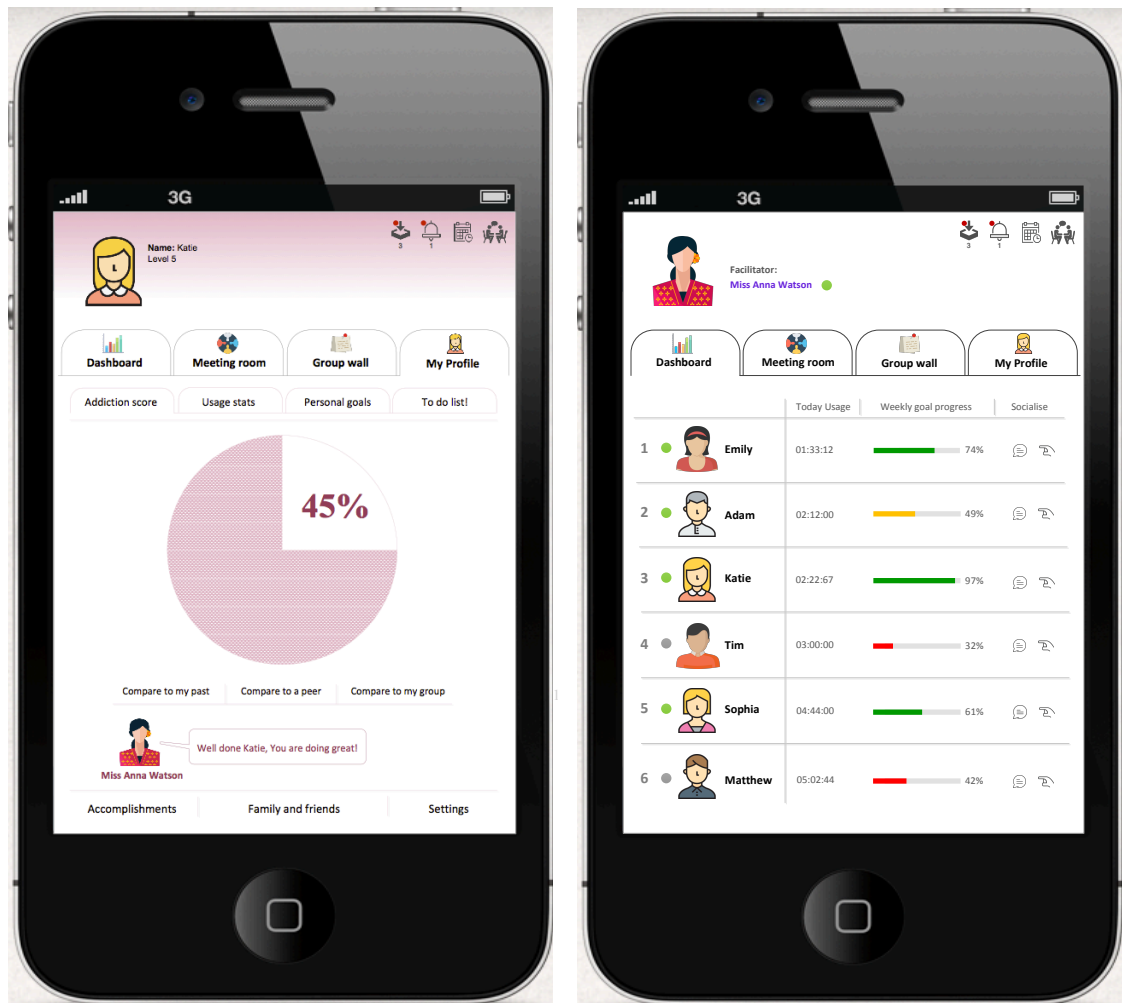


FIGURE 34: MOCK-UP INTERFACES

9.4.2.5 PHASE ONE: 1ST DESIGN ACTIVITY

This phase started with participants’ preparation to explain the evaluation procedures. The moderator, which was the researcher, presented a quick introduction to the topic of the research, i.e. online peer groups as a motivational approach to regulating digital usage. Next, the moderator introduced the proposed reference architecture in **chapter 8 – Figure 31** to provide an overall understanding of designing for regulating digital media usage, followed by introducing the purpose and focus of the evaluation study.

The development team was provided with a document highlighting the aspects that may help them to scope their analysis (see **Appendix 6 Part 3**). These aspects were social roles, social objects and the Honeycomb framework proposed by Kietzmann et al. (2011). The participants were taught what each aspect means but without providing them with the actual artefacts and

heuristics. Also, they were free to suggest any other aspects they think may help in the design activity.

After these preparation steps, the case study and design tasks were provided. Then, those who played the role of designers were asked to lead the design process. However, at this stage, no permissions were given over the design activities, see **Figure 35**. This phase protocol is illustrated in **Figure 36**.

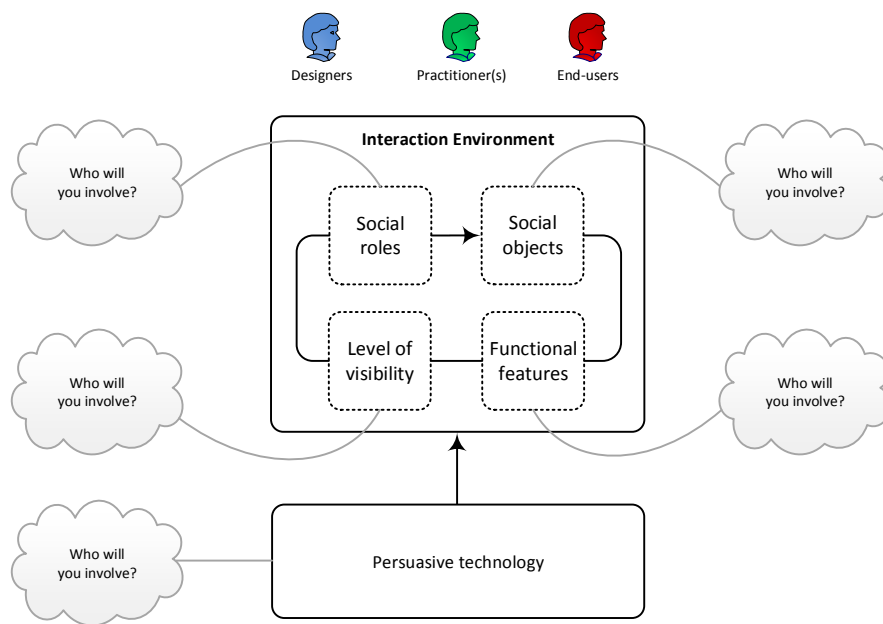


FIGURE 35: THE OVERVIEW OF THE EVALUATION ACTIVITIES WITHOUT SPECIFYING PERMISSIONS

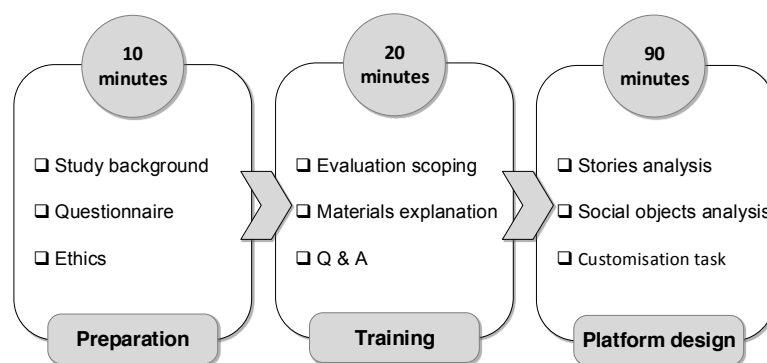


FIGURE 36: PHASE ONE PROTOCOL

9.4.2.6 PHASE TWO: 2ND DESIGN ACTIVITY

This phase was focused on consolidating the understanding of how online peer groups can be designed from different perspectives, (i.e. practitioners, end-users and designers). Also, it helped in identifying further insights to improve the method artefacts. At this stage, the development team was informed about who will be participating in each of the design activities, see **Figure 37**. This phase protocol is illustrated in **Figure 38**. The provided documents in this phase can be found in **Appendix 5 Part 4**.

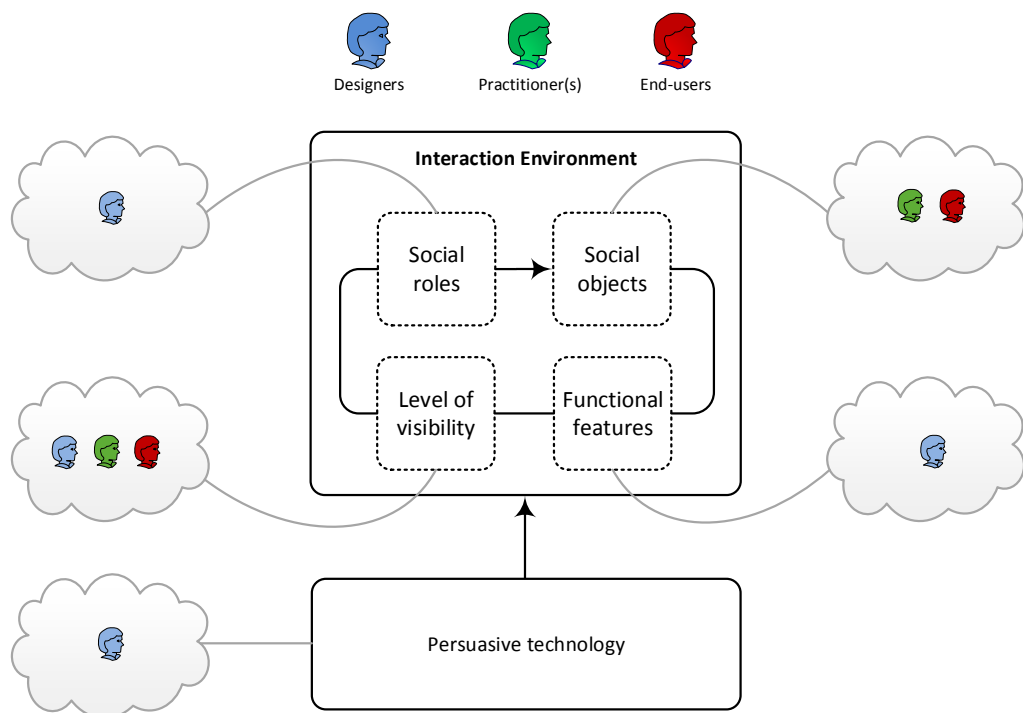


FIGURE 37: THE OVERVIEW OF THE EVALUATION ACTIVITIES WITH SPECIFYING THE PERMISSIONS

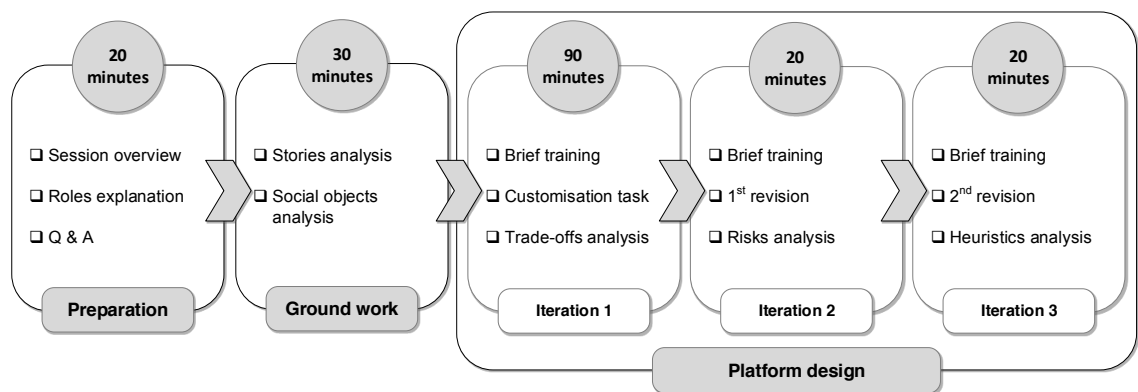


FIGURE 38: PHASE TWO PROTOCOL

9.5 RESULTS

This section presents the results of the two stages, i) the validation findings following the member checking method, and ii) the case study evaluation.

9.5.1 STAGE ONE: EXPERT CHECKING

During the review of the social roles, the counsellor suggested adding a type of effect to each social role. For example, some roles seemed to have very negative effects and must be avoided, e.g. the *fixer* role. These roles were then annotated using the symbol (⊖). Other roles imply negative effects but still important to have in the group to provide good learning opportunities. For example, the counsellor commented that “*if there is the scapegoat role in the group we try to work with it rather than to remove it*”. The counsellor elaborated that the existence of scapegoat role may indicate a high level of avoidance by those who balm a peer who plays it “*the scapegoat peer is the one whose peers focus on, to avoid to deal with what is really going on*”. Such avoidance indicates relapse symptoms.

More meta-information (e.g. definitions and classifications) has been provided to the social roles. For example, a peer can be considered a senior when they start “*picking up new healthy behaviours and also start practising them*”. Also, more social roles have been suggested, such as the *co-facilitator*, *victim*, *fixer* and *avoidant*. The counsellor also recommended merging some roles, such as the *rejected* and *scapegoat*. However, the researcher highlighted that the *rejected* role shows a limited negative attitude towards a specific peer, i.e. rejected by some rather than all members, while *scapegoat* is about the rejection on the group level, i.e. rejected by all or most of the members.

Occasionally, roles can be associated with each other. For example, the disrupting role may be just to seek attention. When seeking attention seems to be persisting, then this can be considered to annotated as attention seeker role. At the beginning, the researcher assigned the value negative (–) to this role. However, the counsellor argued that it could also be a positive (+) effect on the group work. Thus, there should be a condition to be added. Hence the symbol (±) is used to indicate that the role could have a conditional positive or negative effect. In this example,

the condition is that the attention seeking is positive in peer groups unless it turns to be very disruptive to the group work.

It was also highlighted that some roles seemed to be more relevant to the personality traits, e.g. the *follower* role. The counsellor pointed out the in programmes that are based on the 12-steps, the *follower* role is important “*the programme will work really well for followers because they need something or someone to follow. They feel comfortable, and they need a leader*”.

As such, the modifications were limited to the social roles only. The rest of the artefacts had a great deal of agreement. The modifications were greatly in the wording of the guidelines. These changes can be found by comparing the final version of the artefacts in **chapter 8** and the material used during the expert checking, see **Appendix 5 Part 1**.

9.5.2 STAGE TWO (PHASE ONE): DESIGNING WITHOUT THE GUIDE OF THE COPE.ER

This phase was performed without the aid of the COPE.er method and guidelines. Also, it followed a classic software engineering process with user centric design and prototyping. The designers started with analysing clients’ stories. **Table 40** shows the outcomes of this analysis. The comparative findings of the activity will be discussed in **section 9.5.3.1**).

TABLE 40: THE PARTICIPANTS’ ANALYSIS RESULTS

Client	Behavioural attributions and some design decisions
Adam	<ul style="list-style-type: none"> • Denying • Self-presentation • Sociable (sharing functionalities should be supported)
Tim	<ul style="list-style-type: none"> • Lack of time management • Chatting issues • Feelings of guilt • Emotional (functionalities should be more visible to boost the behaviour) • Comfortable with usage (she should be assigned to a group with less addiction severity)
Emily	<ul style="list-style-type: none"> • Developing private relationships (communication should be visible)
Katie	<ul style="list-style-type: none"> • Habitual checking (implement functionalities to reduce the frequency of checking) • Excessive sharing of daily activity (reduce sharing functionalities)
Matthew	<ul style="list-style-type: none"> • Intimidated when criticised (private conversations should be implemented)

	<ul style="list-style-type: none"> • Gamer (reduce gamification) • Lack of time management (implement goal settings features)
Sophia	<ul style="list-style-type: none"> • FOMO • Habitual checking (implement functionalities to reduce the frequency of checking) • Argumentative

The moderator observed that some of the taken decisions seemed to be based on intuitive judgements and were found to be appropriate without the need of any guidance. For example, the designers suggested that the all peer-to-peer communications should be visible to the practitioner to avoid any adverse consequences, e.g. group clustering, consequentially cliques may emerge. The basis for this decision was the analysis of the story of Emily (client three) who was the treatment centre discovered having a new social media account for relationship adventures. Another good design decision is when the designers decided that *reminders* should not be visible to others, so they can focus on their progress.

While some other good decisions were made, the following analysis will focus on those may create negative consequences. This is to assess if the method and the heuristics will help to correct or at least detect them. Thus, the results are categorised into five issues to reflect on the observations and to inform phase two activities.

9.5.2.1 *ISSUE (1): LACK OF KNOW-HOW TO UTILISE USERS' STORIES TO CUSTOMISE THE PLATFORM*

The designers tried to reflect on the users' stories and make an adequate design for them. Some of the design decisions were violating the proposed heuristics which was not provided at this phase. For example, Tim's story tells that he is "a very kind person with his peers in the group. He cannot see them going emotional or crying without trying to calm them down immediately". The designers suggested reflecting this personal trait on the level of visibility of some features, e.g. "*others' mood* [i.e. the 'my mood' feature] *should be visible at least for Tim. So, he can support his peers*". Indeed, this trait is a very negative in peer groups for addictive behaviours in general and should be discouraged immediately. Being overly emotional such as the case of Tim may cause the user to focus on others' treatment rather than the self. Because the designers

decided to consult the practitioner only when needed, this design error could not have been avoided. Then, the moderator suggested consulting the practitioner about this case. The practitioner explained that this behaviour should be discouraged instead. This shows that COPE.er highlights places where concerns could emerge to economise and optimise the interaction amongst members and psychologists.

The following cases provide brief reflections on some of the other violations made during the first phase and relevant to the current issue.

- As Adam is a sociable person, the designers suggested that the system may include sharing functionalities to make the design more appealing to him. In fact, Adam has some preoccupation behaviours associated with sharing, which was clearly stated in Adam's story.
- The designers suggested that as Tim is comfortable with his usage, he should be assigned to another group whose members are having less addiction severity. However, Tim's story includes other aspects that indicate having a severe addiction. For instance, he suffers from preoccupation, poor sleeping pattern and also an impulsive usage of digital media. After asking the participant who played the role of Tim (P8 in **Table 38**), she stated that she is comfortable with her usage, which indicates denial of reality.
- The designers suggested that Matthew should be enabled to be contacted privately as he feels intimidated when criticised. The moderator asked if only the practitioner can contact him privately. The answer was to include his peers as well. However, in peer groups, private communications should be avoided.

9.5.2.2 ISSUE (2): LACK OF UNDERSTANDING BEHAVIOURAL PATTERNS ASSOCIATED WITH ADDICTION

The designers decided to reduce the interaction situations where a user can be confronted by peers. For example, when a user's progress is not satisfactory, the system should limit the visibility of that user to be only observable by the practitioner. This decision was made after reading

Matthew's story which states that "*he gets intimidated when someone criticises his usage*". In fact, confrontational interactions and discussions should not be avoided as long as they are objective and with a respectful tone. In one way, this can be linked to the issue four, see **section (9.5.2.4)**, as healthy confrontational interactions can add positive persuasive effects to the system via *normative influence* and *peer pressure*. In another way, defensiveness is a common behaviour among addicts. As such, an extra guideline was then derived from this case. Generally, when it comes to common behaviours, e.g. defensiveness, the development team should not look at preferences. In other words, healthy confrontations should not be seen as an option but an essential aspect. This insight indicates that COPE.er method should provide a list of common behaviours for designers to exempt them from the process of consulting users' preferences.

9.5.2.3 ISSUE (3): THE LACK OF FEATURES NEGOTIATION

When the development team wanted to include or exclude a feature, it appeared that there was a pattern of errors occur. These errors relate to overlooking the potential persuasive effect a feature may provide. For instance, the designers decided to eliminate the feature of '*contextualising content tracking*' which is concerned with associating time and location to the consumed or generated content. They justified their decision by stating that the feature may trigger some privacy concerns and that may discourage them from continuing the use of the online platform. They pointed that the feature is comparable to the browsing history. Then, the researcher highlighted three scenarios:

- **Scenario (1):** Would you include the feature of '*contextualising content tracking*', if it was at the level of what content an end-user may, for example, *like*, *retweet* or *comment on*, rather than the overall usage? The assumption here is that users' awareness will be enhanced if they know the type of content associated with different interactions.
- **Scenario (2):** Would you include the same feature, if it was visible to the user only?

- **Scenario (3):** Would you be more inclined to think of ways to include it with a minimal side-effect, if you were reminded that this feature aims at enhancing users' awareness?

After providing these three scenarios, the responses had changed to be in favour of including rather than excluding that feature. As such, the above observation indicates the need for providing designers with extra cognitive tools to better guide this activity. Firstly, the designers need to ask themselves these two questions:

- Are we missing any persuasive opportunities?
- Are we creating side effects, e.g. decreasing or increasing unhealthy usage, impacting user experience, etc.?

Secondly, the COPE.er building blocks (**chapter 8 – Figure 32**) should be somehow utilised and integrated to the bank of features to show which blocks a feature would have an influence upon. These two cognitive tools should be used when analysing each feature separately.

9.5.2.4 *ISSUE (4): LACK OF ARTEFACTS THAT BRING THE PERSUASIVE TECHNIQUES INTO THE DESIGN PROCESS*

The participants were provided with a list of persuasive techniques which can be used to increase the persuasiveness of the prototype. However, the participants were very unsure how to incorporate them and how they can influence the design decisions. One of the participants suggested using the list as a benchmark to see what persuasive techniques have been included in the design. As such, they decided to use it after they finish specifying the functional features. To illustrate this issue with examples, three cases are discussed below:

In the first case, the feature of declaring '*mood*' is very important since it is providing users with an opportunity to express their emotions. One of the fundamental aspects of treating addiction behaviours is to assess help-seekers expressing their emotions. Addiction behaviours always associated with the lack of emotional expression and quick fixes through the addiction of choice. As highlighted in **chapter 7 – section (7.4.7.8)**, the '*check-in*' activity was a common

routine in the treatment centre in which the clients are given a chance to describe their current emotional state. The *'my mood'* feature can be included to support the *'check-in'* activity. In reference to the persuasive techniques, this feature can be mapped to the **Rehearsal** principle. In this principle, a system that is providing means with which to rehearse a behaviour can be more persuasive (Oinas-Kukkonen and Harjumaa 2009). The feature can also be mapped to the **Social learning** principle. In this principle, users will be more motivated to perform a target behaviour if they can observe others performing the same behaviour (Oinas-Kukkonen and Harjumaa 2009).

In the second case, the development team decided to remove the feature *'ask a question'* and *'poll option'*. Indeed, these features would have a direct influence on the **collaboration** block of the COPE.er model. For example, a facilitator can enable the *'poll option'* when a user self-selects a goal so that other peers can express their opinions, e.g. via voting or commenting. Overall, the bank of features had very few number of features (five out of 45) that can encourage healthy **collaboration** as a persuasive technique. These are *'setup-goals'*, *'ask a question'*, *'create events'*, *'poll option'* and *'group chatting'*. Other collaboration-related features, e.g. *'create personal groups'* and *'create relationships'* can disrupt group work, and thus they violate the heuristics of the online platform. As a result, the lack of guidance led to including only two features out of five that can encourage group collaboration.

In the third case, the development team decided to eliminate the feature that enables users to *'react to content'*, e.g. emoticon, which is a graphical representation that depicts variations of tones, feelings and moods, for more engagement experience. The elimination was to avoid creating an addiction environment. However, in reference to the persuasive techniques, this feature can be associated to the **Liking** principle which aims at creating an attractive design.

9.5.2.5 ISSUE (5): LIMITED KNOWLEDGE ON WHEN AND HOW TO INVOLVE END-USERS?

At the beginning of the evaluation, the designers appreciated being given access to the knowledge of the practitioner and end-users. However, it was not clear how they can involve them in the design. After a discussion among themselves, the designers decided that the practitioner should

be consulted when needed, while the end-users to inquire about their preferences. In this respect, two observations were collected:

- It was observed that designers overlook the need to involve end-users to check how they would interpret a particular feature. For example, one of the designers pointed out that the ‘*poke*’ feature is comparable to a gentle nudge “*a user can poke a peer as a wake-up call to actively participate in group work*”. Hence, they have decided to include it without asking the end-users how they would interpret it. However, it is a common practice over social media that poking can be used as a feature to get the attention of someone, e.g. flirting or saying hello. What seems more important is knowing how actual users would interpret a particular feature. Another example is when the designers suggested that the ‘*muting*’ feature can be enabled to mute conversations and notifications of specific peers. As such, questions such as “would this feature cause interpersonal damage if a peer knew that he is being muted by someone? Would it develop clique(s) in the group?”

This indicates that the COPE.er method should be enhanced by providing more guidelines related to the component ‘A’ of the reference architecture in (**Chapter 8 – Figure 31**) which is concerned with users’ involvement in the design process. For example, in what cases real users’ perceptions should be considered?

- There was a lack of applying the right analysis mind-set where users should not be asked what they prefer and what they want. Hence, the use of classic requirements elicitation method would be more appropriate. For example, the designers were asking end-users if they would like to have some features and how their visibility should look like. The wording of these two questions appeared to induce biased responses. End-users with addictive behaviours can be prone to conscious and unconscious judgments, e.g. they might manipulate the designers. This suggests that the questions should be formulated in a way that guides end-users to focus on the main purpose of the system. For example, the question can be: what issues or side-

effects could arise if a specific feature was included? This is to involve end-users when a development team is not sure if a certain implementation may cause harm.

9.5.3 STAGE TWO (PHASE TWO): DESIGNING WITH THE GUIDE OF THE COPE.ER

This phase was guided using the pre-evaluated version of the COPE.er method workflow in (**Figure 39**). The following subsections will be organised based on the steps shown in this figure. In line with the objectives of the evaluation, the steps (one, two, five, six, nine, 10 and 11) were planned to be performed by the designers without the involvement of the practitioner and the end-users. In steps (seven and eight), the involvement of the professionals and the end-users was permitted but controlled based on the finding collected in phase one, see **section (9.5.2)**. All these permission settings were represented in different colour codes shown in **Figure 39**. It should be noted that this figure has been revised based on the thesis evaluation findings and re-designed and finalised in (**Chapter 8 – Figure 33**). As such, reviewing **chapter 8 – section (8.3)** will provide enough explanation about the steps shown in both the evaluated and the pre-evaluated versions of the method.

In general, a particular focus was given to steps (five and six) to assess if the designers will be able to adequately perform them with the aid of the proposed guidelines only. However, the design of the evaluation was set to assess when the involvement of the other participants was needed. This assessment will be based on the situations where:

- The designers declare their need for such involvement.
- The designers are unable to reach consensus due to the lack of domain knowledge or the lack of understating users' preferences and perceptions towards certain aspects.
- Inadequate design decisions are made.

If any of these situations are observed, the note will be taken to assess if the involvement is really needed or just the guidelines should be improved. The designers will be then permitted to involve other participants and the changes will be applied to **Figure 39** accordingly.

The rationale of such restrictions within the COPE.er is to limit the scope of the evaluation and prevents uncontrollable span of cases to evaluate, and furthermore, it enables what is intended to be assessed in the first place, i.e. the control over the involvement of end-users and how that would limit potential bias.

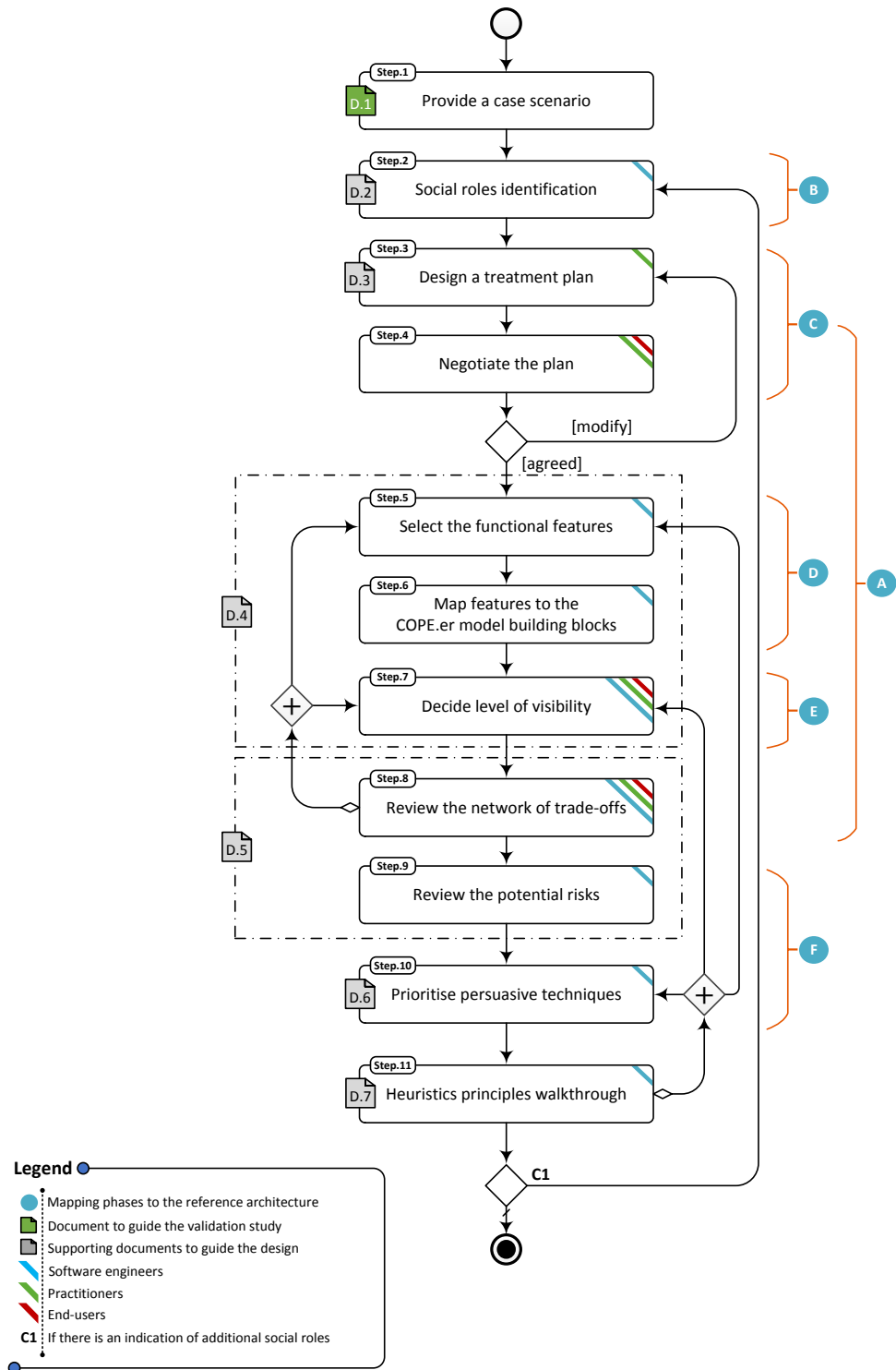


FIGURE 39: THE COPE.ER METHOD WORKFLOW (PRE-EVALUATION)

9.5.3.1 IDENTIFYING SOCIAL ROLES

This step started with re-reading the clients' stories and working collaboratively to identify social roles and other negative attributions to better design for the group. This was to assess the ease of use of the social roles document in guiding this activity. This document can be found in **Appendix 5 Part 4**.

To save time and to reduce the overload of the evaluation exercises, the moderator instructed the participants to select two clients only and analyse them. As such, Adam and Tim were selected. The analysis findings of the rest of the clients were provided on a separate sheet (see **Table 42**).

The social roles and negative attributions identified in the current phase are shown in column two and three of **Table 41**. The fourth column shows the aspects identified by the same participants in the previous session (i.e. phase one). The table shows that the supporting materials helped to come up with more accurate, comprehensive and important specifications to help in the customisation-related steps, i.e. steps five, six, and seven. It was noticed that most of the social roles were identified (see **Table 42** which shows the model answers). In phase one, for example, Adam was characterised to be a *sociable* person. In fact, he was an *isolate* person in his real life and compensating that by using digital technology, i.e. a *sociable* in the cyberspace only.

TABLE 41: THE SELECTED CLIENTS AND ANALYSIS OUTPUTS

Client	Current phase specifications		Previous phase specifications
	Social roles	Negative attributions	Attributions
Adam	<ul style="list-style-type: none"> • Isolate • Denying 	<ul style="list-style-type: none"> • Self-presentation 	<ul style="list-style-type: none"> • Denying • Self-presentation • Sociable
Tim	<ul style="list-style-type: none"> • Fixer • Sociable 	<ul style="list-style-type: none"> • Preoccupation • Habitual checking • Excessive communication 	<ul style="list-style-type: none"> • Lack of time management • Chatting issues • Feelings of guilt • Emotional • Comfortable with usage

TABLE 42: THE MODEL ANSWERS

The model answers		
Client	Social roles	Other negative attributions
Adam	<ul style="list-style-type: none"> • Isolate • Denying • Complying 	<ul style="list-style-type: none"> • Self-presentation
Tim	<ul style="list-style-type: none"> • Senior peer • Fixer • Sociable 	<ul style="list-style-type: none"> • Preoccupation • Habitual checking • Excessive communication
Emily	<ul style="list-style-type: none"> • New peer • Relapsed 	<ul style="list-style-type: none"> • Romance involving forming relationships
Katie	<ul style="list-style-type: none"> • Withdrawing 	<ul style="list-style-type: none"> • Preoccupation • Habitual checking • Negative comparisons
Matthew	<ul style="list-style-type: none"> • New peer • Denying • Withdrawing • Competing • Victim • Isolate 	<ul style="list-style-type: none"> • Gamification
Sophia	<ul style="list-style-type: none"> • Helper • Dominant • Sociable 	<ul style="list-style-type: none"> • Habitual checking, • FOMO • Avoidance

There were some unidentified social roles that are stage-related, e.g. *new* and *senior* peers as participants were unsure how to make judgement based on the duration spent in the treatment centre. This suggests the need to provide an operational definition for each one of these roles. For example, a peer could be considered a senior if he/she spent two months in the treatment centre. As such, the Rehabscene should be consulted to elicit this information.

The designers, also, suggested to explicitly state how many social roles a user can play in each of the four classes in **chapter 8 – Table 23**. The guidelines were updated accordingly to state that in the functional roles a user can play one role only, except the *peer* role which can also be assigned as a *leader* “temporally”. In the stage-related roles, a user can also play one role only,

except *new* peers who might be in the detoxification stage, i.e. the *in-Detox* role. In both the communication and the emotional roles, a user can play multiple roles at once.

The following observations were taken into account to refine the heuristics. Overall, these bullet points were the results of a further *validation* for the social roles, meaning that some extra social roles were suggested, and others were defined in more concrete and meaningful way. The modifications listed in the following bullet points:

- The development team suggested that the *role model* and *helper* roles are not functional as they cannot be assigned to users. The *role model* was then moved to the communication roles as a participant commented “*it is attained for good behaviour and attitude. It is others’ perception which will influence communication within the group*”. The *helper* role was moved to the emotional roles, as another participant commented “*it is the peer attitude to help others. It is the emotions that trigger this behaviour and can improve other emotion-related aspects, like improving self-image*”.
- The *victim* role was moved from the communication roles to the emotion roles. A participant highlighted that “*a peer may play the victim role to manipulate and justify a behaviour or to seek attention which all refers emotional factors*”.
- A participant stressed that the roles *isolate*, *scapegoat*, *rejected*, and *withdrawing* cover different interpersonal and intrapersonal issues that heavily influence communication aspects. But a peer can feel inadequate or socially rejected which is only self-perception. Therefore, a new role named *avoidant* which was defined as “*a peer who has a false feeling of inadequacy, social rejection, and uses avoidance as a conscious coping mechanism*”.

At the end of this step, the participants were given the model answers in (**Table 42**) to encourage richer discussions in the next steps and to assess how social roles will influence the design. The following are a few examples of the design decisions made:

- Adam was identified as a *sociable* in phase one. That judgement was based on Adams' cyber behaviours rather than the offline behaviours. Therefore, the COPE.er should include guidelines to instruct designers to mainly consider the offline behaviours and group-related behaviours in the design as they reflect the real personality traits. On the other hand, the aspects related to the cyber-behaviours can be supplementary and further informing the design. For example, if Adam tends to *isolate* himself in the cyberspace as well, the online peer groups should utilise the IT-facilitated communications to introduce opportunities that promote social inclusion.
- Tim was identified as a *fixer*. As such, the designers suggested that he might need to have a one-to-one consultation to address this behaviour before he re-join the group. Conversely, in phase one, an inaccurate and misguided decision was taken as Tim's emotional attitude seen as a positive trait, i.e. *helper*, and should be encouraged to benefit the group.
- Emily was identified as a *relapsed*. Based on the guidelines, she should be offered one-to-one consultations or even to be assigned to another group.

9.5.3.2 *DESIGNING AND NEGOTIATING TREATMENT PLAN*

Participants found it a very challenging to consider and integrate this part into the customisation exercise. A designer highlighted that “*each one of these items [in chapter 8 – Table 24] needs to be described in detail to identify the core communication aspects and then customise the functional feature to facilitate and support them*”.

Then, a demonstration example using the ‘*goal settings*’ feature was given by one of the designers. Firstly, if this feature was to be used within a collaborative activity, the qualities i) discussion, ii) collaboration and iii) negotiations may need to be selected. Before ‘*goals selection*’, a group may have a session for an open discussion using the feature ‘*group chatting*’. Then, a user can ‘*select a goal*’ and a ‘*poll option*’ is embedded to enable collaborative selection, e.g. via voting. The negotiation part can be via checking the user ‘*calendar*’ to ensure conflict-free selection. The negotiation can also be via ‘*commenting*’ option where the user can explain,

for example, why the difficulty of the goal should be deemed less. The designer in his example, which can be found in **Table 43** provided a practical analysis on how the social objects can be incorporated and considers while specifying the features and functionalities of the interaction environment.

TABLE 43: SPECIFYING SOCIAL OBJECTS

Purpose	Qualities	Functionalities	Features
Goals selection	<ul style="list-style-type: none"> • Q2: Discussion • Q6: Collaboration • Q7: Negotiation 	<ul style="list-style-type: none"> • F6: Open discussion • F9: Voting • F5: Peer pressure 	<ul style="list-style-type: none"> • Group chatting • Poll option • Calendar negotiation • Commenting • Goal progress (visible to the group)

9.5.3.3 CUSTOMISING THE INTERACTION ENVIRONMENT

The customisation process was performed over three iterations. The first iteration was guided with the aid of the network of trade-offs (**chapter 8 – Table 34**). The second iteration utilised the potential sources of side-effects (**chapter 8 – Table 35**). The third iteration was performed using the heuristic principles. The main purpose of these iterations was to enable the development team to revise their design decisions using different forms of guidelines. This was to assess how the design decisions evolve throughout the customisation process.

This section presents the findings related to the first iteration which was mainly covered steps five, six, seven and eight of (**Figure 39**). As this was the main part of the evaluation, careful preparation was essential to collect rich data.

Preparation:

Before the beginning of these steps, the moderator spent 15 minutes explaining the materials that should be used. The group of the end-users were permitted to interact with the designers at step seven in two situations only:

- When there is a concern or disagreement with an assigned level of visibility.

- When the designers directly direct the questions to them.

On the other hand, the practitioner can intervene with the designers at step seven only:

- When he thinks that the designers have overlooked an aspect that might negatively affect the group performance.
- When he thinks that the designers have taken a decision that may create side effects.

Unless one of these two situations take place, the practitioner only interacts when the designers need a consultation. Also, the designers were reminded to always ask themselves these two questions when analysing each feature

- Are we missing any persuasive opportunities?
- Are we creating side effects, e.g. decreasing or increasing unhealthy usage, impacting user experience, etc.?

Also, the COPE.er building blocks were integrated as seen in (**chapter 8 – Table 29**). The building blocks were mapped to each feature using three colour codes, dark grey, light grey and white. These colour codes are explained with examples in (**chapter 8 – Table 28**). The mapping of each feature was based on the researcher's judgement. Therefore, the participants were asked to validate and revise the mapping when errors or disagreements are found.

Finally, to address the issue (3) in **section (9.5.2.3)** which is concerned with the appropriate decisions the designers may take when they encounter a feature that could cause side-effects, the following countermeasures were advised:

- Modify the level of visibility.
- Apply some constraints, e.g. a user can post no more than five times a day.
- Add another feature or functionality, e.g. implement some auditing capabilities if the private communications to be allowed. Yet, the private communications were not

advisable. Auditing can, also, be seen as a visibility option, i.e. private communication can be visible to the practitioner.

- Utilise the moderator direct intervention, e.g. by offering extra tasks and activities or one-to-one counselling, etc.
- The last countermeasure is to provide practitioners with some recommendations related to the group restructuring. This is based on the scale of the side-effects, e.g. affecting all peers or some of them. This might need re-analysing the social roles. For example, if a peer has addictive behaviours associated with the video gaming, he might need to be re-assigned to another group whose interaction environment is less gamified. This is instead of removing the gaming elements from the interaction environment of the group he was assigned to.

Before starting the evaluation, the designers highlighted some concerns, particularly around the issue of users' preferences:

- It was observed in the phase one that assigning the visibility to *specific peers* is the most selected option. From the designers' perspective, it was seen as the default option, especially those with usability and user experience issues. This may refer to the user control and freedom as a one of the usability principles. As such, the designers suggested the "*active*" participation of the practitioner and end-users to include other perspectives and get border analysis. Active involvement refers to being part of the design group.
- The designers, also, highlighted that the recommended number of end-users participating in the design sessions should not outweigh the number of practitioners to avoid potential bias end-users may induce.
- One of the designers suggested that "*rather than the end-users, the practitioner [involvement] is far more important because the users tend to think like us*".

However, the moderator instructed the participants to adhere to the principles related to user's involvement proposed by the COPE.er method which was discussed at the beginning of this section. This is to determine if the guidelines are capable enough to minimise the need for such involvement, also to assess how the guidelines would help the designers to recognise when to avoid prioritising users' preferences i.e. focus on what they actually need rather than what they want.

There was a risk that the above discussions might make the designers more hesitant to take decisions without the practitioner's oversight. To reduce this risk and to provide designers with motivation to carry on with the customisation exercise, the moderator asked the practitioner and the end-users to join after 15 minutes from the beginning of the actual evaluation. The designers were also told that the follow-up questions will be noted so they can re-check them with the other participants. The moderator also paid attention if such situations occur to investigate them further. The features selected and configured in phase one were not provided during this phase to avoid any influence on the analysis. Finally, the designers decided that the best approach is to go over the features one by one and keep examining the guidelines.

Evaluation:

The evaluation activity has then started and performed based on the above guidelines, insights, and recommendations. The findings outlined below will focus on the features that enlightened rich discussions. This is to demonstrate how the COPE.er method was used and how the decisions evolved.

One of the designers suggested to include the '*goal settings*' feature as it has a direct influence on the *collaboration* and *awareness* blocks (both in dark grey). Consequentially, the visibility was assigned to the whole group members, while in phase one, it was made visible to specific peers. In the actual use of the platform, if side-effects occur, the visibility should be assigned to the practitioner only. The discussion of this feature took around five minutes which was a relatively longer than expected.

However, right after that, they collaboratively decided that any features associated with the *assessment* block, i.e. light or dark grey, should be visible to the practitioner by default. Also, any features associated with *collaboration* block should be visible to the whole group members. Then, this should be subject to further modification based on the guidelines provided. It appears that the building block helped the designers to devise this approach in order to better manage the analysis.

One of the designers recommended dividing the *friends and family* as a one visibility level into two separate levels. However, the moderator clarified that this level refers to any external actor, i.e. without a profile in the system. For example, the online platform may be implemented in a way to enable users in other online social platforms to view certain aspects, e.g. progress bar. This is to promote social support via other features such as ‘like’. For this case, it was suggested that the ‘react to content’ feature, e.g. likes or emoticons, should be invisible to other peers to avoid affecting their self-esteem, e.g. some may lack such external support. This suggests that the guidelines should inform designers to consider different levels of visibility for the options which can be embedded to the other features. For example, the embedded ‘likes’ to the ‘goal(s) progress’ feature should be visible to peers as one of the designers commented, but invisible when it is embedded to the ‘events’ feature. However, the designers believed that there should be some risk assessment procedures performed by the practitioners when it comes to any external support. Then, the designers decided to involve the practitioner in this discussion to help them reaching consensus. The practitioner agreed with such further customisation settings but advised against the idea of having family oversight and then highlighted that “*people often have complicated relationships with their families’ members and quite a lot psychological issues are coming from families*”. However, the researcher still believes that in some cases family careful involvement is needed, e.g. the online group is for minors.

The ‘goals progress’ feature was set to be visible to the user only to avoid any negative peer pressure, e.g. peers’ performance is satisfactory except one of the members. This decision was made after reviewing the gamification potential side-effects in (**chapter 8 – Table 35**). The designers, then, reviewed the mapping of this feature to the COPE.er building blocks and spotted

that the mapping was overlooking some aspects, i.e. the mapping should be revised. They pointed out that the ‘*goal progress*’ and ‘*treatment progress*’ features should be mapped to the ***collaboration*** block rather than to the ***assessment*** and ***awareness*** blocks only. A designer highlighted that both features have a direct influence on the ***social awareness***. For example, having a peer who achieved excellent progress in a certain task(s)-oriented goals, can enhance social awareness and provide collaboration opportunities, e.g. those with low progress in these tasks can seek their peers’ help and support. Hence, it can indirectly influence the ***collaboration*** block, i.e. light grey. Then, they found it positive and more persuasive to make the ‘*goals progress*’ visible to all group members.

The ‘*accomplishment*’ feature has a direct influence on the ***reputation*** block. Hence, the designers argued that it might cause self-presentation issues which is one of the negative design concepts listed in the network of trade-offs. They decided to check the countermeasures provided to them at the beginning of this phase. After that, they re-analysed the social roles and concluded that this feature might cause a negative effect to Adam whose problematic digital usage was associated with self-presentation, and Mathew whose problematic digital usage was associated with the gaming elements. By evaluating the potential effects of this design concept, i.e. self-promotion and false self-esteem, they decided to make it visible to the practitioner only. They also had consensus over this configuration as the mapping of the feature would directly influence self-awareness rather than the social-awareness. As such, it is unlikely to provide an opportunity for collaboration. In the mapping, however, the self-awareness and social-awareness is the same option. The purpose not to divide them is to allow the designers to apply in-depth analysis from different angles in order to decide whether the type of awareness a feature may provide is self, social or both.

For the same feature, i.e. ‘*accomplishment*’, a designer pointed out that the feature could have been included if the element of the collaboration was considered. He elaborated by giving an example of a system that is associating badges, which is a form of accomplishment, based on

achieving tasks that require working with peers rather than alone. As such, this can indirectly influence social awareness which may then create opportunities for collaboration.

The designers suggested two different set of configurations to the '*usage comparisons*' feature. One is to include it only if anonymised, i.e. a peer compares himself with his anonymised peers. Otherwise, it should be enabled to the practitioner only to avoid any negative usage of it, i.e. only the practitioner can compare between peers for assessment purposes. The designers, also, pointed out that Matthew plays the *competing* role and Katie is used to making negative comparisons. As such, enabling this feature for them can be risky. As a result, both approaches were agreed by all designers. However, they were unsure about end-users' perception. One participant asked for permission to direct the question to the end-users. This was a good opportunity to assess to what extent the wording of the question would change in comparison to the phase one. During phase one, the questions were always about whether a user would like to have a feature or not. In the current phase, a designer asked, "*would this feature [i.e. comparing usage] motivate you [the end-users] to regulate your usage? And what is your feeling if you knew that your peers are achieving better results?*". At the end, the end-users were in favour of '*usage comparisons*'. However, as this feature has a direct influence on the **assessment** block, the designers suggested consulting the network of trade-offs and looking for usage related concepts. The guidelines state that '*usage measurement*' might lead to false-assertions. Then, one of the designers highlighted that "*such comparisons might tell the usage norm in the group and then take it as a false benchmark*". Finally, they decided to make it only offered and visible to the practitioners.

The designers decided that the '*my mood*' feature should be visible to all members. However, one of the end-users intervene and pointed out that this might lead to emotional contagion which is defined by Schoenewolf (1990) as "*a process in which a person or group influences the emotions or behaviour of another person or group through the conscious or unconscious induction of emotion states and behavioural attitudes*". As the governance guidelines of the COPE.er method allow end-users to intervene if there is a concern or disagreement with an

assigned level of visibility, that conduct was valid as it was for a reasonable concern. A designer pointed that making it visible to specific peers may lead to group clustering. Yet, the practitioner argued that emotional expression is an important aspect in support groups for addictive behaviours. Another designer pointed out that according to the network of trade-offs, expressing emotions can reduce denial and defensiveness which is a positive as long as none of the clients was identified as an *attention seeker*. Another designer suggested that making peers mood visible to all group's members can be positive as it can increase *social awareness* according to the mapping with the COPE.er building blocks. As such, the development team reached a consensus that it should be enabled and visible to all members. But the system should help practitioners to assess if a negative emotional contagion is detected and then allow them to edit the visibility to be limited to the practitioners only.

The '*muting*' feature was included in phase one and visible to specific peers, i.e. a peer can select who to mute and, also, choose who can see his/her muting list. In phase two, the designers asked the end-users what they think if they can find who has been muted and by whom. The end-users expressed high concerns as that can lead to severe side-effects. The practitioner intervened and pointed out that "*in peer therapy, peers often are being challenged by someone in the group to discourage denial. So, muting might be abused and lead to missing persuasive opportunities*". Then, a designer pointed that the mapping to the COPE.er building blocks can be misleading. It was then explained that the '*muting*' feature was mapped to the *conversation* block, which was a bit confusing how muting would improve conversations. The moderator explained that the mapping does not always mean a positive implication of a feature to a particular building block but also include negative implications, e.g. muting negatively impact the conversations. Another example is the '*creating personal groups*' and '*creating relationships*' features which have a greater influence on the *collaboration* block. The designers decided not to include it. They highlighted that it might lead to group clustering as a critical side effect. A participant commented that "*the two questions [referring to reminding questions in issues (3) of section (9.5.2.3)] help a lot to make us more aware of how to assess whether a feature to be included or not*". At the end,

the designers suggested adding some symbols such as '+' and '-' to the dark and light grey of the mapping to inform designers about the type of implication.

A consensus was reached on excluding '*posting content*' feature, unless some constraints are applied, such as deciding topics to post on and how many posts can be made as well. Also, "*it should be designed as in discussion forums rather than social media*". The designer elaborated that the conventional discussion forums, often, follow stricter rules and have a more structured environment where "*communities guide discussions rather than individuals via their personal profiles and the sizes of their relationships*". Another designer concluded that online peer groups should have less emphasis on the **identity** and **reputation** blocks.

The '*poking*' feature was interpreted by the designers in phase one as a gentle nudge and "*a wake-up call to actively participate in group work*". In phase two, the designers were more inclined to seek end-users' perception about this feature. It was then highlighted by an end-user that it could be very intimidating if it embedded to group chatting for example which it means "*wake-up!*". Otherwise, it is just a gentle nudge. This shows the need for helping the designers recognising when the end-users should be "actively" involved.

The mapping of the feature '*sharing*' shows no influence on the **collaboration**, **assessment** and **awareness** blocks. Hence, the designers argue that "*it is unlikely to miss any persuasive opportunities*". In fact, it can have some side-effect as "*it may trigger some self-presentation behaviours and probably social recognition*".

The '*creating events*' feature was hard to decide whether to include or not. A designer suggested that it would lead to "*building trust, increasing engagement and social interactivity. Also, no addictive experience is associated with it*". Another designer highlighted that "*if a user can create an event and invite other peers to join, it is like the private messaging feature which we [the designers] decided to exclude*". This is another situation where the designers decided to seek the practitioner consultation. The practitioner suggested that events, often, organised by the treatment centres only.

The ‘*wall*’ feature was excluded as it contributes to self-presentation without any added values to *assessment*, *collaborations* and *awareness* blocks. A designer commented that “*this feature is like a personal space where users can have an authority of their own*”, i.e. who can post on the ‘wall’ and how a user self-presenting and self-promoting the self. Also, including this feature would mean enabling other eliminated features such as ‘*posting videos*’ and ‘*posting status*’. The designers argued that the way to include it with a minimal side-effect is to make it for the group, rather than for the users, i.e. group’s ‘*wall*’. A designer suggested that there should be another layer of configuration besides levels of visibility, e.g. limitation and restrictions or to specify the ownership of a feature. For example, the ‘*wall*’ should be for the group, while the ‘*private messaging*’, ‘*creating events*’, and ‘*enforcing a rule*’ are for the practitioners. Another designer argued that ‘*personal wall*’ contributes to self-presentation, while ‘*group wall*’ is to do with self-disclosure which is recommended according to the network of trade-offs. While analysing this feature with the aid (D.5) and the COPE.er building blocks, a designer pointed out that the guidelines reduced the need for the end-users’ involvement.

In phase one, the ‘*announcing current location*’ feature was enabled, but made visible to the practitioner only, i.e. if a peer shares the current location, only the practitioner is notified and can view that. In answering the question of whether a persuasive opportunity will be missed, a designer suggested that the feature has an influence on the *social-awareness* block (light grey), hence it is worth checking the persuasive techniques list in (**chapter 8 – Table 36**). The designers suggested that ‘*announcing current location*’ can be mapped to the social learning principle. In other words, peers would be more persuaded to go out and engage more in the offline activities. As such, the visibility was changed, so that all group members including the practitioner can view location-based posts. In this case, the COPE.er mapping helped to remind the designers to analyse the persuasive effect of the feature and then to make an informed decision.

The ‘*commenting*’ feature provoked conflicting opinions. One designer was in favour of the feature to create a more engaging experience. Another designer argued that it may create side-effects, e.g. “*why my peers do not comment on my posts?*”. In the end, the designers decided to

include it for some features only, such as *'commenting'* on offline *'events'* which can help users to communicate and interact for **collaboration** purposes. This suggests a new concept that should be considered by the COPE.er method. This concept can be named as **features inheritance**. It refers to the case where combining some features with others will introduce extra attributes. For instance, *'commenting'* is mapped to the **sharing** block only. However, when it is combined with the *'events'*, it can boost **collaboration**. As such, the development team managing the design activity should consider re-mapping the features that are going to be combined with others.

The *'poll option'* was excluded in phase one. However, it appeared that the mapping with COPE.er had influenced the decision. The *'poll option'* was mapped to the **collaboration** and **assessment** blocks. As such, the designers immediately decided to include it. For example, it can be enabled for the *'goals settings'* and *'events'* features. The same also applied for the *'update notifications'* feature which was mapped to the **awareness** block. However, the designers argued that the notification should be limited to, for example, *'events'*, *'goals progress'*, and *'achievements'*, to avoid its potential side-effects, e.g. excessive updates.

It has been noticed that the COPE.er has also helped to analyse the functional features from different perspectives to achieve the balance between persuasive effects, side-effects, treatment requirements and users' preferences. For example, the *'tagging'* feature can be seen as a tool not for sharing only as it mapped originally by the researcher. However, designers argued that it can also be mapped to the **social awareness** block. For instance, a peer can *'tag'* someone who participated in an offline activity. This in turns would enhance the social awareness of the group and work to persuade peers to engage in such offline activities. In another example, in phase one, the *'tagging'* and *'mentioning'* features were perceived as comparable features in terms of their functionality and influence. Both were, also, excluded to minimise the risk of creating an environment similar to the conventional social media websites. In phase two, looking at the features through the lenses of the COPE.er building blocks facilitated richer analysis where *'tagging'* and *'mentioning'* seemed to have distinct influence. The designers viewed *'tagging'* as a feature that can create positive peer pressure as it is used to refer to the ownership of the content,

i.e. tags are given to those participating in the offline activity (peer pressure exerted by *social awareness*). The ‘*mentioning*’ feature, on the other hand, “*seems to be similar to poking but by default visible to others*”. As such, the designers decided to include the ‘*tagging*’ and excluded ‘*mentioning*’.

For the ‘*personal biography*’ feature, the designers asked the end-user of “*what do you think about this feature? How would you feel about it?*”. Also, they asked the practitioner of “*what kind of information do you think would be appropriate for them to put there?*”. Again, this demonstrates how the wording of the questions became more appropriate than that in phase one. After collecting other participants’ points of views, the designers decided that ‘*personal biography*’ should not be written by the users themselves. It should be something similar to users’ stories given by the moderator. This is without including the practitioner’s notes part, see (**chapter 8 – Table 33**). Also, it should be only focused on the general background and some sentences describing their problematic usage. This is to avoid self-presentation issues.

The detailed examples above demonstrate how the participants utilised the COPE.er method, its building blocks mapping, and the provided guidelines to holistically analyse the functional features and how the persuasive techniques better integrated into the analysis.

9.5.3.4 REVIEWING THE POTENTIAL RISKS

This section presents the third iteration of the customisation process. The iteration was guided with the aid of the potential risks and their sources in (**chapter 8 – Table 35**). These guidelines focus on highlighting sources of side-effects which designers need to eliminate or at least reduce.

The approach taken to assess the adherence to these guidelines was as follows: the designers take each source of concern and then skim through the features selected in the previous iteration to look for any potential risks based on the knowledge provided in (**chapter 8 – Table 35**). Interestingly, it was observed that the designers started with looking for the features where the visibility was set to the ‘*my group*’ or ‘*specific peers*’. They argued that most of the risks would stem from those visibility levels. **Table 44** outlines the main revisions were made.

TABLE 44: THE REVISIONS MADE BASED ON THE ANALYSING THE POTENTIAL RISKS DOCUMENT

<p>Creating an addictive experience</p>	<ul style="list-style-type: none"> • The only features that can be gamified are those requiring users to work on themselves, e.g. <i>‘limiting usage’</i>. As such, they decided that the <i>‘asking questions’</i> feature should not be gamified, e.g. the more answers a user provides, the more points he/she earns. • The <i>‘group chatting’</i> feature should be only for either formally scheduled or moderated meetings, to avoid pre-occupation, i.e. what would my peers chat about now? Peers should be notified in advance to avoid pre-occupation especially for <i>‘events’</i>, i.e. when the next meeting would be?
<p>Peer-pressure</p>	<ul style="list-style-type: none"> • The <i>‘tagging’</i> feature was re-assessed and found to create positive peer pressure.
<p>Experiencing fail to engage</p>	<ul style="list-style-type: none"> • The designers excluded <i>‘Leaderboard’</i> as it may cause lack of interest due to the possibility of experiencing fail to engage.
<p>Downward social comparisons</p>	<ul style="list-style-type: none"> • Comparisons should be restricted to the practitioners only.
<p>Assigning to non-matched groups</p>	<ul style="list-style-type: none"> • The designers checked the existing social roles, and they believed that there were no issues with this. However, they argued that the practitioner should look at this aspect as it requires practical domain knowledge.
<p>Addiction scoring</p>	<ul style="list-style-type: none"> • The designers suggested that it might be included, but only visible to the practitioner. Then, they consulted the practitioner, and it was suggested that <i>‘addiction scoring’</i> should be only for self-help, i.e. similar to self-screening questionnaires, rather than to be used to make treatments decisions.
<p>User experience impact</p>	<ul style="list-style-type: none"> • The designers suggested that all coercive features should be changed from imposing actions to send reminding messages instead. The group should decide collaboratively what apps/features/times to be considered for such coercive measures.

9.5.3.5 REVIEWING HEURISTIC PRINCIPLES

This section presents the final iteration of the customisation process. The iteration was guided with the aid of the heuristics principles, see **chapter 8 – section (8.3.1.3)**.

Principle 1 (Social equality rather than hierarchy): The ‘*reacting to content*’ feature should be only for group chatting and to be cleared after each session. This is to avoid aggregating reactions to content, e.g. the number of likes per posts. For the ‘*posting*’ feature, only ‘*commenting*’ should be embedded, but not the “*reacting to content*”. Also, if the online peer group platform is implemented as a dashboard application to manage multiple social media accounts from one place, certain features should be made hidden, e.g. the online platform hides the number of friends Facebook provides to users. In other words, the platform acts as a filtration layer. Also, anything related to the success outside the rehabilitation goals must be filtered out as it can be mapped to the **reputation** block. A participant commented that “*this block seems to be a source of negative side-effects*”.

Principle 2 (Instinct to survive): The designers recommended that for any social object in (D.3) where the confrontation is set to be the mode of the delivery, the practitioner should be involved. Also, the rewarding system should consider less challenging earnings to avoid any defensive mechanisms, e.g. “*the treatment is not suitable for me!*”. The ‘*goals progress*’ should be enabled at the stage where users shift from group-based tasks to the ones focusing on the self, i.e. the blue, pink and green transitions according to (**chapter 7 – Figure 28**). One of the designers suggested re-checking any feature that involves messaging either peer-to-peer or system-to-peer to detect any violations to this principle.

Principle 3 (Encourage collaborative decision making): The designers suggested that ‘*creating events*’ and ‘*selecting goals*’ should utilise collaboration as a strategic objective. The ‘*asking questions*’ feature can be utilised here as well to encourage the collaboration, ownership and commitment.

Principle 4 (Focus on the self): A designer suggested that if the usage statistics configured to be visible to the whole group members, the name of the applications associated with the statistics

must be anonymised. Firstly, this will economise surveillance and encourage focusing on the self. Secondly, seeing someone who heavily uses a specific app may trigger the urge to go and try it.

This can also be linked to the heuristic principle six which reads “eliminate private relationships and subgroups”. A user may try to find a peer on the social platform that appears in that usage dashboard. As such, the private relationship may emerge. The designers then decided that ‘*usage stats*’ should be visible to the user and the practitioner only. The ‘*treatment progress*’ feature should be made visible to all members to identify senior and new peers. The ‘*self-assessment*’ feature should be only visible to the user. The ‘*posting content*’ and ‘*asking questions*’ may potentially violate this principle. But the designers decided to enable them. However, their usage should be supervised, perhaps in the form of an auto-generated report to the group moderator.

Principle 5 (Prevent selective and optimised self-presentation): The designers suggested restricting how many times a user can change the ‘*profile picture*’. Also, in phase one, the designers decided to include ‘*my mood*’ and make it visible to all members. However, the mood history should be only visible to the user and the practitioner. The designers argued that if the mood history was visible to all peers, some might try to intentionally express false positive attitude and emotions and that violates the current principle. The ‘*personal skills*’ feature was removed by the practitioner. He suggested that it may lead to false self-presentation and impacts others’ self-esteem as well.

Principle 6 (Eliminate private relationships and subgroups): The designers highlighted the need to ensure providing random names to users rather than users select their own. The addicts may have a tendency to use their own digital identity. Consequentially, other peers may try to find them online and, then, secret relationships may develop. The system should also detect and inform the moderators when ‘*tagging*’ and ‘*commenting*’ are exchanged exclusively between specific peers. Also, the designers recommended removing the level of the visibility that allows users to allow *specific peers* (see **chapter 8 – Table 29**) to view their social activities as it may cause group clustering or private relationships.

Principle 7 (Learning before doing): One of the designers suggested that the *'Leaderboard'* feature can be only used at last stage of the treatment. Also, it should be only for certain tasks and for generic goals, and for clients who are at the same level of the treatment. However, they argued that this would not work for the current group where senior peers and new peers are part of the group. Then, the practitioner suggested that *'Leaderboard'* is very risky as it could also cause group clustering. However, he suggested to limit it to the top two or three, and that should be on a weekly basis, i.e. to be cleared every week.

Finally, for the last two principles, i.e. *Encourage user self-labelling and personalisation* and *Emphasis dispositional attribution*, the designers argued that they can only be assessed on the run-time, i.e. during the actual use of the system. This is because these principles seem to be more about the actual moderation.

9.6 DISCUSSION

In the light of the evaluation findings, this section discusses that questions outlined in the beginning of this chapter which ultimately focus on the understandability, comprehensiveness, appropriateness, and usefulness of the COPE.er method.

9.6.1 UNDERSTANDABILITY

While the participants highlighted that the method was easy to understand, they suggested that an extra day to run a small-scale exercise was very important. However, to ensure that the validation collects the first reactions and impressions which were important to identify the weakness and challenges of the method, it was important to avoid overtraining which could bias the performance of the participants.

9.6.2 COMPREHENSIVENESS

It was observed that the method materials were very overwhelming to the participants. Yet, it was obvious that the method still lacks some extra materials to help to manage the design decisions made in order to facilitate the flow of the iterations of the second phase. Consequentially, some

extra steps are needed to do with registering the decisions made in each phase to inform the next one.

Further guidelines are also needed to reduce the evaluation workload. For example, the designers suggested that the platform should be designed in a way to discourage the motivations for using digital media which were mentioned in the clients' stories. For example, Adam's motivations are self-presentation, passing time, and maintaining old ties. As such, the online platform should be designed against those three motivations. This suggestion can be seen as a practical approach to deal with the complexity of analysing and addressing different aspects of the users' stories. However, it may induce some design errors. For example, some motivations are positive and should be encouraged, e.g. relationship maintenance, and meeting new people. This suggests the need for adding guidelines related to what motivations are more relevant to the problematic usage, such as self-presentation, online romance, social comparisons and social presence, etc. and tailor the functional features in a way to discourage them.

In terms of the social objects, there was a consensus that further observational studies focusing on each element in the social objects document are still essential. This is to help to understand what qualities and functionalities should be assigned to each planned purpose in column 'A' of (**chapter 8 – Table 24**) and what features to be offered.

9.6.3 APPROPRIATENESS

In terms of the appropriateness to the designing for the online space, the insights collected from the online observation study and the informal survey which was done to collect functional features from different behavioural change applications in the market have significantly improved the method to design for the online peer groups platforms.

In relation to whether the method can be applicable to other rehabilitation practices, the evaluation exercise was designed independently from the organisation culture, i.e. the observed rehab centre. The organisation culture refers to the processes, tools, practices and methods already exist where the COPE.er is expected to be applied. This is to reduce any potential influences stems from their internal practices. Therefore, the reflection of the proposed method on the current

activities and practices of the rehab centre was out of the scope of the thesis, e.g. how would the rehab centre involve real patients in the design activity.

9.6.4 USEFULNESS

While the methodological stance of the COPE.er emphasises the domain logic as a primary focus; it was observed that the involvement of the designers who had experience in some specific topics, e.g. usability, had a negative influence on the discussions in the first phase. For example, while the moderator kept reminding the participants about the scope of the design, occasionally some usability issues, such as learnability, were the centre of the discussions. In the second phase, it was observed that the maintainability of the design scope had improved the analysis. Designers communications were more focused on the core treatment requirements rather than personal preferences. However, the interaction with the end-users dropped significantly.

The findings suggest that the method encourages analytical thinking and collective judgments. For example, the mapping of features to the building blocks helped the designers to incorporate the persuasive techniques in the analysis. Also, helped to better understand the impact of the features and how to minimise/maximise that negative/positive impact by negotiating the parameters of the features. Parameters here refers to how a feature can be configured, e.g. in terms of the level of visibility, constraints, feature ownership.

Involving the end-users without careful governance can easily inject biased decisions. Controlling the wording of the questions and the situations where end-users' involvement to be permitted seems essential aspects. It was noticed, however, that in the second phase that the practitioner's involvement outweighed the end-users. While this indicates a good performance of the proposed method, such minimal participation can severely impact the ownership principle which should be promoted by the method.

In terms of the practitioner, some of the designers highlighted that the iterative consultation of the domain experts' is very needed, others suggested the practitioner active role rather than a consultative role.

This chapter presented the approach taken to evaluate the COPE.er method, its artefacts and the supporting guidelines. The method aims at managing the design process for online peer groups platforms to regulating digital usage. The member checking method was utilised to validate some of the artefacts, e.g. social objects and social roles. The rest was validated using a case study which helped to investigate how the design process will be managed with and without the COPE.er method in order to draw some conclusions.

10. CHAPTER 10: CONCLUSIONS

Digital Addiction is an emerging behavioural phenomenon that denotes a problematic usage of digital media. It refers to a usage of digital devices that is characterised by being excessive, compulsive, impulsive and hasty. It is often associated with negative life experiences such as anxiety and depression. Such usage could meet various criteria of an addictive behaviour such as salience, conflict, tolerance and withdrawal symptoms and, hence, it would raise new challenges and ethical considerations on the way the software is engineered. Luckily, software as a medium for such addictive usage could also be a medium for enacting a behaviour change and prevention strategy towards a regulated usage. However, due to the recentness of such software-based interventions including those applied in social settings, a well-defined body of knowledge on how to develop them is still needed.

Social software systems are expected to provide interactive tools to build and maintain social connections and facilitate mass interactions and collaboration among individuals. The results of this thesis suggest that utilising traditional software design processes and models to build persuasive systems for behavioural change is questionable, e.g. in the notion of user requirements and its peculiarities when users can have a degree of denial and conflict in their requirements and preferences. The reliance on de-facto social software constructs may not be sufficient enough to for designing online environment to influence behaviours for users who want to achieve specific goals and make positive change. In addition, using such systems and their features, e.g. chat and praise, to mediate behavioural change may lead to adverse consequences as they were not built for this purpose but mainly to increase openness and connectedness which is a double-edged sword if used for problematic behaviour such as DA.

This thesis is intended to shed light on the need for a careful design of technology in this emerging field. It also highlights the new challenges which arise when developing software for addictive behaviour where users' requirements have particular characteristics, e.g. being against their comfort and current desire to achieve a new behaviour in the long-term.

In the light of these issues, this thesis has attempted first to understand users' perception of such systems. It specifically looked into the online peer groups as a motivational strategy to support the behavioural change for those who exhibit symptoms of DA. Online peer groups can be an appropriate approach for this type of users due to their need for less action-oriented strategies in which immediate change is not expected (Prochaska 2013). However, this strategy will be a good place for those who are also unaware of their level of addiction as it can make them more informed of the consequences occurred to their peers. Subsequently, the theoretical aspects of social software design have been investigated to enable building systems that mediate persuasive messages to the targeted audience. Then, a participatory design method was proposed to systematically manage the life cycle of the design by taking an iterative and interactive approach to refine the design and promote communication in the development team. The participatory approach has helped to reduce the number of the biased design decisions which can then reduce unpredictable effects.

10.1 OBJECTIVES REVISITED

Objective one: Conducting a literature review on the DA and its related topics

To achieve this objective, the thesis reviewed the literature from four perspectives to achieve comprehensive understanding:

- Digital addiction as a symptom: The thesis reviewed the social psychological literature to understand the main theories on how the technology is used. This perspective helped to advance the understanding of how the condition is influenced by the psychological factors as underlying causes. Additionally, it helped to understand the importance of considering different diagnostic criteria to prescribe DA.
- Digital addiction as a behaviour: The thesis also reviews key models and theories of behavioural change which take pragmatic approach aiming to support intervention.

Modifying the context by, for example, understanding and addressing barriers, perceptions and self-efficacy, appeared to represent the spirit of this perspective.

- Technology as a modality: The thesis reviewed some topics related to the technology that can deliver the interventions such as online peer groups and motivational interviewing. This includes the persuasive techniques and gamifications which can be delivered through online peer groups.
- Technology as a design discipline: The thesis reviewed topics related to the design and engineering facets. This includes software engineering, self-adaptive systems, social computing design, HCI, user-centred design and user involvement.

Objective two: Building a reference model for digital addiction

The thesis utilised the outcomes of objective one and reviewed more materials to conceptualise DA. The outcomes were represented as a working reference model in an ontological form. The ontology was centred around the factors that play a role in enforcing users behaviours and causing DA. The ontology classified factors into three main categories: i) factors related to the user, ii) factors related to the software, and iii) factors related to the user interface as an interactive layer the optimise users' experience.

The reference model was then validated in a focus group session involved experts who checked the ontology structure and concepts.

Objective three: Exploring the IT-facilitated behavioural change technology and the online peer groups as an intelligently mediated intervention

Empirical studies were performed to explore and model E-health technology and online peer group to regulate DA. As a new field of research, the attention was paid to the risks, potentials, challenges and considerations to utilise E-health and enhance it with the online peer group approach to regulate usage. Also, a range of design aspects and ethical concerns were highlighted.

Objective four: Devising a novel method for managing the design process of the online peer groups platforms to overcome digital addiction

Two observational studies were performed to understand face-to-face and online peer group approach. These two studies were complemented by an interview and document analysis methods to collect more data and insights. All the data obtained were analysed and synthesised into a process-method to facilitate a systematic design process of online peer groups. As objective three showed that no consensus on how online peer groups should be designed in terms of the features, feedback messages and governance, the proposed method adopted a participatory approach to involve users and to recognise their preference and needs.

Objective five: Evaluating the proposed method

The validation and evaluation of the proposed method (COPE.er) were performed in three phases.

- **Phase one** consisted of a validation exercise using expert checking. The addiction counsellor who moderated the face-to-face peer groups was recruited to review the knowledge derived from the observation study to improve its accuracy and validity. Based on the validation outcomes the modifications and suggestions were applied the COPE.er artefacts and guidelines and prepared for the next phase.
- **Phase two** involved utilising a case study to design an online peer group in terms of deciding the features and functionalities as well as the constraints that needed to alleviate any negative side effects. This phase was performed without the COPE.er method. This phase helped to detect the situations where the design process should be guided and where the end-users and practitioner intervention was needed. All these situations were analysed, and further modifications were applied to the method to prepare for the next phase.

- **Phase three** focused on evaluating the COPE.er method by applying it to design the online peer group. A set of quality attributes were specified to guide the evaluation procedures taking a subjective stance. of the method understandability, comprehensiveness, appropriateness, and usefulness.

10.2 CONTRIBUTION TO KNOWLEDGE

This thesis contributes to the growing field of research into the area of digital addiction behaviour. It also contributes to the design of interactive online peer groups as a promising strategy to promote and sustain behavioural change. This section highlighted the four main contributions

Identifying challenges and core principles for developing technology to regulate DA:

Despite the growing body of knowledge on dealing with digital addiction, there has been little work on synthesising the available knowledge into conclusions about design challenges, potentials and concerns in this emerging area. Thus, this thesis made an initial attempt to address this gap as a first contribution.

The main conclusion is that DA relates heavily to user personal circumstances, requirements and expectation that can be hard to express due to their sensitivity and tacit nature. It is also the holistic and long-term experience that can be assessed in some cases, but in others, it should be envisioned. The technology is strongly influenced by individuals' inclination to seek help and perception that the change is not beyond their control. As such, the technology may not only fail because of the design but also because of the inaccurate articulation and scope of the audience. For example, overlooking willingness and readiness to change is highly likely to fail to motivate and even create resistance to change.

The reviewed literature suggests that addiction is heavily tied to underlying problems where addiction is seen as an unhealthy coping mechanism. In other words, addressing these underlying problems would help to overcome the addiction. This is reflected on the treatment practices where individuals with different addiction themes are treated equally using the same strategies.

However, in digital addiction, the technology can be harnessed to complement current treatment practices to intervene with the behaviour. **Chapters 2, 4, and 5** made an attempt to advance the understanding of this condition and to explore how the software can contribute to enhancing self-regulation. The thesis argues that between the thing (e.g. events, processes, etc.) that triggers a behaviour and the users' reaction, there is always a choice. Unfortunately, unlike other behaviours, the response to a stimulus in addictive behaviours is often spontaneous and fundamentally motivational. So, when a technology is designed to offer and enforce users to select pre-planned choices that do not consider users' values and actual needs, the process of addiction my start. However, the results obtained from these chapters suggest that the software can help to identify the right time to install a pause where users are offered a chance to rethink their use, empowered by alternative choices, and enforce these choices with the aid of digital motivation techniques. By understanding the dynamics that shaped the user experience, the software can help to decide what alternative choices can be offered to re-gain control.

Applying classical HCI principles may not be sufficient to offer designers with the right tools, principles and methods to understand how and when to install that pause. Not only that but also what that pause would look like. In digital addiction, attention distraction if carefully designed can be an effective strategy to account for such spontaneous reactions. This strategy and others cannot be simply selected and applied to the software hoping the behaviour would be influenced. The reason is that a stimulus can be enforced with other surrounding powerful elements such as hope, misconceptions, urges, and even motivations. Without a better understanding of this complexity and how to deal with it, the resulting E-health system is likely to fail.

Investigating online peer group as a strategy to overcome digital addiction:

The thesis introduced online peer groups as a persuasive technique to aid users to adjust their usage style, promote and sustain behavioural change. Also, it suggests two main modifications to be applied to the conventional online peer groups in order to boost their performance. Firstly, online peer groups should be built based on the tunnelling principle, meaning that persuasion

experience should be guided by permitting predetermined tasks in a sequential manner following the model proposed in **chapter 7 – Figure 30**. Secondly, online peer groups can incorporate other persuasive principles (e.g. monitoring, digital rewards) to create a better motivational environment.

The findings in **chapters 6, 7, and 9** suggest that mediating behavioural interventions in a group setting can be a promising approach to overcome digital addiction but would transform the solution into a socio-technical system. As such, the thesis argues the potential for adopting socio-technical approach as a multidisciplinary strategy to design online peer groups. Socio-technical systems call for accommodating social requirements to recognize social values such as trust, fairness and justice (Whitworth 2009). Mumford (2000) also highlighted the importance of the democracy as a social value as people who are part of the system should participate in the decisions that concern them. This is also known as commitment and consistency, i.e. people feel obliged to what they committed to (Cialdini 2009).

While Socio-technical approach can help to harness both individuals' and technical aspects to achieve efficient group optimisation, the challenge would be to identify the right methods to elicit collective group needs rather than personal desires which are, to large extent, easy to communicate. For example, like any other types of treatments, it can be acceptable by a patient, to a certain extent, to tolerate short-term side-effects as a first positive reaction to the recovery provided through this technology. Yet, this requires that individuals are made aware of these possible side-effects. However, more efforts are still needed to identify the symptoms of those side-effects on the group level in order to monitor them and apply any further remedy. Also, the trade-offs between the social aspects, (e.g. social structures, roles and norms), and personal characteristics, (e.g. personality traits and level of dependency), should be considered as a challenge in these systems. For example, in certain stages of the treatment, these systems might need to focus more on the group requirements to promote the overall group performance and address individual requirement, for example, in one-to-one sessions. Further issues relate to the trust, privacy and transparency when the group interaction involves a heavy element of self-

disclosure; as well as how can this type of socio-technical systems assess the adjustment needed for the socio-physical dimension in the advanced treatment stages. In other words, the system should play a role to promote the opportunities for face-to-face communications. These chapters looked at such issues and provided some insights and guidelines to identify them and provide some countermeasures.

Revising the social software constructs to recognise emerging cyber behaviours:

The literature review identified some conceptual models for understanding the design principles of social software systems. **Chapter 7** showed that these models are not sufficient to build social platforms that have a critical focus on boosting healthy behaviours. These platforms have distinct principles, e.g. awareness and collaboration. When adopting current models for requirements elicitation, these principles will be studied as elements of other principles, e.g. reputation and competitiveness.

For example, the *presumption* principle where users produce values for their own consumption can be translated in social software into a set of features that aid users to generate content to receive feedback. Apparently, enforcing this role (i.e. active consumer) will increase social participation but will also create an addictive environment. In this environment, users are driven by their desires (e.g. personal branding), not by the predictable outcomes (Xie et al. 2007). In online peer group to regulate DA, features and functionalities that encourage *presumption* role may need to be moderated to avoid “*unconscious and hasty actions, which exacerbate the consequences and necessitate*” (Ali et al. 2015). However, this role can aid recovered users who act as moderators to sustain their behaviours (i.e. “helper” principle). Helping others can enhance therapeutic benefits in preventing relapse.

Another example is the Honeycomb framework shown in **chapter 2 – Figure 7** which proposes seven blocks to build social software. The *awareness* requirements can be prescribed by building blocks such as ‘presence’, ‘reputation’, and ‘relationships’. The number of ‘followers’ represent the popularity of a member in a social structure. In turn, this will shape other members’ interaction style and perceptions towards that member (e.g. being mindful and send positive

reactions to avoid hate responses). In this case, the *awareness* is centred around other social principles (reputation). If the reputation is dealt with a primary gain, the *awareness* will be regulated by the reputation constructs, e.g. earning respect, attractiveness and constant presence rather than, for example, perseverance, openness, cooperation, equality and enjoy helping.

The thesis contributed to this gap by revisiting a well-known framework and introducing some modifications to cater for these requirements. As a result, the thesis proposed a modified framework where further constructs such as assessment, collaboration and awareness were introduced and discussed in **chapter 7** and evaluated and refined in **chapter 9**.

Devising a participatory design method to design online peer groups to regulate DA:

Despite the design frameworks that can help to build systems for behavioural change, there is a lack in engineering methods to build online peer groups. As a contribution to knowledge, this thesis devises a participatory method to address this gap by proposing the design method for online peer groups. The findings obtained from **chapter 6** showed that there is no consensus about the online group structure, governance style and motivational techniques. This motivated the method to adopt a participatory approach to facilitate conception, designing and customising online social platforms for behavioural change. The method, also, classifies behaviours in peer groups into a set of social roles to reduce the complexity to design and manage social systems efficiently. The analysis of the users' behaviours and mapping them to the derived social roles can facilitate the design activity. Additionally, to better guide the identification of the persuasive opportunities in a given case design, the revised building blocks which were highlighted in **chapter 8 – section (8.2.3)** are integrated into the method. The method, also, provides step by step instruction on who to define and priorities requirements and actively involve different stakeholders to collaboratively design the platform. The method provides the designers with the tools and guidelines, artefacts and governance protocol to effectively manage the design process and reduce potential bias may result from end-users.

The research has several limitations that may have a potential impact on the results. As a qualitative research, the main limitation is the generalisability of the findings to a larger population. The following bullet points highlighter the research limitations.

- In **chapters 5, 6 and 9**, the CAGE questionnaire was used to measure participants' level of addiction. This instrument is a simple and inexpensive tool that does not cater for the wide spectrum of cases and levels of addiction. However, other comprehensive psychometric measures still face other issues in the addiction criteria itself such as the lack of considering the context of use, the aspects related to the temporal dimension such as compensating relationship breakdown (Griffiths 2000b) and preoccupation component. This explains why “no gold standard” for diagnosing and assessing DA yet exist (Kuss et al. 2014).
- This thesis has mainly targeted those who seek help for their shortcomings. While targeting this type of participants helped to eliminate a wide range of denial patterns, it may limit the findings to those individuals. This has also helped to ensure an adequate degree of willingness and readiness to change. For example, in **chapter 5** help-seekers were recruited to install the E-health applications. Apparently, non-help seekers may have different views and perception about features these applications that were investigated. Also, the choice of the E-health applications may have a potential influence, i.e. analysing other applications might lead to discovering additional concepts and risks of the E-health technology in the domain of DA.
- In **chapter 7**, the researcher was a key instrument in collecting the data. Observational studies are subject to the observer bias (e.g. to confirm hypotheses) and error (e.g. overlooking some aspect due to the lack of understanding the social context) (Saunders et al. 2009). The research studies conducted in **chapter 7** were exploratory in nature (i.e. inductive). Hence, there was no formal hypothesis as the purpose was to explore peer group thoroughly and form some hypotheses for future

research. To reduce the potential error, the researcher validates the observations and findings with the expert who moderated all the observed sessions. However, other rehabilitation centres might have different theoretical underpinnings. In other words, different centres might advocate different theories, see **chapter 2 – section (2.4)**.

10.4 RECOMMENDATIONS AND LESSONS LEARNED

- Despite the impact of DA on society, it is still considered outside the boundary of the software engineering community. That is, unlike the situation with drugs or alcohol, software engineering has, so far, not been charged with the responsibility for dealing with or mitigating the effects of DA. The software is still seen, implicitly, as just a medium in which its requirements, features, values and design are not studied as primary causes of DA. In contrast, this thesis suggests that the study of these factors inherently belongs to the early stages of developing software; namely requirements engineering. There is still a lack of consensus in a variety of domains, such as Green Computing, Digital Citizenship and Agent Computing. For this reason, this thesis encourages approaches that do not interfere with the decision-making about DA, but rather provide tools and platforms to facilitate taking those decisions effectively.

DA relates heavily to users' perceptions, expectations and personal requirements which are not easy to express in words for most users, i.e. tacit, fuzzy in nature and, also, very sensitive and private. This maximises the challenge of the conventional elicitation methods to capture DA knowledge even via crowdsourcing. However, whilst ultimately wanting to reach such rich understanding, a more pragmatic view can be adopted. For example, it might be hard to fully understand some psychological reasons for why certain features appear to trigger or exacerbate particular addictive behaviours. Yet, designers could still learn which features have those impacts. That is, from a behavioural perspective, software engineers should be able to learn to produce software products that are less likely to stimulate addictive

behaviours. Hence, in having such an engineering goal, the thesis turns again to consideration of DA from a requirements perspective.

- It could be argued that behaviour change is easy to achieve but ensuring that the change occurs in the intended direction is much more challenging. As a reflection of this, there is a movement within the behaviour change field towards a more holistic and co-ordinated approach that takes into account the individual and contextual factors that may influence the success of a particular strategy. Some of this draws upon social marketing, which uses techniques from commercial marketing to identify possible barriers to achieve a successful behaviour change. In the case of E-health technology to overcome DA, more extensive research into perceptions and attitudes of users can develop a better understanding of the context in which strategies will be applied.

Many of the E-health applications could also be considered to deliver brief interventions. In alcohol misuse treatment terms, this refers to a fairly limited and quick intervention in which individuals are made aware of the health risks of their behaviour and prompted to set some goals for improvement. Similarly, many of the characteristics identified in the studied E-health applications in **chapter 5** can be found in NICE recommendations for substance use education and prevention programmes, such as the use of motivational techniques, interactive activities and social comparisons. As such E-health applications do appear, at least in some ways, to correspond with that could be considered to be government and behaviour change expert approaches to behaviour change.

- The current state of the classical methods in software development, e.g. requirements engineering, are not efficient enough to deal with users in severe stage. This type of users exhibits distorted, conflict and changing requirements, denial of reality and refusal to admit and change using a wide range of defending mechanisms. Thus, to design persuasive systems for DA, future studies are required to re-visit software

engineering methods to customise existing elicitation models to the field of behavioural addiction. This is to bridge the gap between elicitation practices and psychology in the domain of addiction.

- Addiction is a complex behaviour and usually driven by underlying causes that need to be addressed first. As such, this thesis argues that E-health technology would not replace clinical treatment. However, behavioural change strategies and approaches including online peer groups will complement that and act as an early intervention, i.e. helping addicts to start the cycle of change. However, in order to achieve that, the design should ensure certain pre-conditions, e.g. willingness and readiness to change, openness to shortcomings and being free from denial of reality. These can be seen as extra social requirements to ensure the success of the system and to be integrated properly into the treatment programmes provided by professionals in treatment centres.
- Using simple metrics such as time and frequency to measure the level of addiction would perhaps provide misleading assertions. As such, this thesis argues that measurement models should consider the psychological research on the addiction severity based on clinical criteria, such as salience, conflict and relapse (Griffiths 2005). Thus, users' feedback should feed into future measurement models to provide meaningful and suitable configurations for online peer groups. The design of such user feedback acquisition and its peculiarities in this domain, e.g. to detect and react against denial of reality, is a challenge to address.
- Software design can play a key role in facilitating addictive behaviours. Certain interactivity can trigger preoccupation and an escalation of commitment and tendency to allocate additional time to a chosen task, e.g. replying to mentions on the Twitter. Others can trigger the fear of missing out events that may be currently happening, e.g. newsfeeds in a social network. At the same time, this thesis argues that software enjoys capabilities that can offer breakthrough solutions to manage such

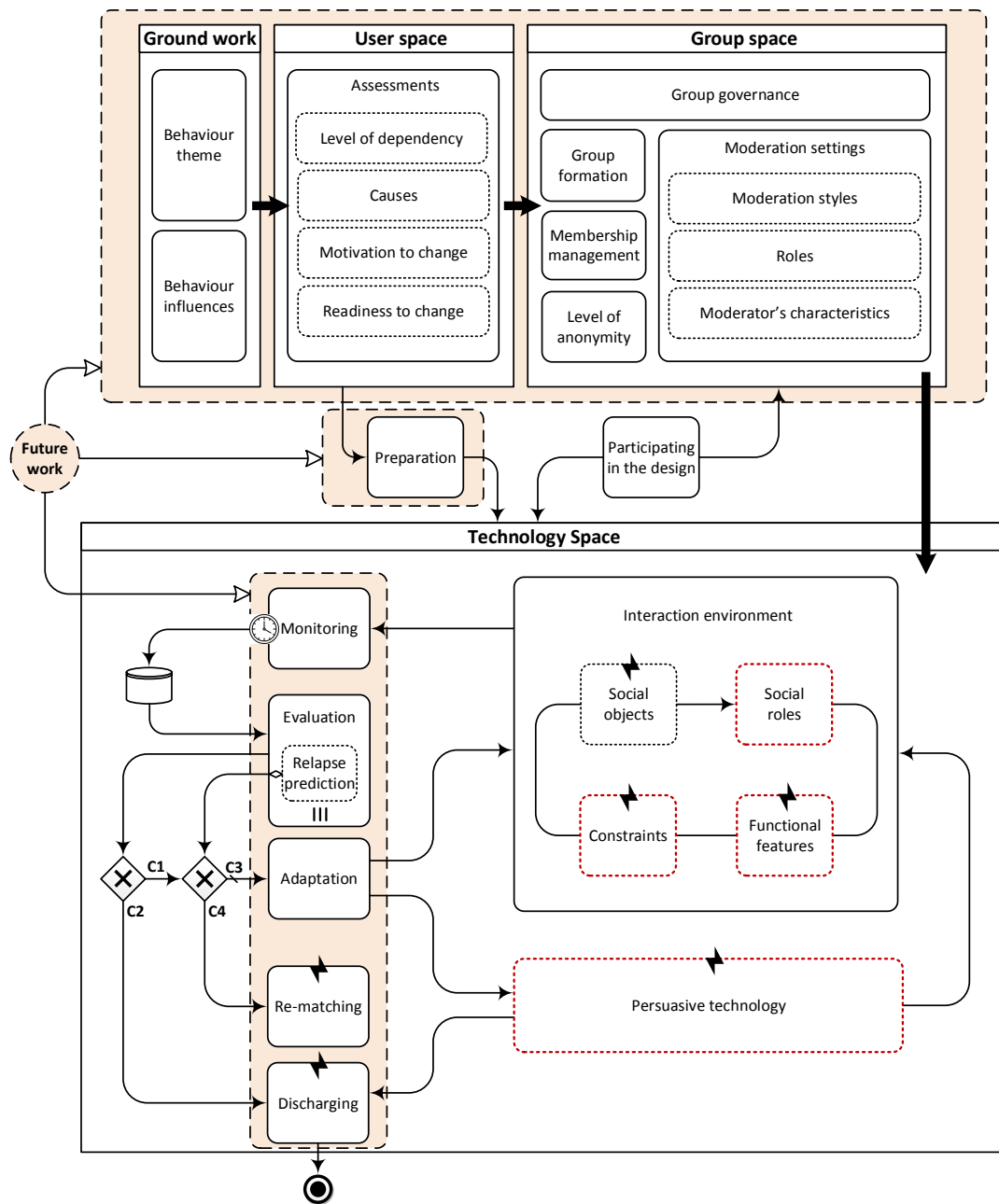
addictive behaviour. This includes being transparent to users and providing real-time traceability of their usage and intelligent and personalised feedback messages. Unlike other addictive mediums, e.g. tobacco and alcohol, the software can aid users to take an informed decision of their usage more actively. However, it is not yet clear what scenarios in which the system should react to negative practices, such as unsafe “dosage”, e.g. implementing lots of rewards or badges, which could create confusion and distraction. Another example is when newcomers to these treatment communities are offered competitive tasks, i.e. performance-oriented goals, while they might be at the stage of being emotionally vulnerable. Collaborative tasks, in this case, might be the right one to start with in order to improve groups cohesion, while competitive tasks can be introduced carefully in later stages of treatment, e.g. relapse prevention stage. This is to create conditions for more successful interventions where ethical values are carefully considered. This raises the need for essential knowledge on rigorous testing and validating the anticipated health outcomes. This includes the early focus on the measurement of users’ needs, requirements and performance to inform the design of the interventions, can provide better outcomes.

10.5 FUTURE WORK

- **Figure 40** shows the deduced reference architecture to design online peer groups to overcome DA. It highlights the main components need to be considered in the design to such systems. It should be noted that reviewing **chapter 8 – section (8.1)** will provide more explanation about the components shown in **Figure 40**. In this thesis, the key components (i.e. ground work, user space, group space and technology space) were explored. Further research was performed on the technology space. As a result, the COPE.er method was proposed and evaluated in terms of having proof of concept. Future work should focus on devising tools, methods and frameworks to systematically engineer the rest of the components in the reference architecture in addition to their various entities. For example, the COPE.er lacks tools and guidelines

to bring the group governance styles into the design process. This is including users' involvement in design activities relevant to the group space. Also, to enhance the processes in the user space beside the monitoring and evaluation processes in the technology space, a set of metrics for addictive software and addictive behaviour will be defined to make more accurate evaluations and adaptation decisions to re-adjust the online peer group design.

The COPE.er needs to explicitly advocate the theories of behavioural change to carefully plan interventions. This can be achieved by providing extra tools that help designers to conceptualise the targeted behaviour, and then model and translate the behavioural change theories and their strategies into functional specifications. The results of the method evaluation indicate this gap where the behavioural aspects of the targeted audience were not the starting point of the analysis during the evaluation. Hence, the future work should investigate what tools to offers in order to bring this aspect as a reference point of the analysis. Then, to assess if this would help to effectively integrate behavioural change theories and provide the design with a clear basis of the mapping to these theories constructs (e.g. self-efficacy which seems to be a core aspect of most of the investigated theories throughout the thesis).



- Legend**
- Architectural components
 - ▭ Key interactions to mediate behavioural change
 - User involvement
 - C1 If severe negative symptoms are detected
 - C2 If a user requires no additional group rehab
 - C3 If effects can be alleviated at the technology level
 - C4 If effects more relevant to the group structuring and re-formation is needed

FIGURE 40: THE COPE.ER REFERENCE ARCHITECTURE AND FUTURE WORK

- The proposed method (i.e. COPE.er) can be supported with a Computer-Aided Software Engineering tool (CASE) to enable the modelling and designing of online peer groups in a participatory style. This method can recognise group's choices to ensure that members have the design that fits their needs. The method emphasises the need to consider conflicting requirements. For example, a group's configuration that states that the design should eliminate interactions aggravate addiction-related behaviours (e.g. anticipation and fear of missing out) but at the same time overuses competition techniques as gaming elements. Such complexity requires extra tools that enable stakeholders to detect design violations, define the optimum features, how they should interact, and then visualise the overall design. The COPE.er CASE tool can also benefit from some requirement engineering languages to facilitate expressing the online peer groups requirements. For example, the RELAX language proposed by Whittle et al. (2010) can help to express both environmental and behavioural uncertainties, entities to be monitored in addition to the "addictive" and non-critical requirements that can be "RELAXed" temporarily as a response to change. Such languages and techniques need to be assessed to judge their suitability to the online peer group and the self-regulation systems in general.
- There is still lack of theory-based frameworks to guide the design decisions within the intervention systems for DA. Decisions in the intervention systems can be made: i) automatically by the system, ii) explicitly by users through manual customisation of the system's parameters or iii) implicitly by utilising users' quality feedback. The future work should look at who is responsible for framing these decisions, e.g. parents, users themselves, design experts, health-care professionals. Also, if it is to be based on a hybrid approach, the decisions a software can make remain unknown. This is including the study of the design of software-based behaviour change at the precautionary and recovery stages. However, the focus will be on other motivational approaches that can complement online peer groups, e.g. engineering rewards within the group level.

- Future work will investigate the requirements engineering and software validation for DA and their challenges (e.g. the denial of requirements of addicts and their conflicts). This raises the question of how to support software engineers to capture and model requirements. *Analysis Pattern* (Fowler 1997), for example, may help to capture the abstract patterns and re-use them for other digital addiction themes (e.g. game addiction, online gambling addiction). This approach may help to model situations occur in different contexts but are likely to share similar attributes (i.e. user experience, triggers and stimulus responses). Patterns can also cover different group structures, interaction styles, and even denial behaviours. This approach allows engineers to define useful constraints and also variations to add more flexibility to the developed models. This can help to account for the frequent change in the context, e.g. group structure and the types of social roles exists based on the individuals progress the end of the treatment. However, the approach is not meant to be for problem analysis but for business applications (Cox et al. 2005). Another example is *Goal-oriented approaches* (Van Lamsweerde 2001) which uses the goals notion to guide the requirements elicitation and to deal with potential conflict of interests may arise in online peer groups. This is also cover the conflicts between personal interest and rehab requirements.
- Future work will investigate the stakeholders set and their decisions rights in the engineering process, including addicts, the ethical issues around the engineering process, the sustainability of software-facilitated prevention and early-intervention for digital addiction and their potential short and long-term side-effects. Apparently, this will also require a multidisciplinary research.

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12. APPENDICES

12.1 APPENDIX 1

Part 1: Source knowledge

Original text:	
<p>“Almost all of the technologies mentioned above combine the three types of variable rewards, increasing their effectiveness in creating user habits. Email, for example, is addictive because it provides all three-reward types at random intervals. First, we have a social obligation to answer our emails ...” (Eyal 2012a).</p>	
Definition(s):	
<p>The extent to which an individual’s response reflected an understanding and respect of cultural norms and values, including understanding guidelines and the duties of given social roles.</p>	
Extracted knowledge:	
Individual(s)	Social obligation
Original text:	
<p>“A few short years ago it was becoming widely accepted that individuals would have access to their e-mail while at home and in the workplace. This expectation has recently expanded to include the portable and constant availability of e-mail and other data. It is now expected that individuals can and should access their e-mail remotely at any time and any place. All these expectations lead to, at minimum, an increase of psychophysiological stress and at worst contribute to the potential for Internet addiction” (Young and de Abreu 2011).</p>	
Definition(s):	
<p>Expanding expectation</p>	
Extracted knowledge:	
Individual(s)	Expanding expectation
Original text:	
<p>“Attention-deficit/hyperactivity disorder (ADHD) has been reported to be associated with Internet addiction in cross-sectional investigations among adolescents.” (Ko et al. 2009).</p>	
Definition(s):	
<p>A group of behavioural symptoms that include inattentiveness, hyperactivity, impulsiveness, short attention span, restlessness or constant fidgeting and being easily distracted (NHS 2014).</p>	
Extracted knowledge:	
Individual(s)	Attention-Deficit/Hyperactivity (ADHD)
Original text:	

<p>“Depression has been linked to Internet overuse in general. It has not been shown whether depression causes the addiction or if being addicted causes depression, but studies have shown the two syndromes are highly correlated, reinforcing one other” (Young and de Abreu 2011).</p>	
<p>Definition(s):</p>	
<p>A mental condition characterised by severe feelings of hopelessness and inadequacy, typically accompanied by a lack of energy and interest in life (Oxford dictionary).</p>	
<p>Extracted knowledge:</p>	
<p>Individual(s)</p>	<p>Depression</p>
<p>Original text:</p>	
<p>“Adolescents with higher social phobia were more likely to develop Internet addiction. Because Internet use can provide social support” (Ko et al. 2009).</p>	
<p>Definition(s):</p>	
<p>The prospect of presence of interpersonal evaluation in real or imagined social settings (Leary 1982).</p>	
<p>Extracted knowledge:</p>	
<p>Individual(s)</p>	<p>Social anxiety</p>
<p>Original text:</p>	
<p>“His primary motivation for excessive use of his computer appears to be some sort of escapism into his own world where he can counteract this depression and forget about his social isolation and his medical condition” (Griffiths 2000a).</p>	
<p>Definition(s):</p>	
<p>The tendency to seek distraction and relief from unpleasant realities, especially by seeking entertainment or engaging in fantasy (Oxford dictionary).</p>	
<p>Extracted knowledge:</p>	
<p>Individual(s)</p>	<p>Escapism</p>
<p>Original text:</p>	
<p>“Mood regulation refers to using the Internet to alleviate a dysphoric affective state such as anxiety, loneliness, or depression” (Young and de Abreu 2011).</p>	
<p>Definition(s):</p>	
<p>Changing one's emotional state.</p>	
<p>Extracted knowledge:</p>	
<p>Individual(s)</p>	<p>Mood altering</p>
<p>Original text:</p>	
<p>“This disinhibition effect further supports the Internet as a psychoactive medium; this consciousness- and mood-altering effect seems to operate irrespective of content. The attractiveness of the Internet</p>	

modality seems, in part, to be separate from the content that is being consumed” (Young and de Abreu 2011).	
Definition(s):	
A temporary loss of inhibition, caused by an outside stimulus such as alcohol or a drug (Dictionary.com).	
Any behaviour that is characterised by an apparent reduction in concerns for self-presentation and the judgment of others (Joinson 1998).	
Extracted knowledge:	
Individual(s)	Disinhibition effect
Original text:	
“Despite the frequency with which humans disclose the contents of their own thoughts, little has been known about the proximate mechanisms that motivate this behaviour. Here, we suggest that humans so willingly self-disclose because doing so represents an event with intrinsic value, in the same way as with primary rewards such as food and sex. Intriguingly, findings also suggested that both parts of “self-disclosure” have reward value” (Tamir and Mitchell 2012).	
Definition:	
“any message about the self that a person communicates to another” (Wheless 1978).	
Extracted knowledge:	
Individual(s)	Self-disclosure
Original text:	
“Absent face-to-face cues combined with text communication can alter self-boundaries.” “... The online companion then becomes a character within one’s intrapsychic world, a character shaped partly by how the person actually presents him or herself via text communication, but also by one’s internal representational system based on personal expectations, wishes, and needs” (Suler 2004).	
Definition:	
The process of creating character for an online companion within one’s intrapsychic world, a character shaped partly by how the person actually presents him or herself via text communication, but also by one’s internal representational system based on personal expectations, wishes, and needs (Suler 2004).	
Extracted knowledge:	
Individual(s)	Solipsistic introjection
Original text:	
“The effect of this dissociative imagination surfaces clearly in fantasy game environments in which a user consciously creates an imaginary character, but it also can influence many dimensions of online living” (Suler 2004).	
Definition:	
Splitting and dissociation online fiction from offline fact (Suler 2004).	

Extracted knowledge:	
Individual(s)	Dissociative imagination
Original text:	
“Anonymity causes individuals to pay more attention to their external cues and environment, and less to their own self-awareness and internal guides” (Young and de Abreu 2011).	
Definition:	
Feeling anonymous in one’s environment, resulting in behaviours contrary to one’s typical pattern of behaviour (Widyanto and Griffiths 2006).	
Extracted knowledge:	
Individual(s)	Deindividuation effects
Original text:	
“Results indicated that self-esteem was a better predictor of Internet Addiction compared to impulsivity”. “Individuals with low self-esteem seem to spend more time online” (Widyanto and Griffiths 2006).	
Definition:	
A chronic dislike for oneself (Kernis et al. 1993).	
Extracted knowledge:	
Individual(s)	Low self-esteem
Original text:	
“This study presents the evaluation of three-dimensional traits of personality (Sensation Seeking, Anhedonia, Impulsivity) among 65 patients admitted ...” “... These results of this transverse study confirm the link between addiction behaviour and these three personality traits” (Sarramon et al. 1999).	
Definition(s):	
<p><i>Impulsivity</i> The tendency to respond impulsively without sufficient forethought (Sternberg and Grigorenko 1997).</p> <p><i>Sensation Seeking</i> A personality trait expressed in the generalised tendency to seek varied, novel, complex, and intense sensations and experiences and the willingness to take risks for the sake of such experiences (Zuckerman 2010).</p> <p><i>Anhedonia</i> Inability to feel pleasure in normally pleasurable activities (Oxford dictionary).</p>	
Extracted knowledge:	
Individual(s)	Impulsivity – Sensation Seeking – Anhedonia
Original text:	

<p>“Characteristics frequently associated with IA have been identified as depressed mood, impulsivity, sensation-seeking, low self-esteem, shyness, and reduced attentiveness” (Young and de Abreu 2011).</p>	
<p>Definition:</p>	
<p><i>Shyness</i> The quality or state of being shy (Oxford dictionary).</p>	
<p><i>Reduced attentiveness</i> Attentiveness defined as “the trait of being observant and paying attention” (Oxford dictionary).</p>	
<p>Extracted knowledge:</p>	
<p>Individual(s)</p>	<p>Shyness - Reduced attentiveness</p>
<p>Original text:</p>	
<p>“When they got stressed out by work or were just depressed, Internet addicts showed a high tendency to access the Internet” (Young and de Abreu 2011).</p>	
<p>Definition:</p>	
<p>A state of mental or emotional strain or tension resulting from adverse or demanding circumstances (Oxford dictionary).</p>	
<p>Extracted knowledge:</p>	
<p>Individual(s)</p>	<p>Stress</p>
<p>Original text:</p>	
<p>“Loneliness has been associated with increased Internet use. Lonely individuals may be drawn online because of the increased potential for companionship” (Morahan-Martin and Schumacher 2003).</p>	
<p>Definition:</p>	
<p>The phenomenon of non-participation (of an individual or group) in a society’s mainstream institutions (Barry 1998).</p>	
<p>Extracted knowledge:</p>	
<p>Individual(s)</p>	<p>Social isolation</p>
<p>Original text:</p>	
<p>“In contrast, Internet use in the second case could be seen as a remedy for his homesickness. His online time seemed to make him a happy and functional individual although it could also be seen as the mechanism that caused him further isolation” (Widyanto and Griffiths 2006).</p>	
<p>Definition:</p>	
<p>Seeing the self as separated from others and as not having a common framework within which to interact (Korman et al. 1981).</p>	
<p>Extracted knowledge:</p>	
<p>Individual(s)</p>	<p>Social alienation</p>

Original text:	
“... If he’s not connected even for a short length of time, he worries he no longer knows what is going on” (Griffiths 2000a).	
Definition:	
An emotion involving pleasure, excitement, and sometimes anxiety in considering some expected or longed-for good event (Wikipedia).	
Extracted knowledge:	
Individual(s)	Anticipation
Original text:	
“Both voyeurism and exhibitionism were revealed as motivations for using Facebook.” (Bumgarner 2007)	
Definition:	
<i>Voyeurism</i> The tendency to track people because of the curiosity about what they are up to (Bumgarner 2007).	
<i>Exhibitionism</i> The desire to use social media to get attention (Hollenbaugh and Ferris 2014).	
Extracted knowledge:	
Individual(s)	Voyeurism – Exhibitionism
Original text:	
“Components of motivations for using Facebook ...” “... I make friends with people through Facebook” (Bumgarner 2007).	
Definition:	
The need we have or the tendency to seek out companions, social relationships and friends (psychologydictionary.org).	
Extracted knowledge:	
Individual(s)	Sociability
Original text:	
“The results suggest that the value of self-disclosure may derive from two independent sources: both introspecting about the self and communicating information to other people. Because both factors robustly activate neural regions associated with reward and do not interact, each of these factors appears to contribute independently to the motivation for self-disclosure.” (Tamir and Mitchell 2012).	
Definition:	
--	
Extracted knowledge:	

Individual(s)	Share personal experience and believes
Original text:	
“Components of motivations for using Facebook ...” “... I like things such as fake profiles” (Bumgarner 2007)	
Definition:	
An act of pretending to be another person for the purpose of entertainment or fraud (Oxford dictionary).	
Extracted knowledge:	
Individual(s)	Impersonation
Original text:	
A participant comment from the study conducted in chapter 5 : “Facebook makes me very excited and I like it more than other social networking sites”	
Definition:	
A feeling of great enthusiasm and eagerness (Oxford dictionary).	
Extracted knowledge:	
Individual(s)	Excitement
Original text:	
“Components of motivations for using Facebook: I use Facebook because I’m nosey”. (Bumgarner 2007).	
Definition:	
A strong desire to know or learn something (Oxford dictionary).	
Extracted knowledge:	
Individual(s)	Curiosity
Original text:	
Kujala <i>et al</i> (2009) point out that pleasure is one of the users’ emotional/hedonistic values.	
Definition:	
A feeling of happy satisfaction and enjoyment (Oxford dictionary).	
Extracted knowledge:	
Individual(s)	Pleasure
Original text:	
“Components of motivations for using Facebook: I feel like part of a community on Facebook” (Bumgarner 2007).	

Definition:	
Type of social influence involving a change in belief or behaviour in order to fit in with a group (psychologydictionary.org).	
Extracted knowledge:	
Individual(s)	Conformity
Original text:	
Kujala <i>et al</i> (2009) point out that control is one of the users' social values.	
Definition:	
The situation of being under the regulation, domination, or command of another (Dictionary.com).	
Extracted knowledge:	
Individual(s)	Control
Original text:	
Kujala <i>et al</i> (2009) point out that self-actualisation is one of the users' values.	
Definition:	
The realisation or fulfilment of one's talents and potentialities especially considered as a drive or need present in everyone (Oxford dictionary).	
Extracted knowledge:	
Individual(s)	Self-actualisation
Original text:	
Kujala <i>et al</i> (2009) point out that Freedom from fear is one of the users' safety values.	
Definition:	
*Fear: is an unpleasant emotion caused by the threat of danger, pain, or harm (Oxford dictionary).	
Extracted knowledge:	
Individual(s)	Freedom from fear
Original text:	
Jolibert <i>et al.</i> (1997) point out that social recognition is one of the users' power values.	
Definition:	
Appreciation or acclaim for an achievement, service, or ability (Oxford dictionary).	
Extracted knowledge:	
Individual(s)	Social recognition

Original text:	
Jolibert et al. (1997) pointed out that this is a personal goal.	
Definition:	
The appropriate performance of a particular identity in a particular situation and graceful passage between roles and situations (Čas 2011).	
Extracted knowledge:	
Individual(s)	Successful social life
Original text:	
“Lonely individuals may be drawn online because of the increased potential for companionship.” (Morahan-Martin and Schumacher 2003).	
Definition:	
Seeking the feeling of fellowship or friendship (Oxford dictionary).	
Extracted knowledge:	
Individual(s)	Seeking companionship
Original text:	
Even with everyone’s identity known, the opportunity to be physically invisible amplifies the disinhibition effect. People don’t have to worry about how they look or sound when they type a message (Suler 2004).	
Definition:	
The state of an object that cannot be seen (Oxford dictionary).	
Extracted knowledge:	
Individual(s)	Invisibility
Original text:	
“Authority figures express their status and power in their dress, body language, and in the trappings of their environmental settings. The absence of those cues in the text environments of cyberspace reduces the impact of their authority” (Suler 2004).	
Definition:	
Reducing the impact of authorities status and power (Suler 2004).	
Extracted knowledge:	
Individual(s)	Minimisation of authority
Original text(s):	

<p>“Tentative post hoc analysis proposed several variables that made the Internet attractive: intense intimacy, disinhibition, loss of boundaries, timelessness, out of control.” (Widyanto and Griffiths 2006).</p> <p>“The Internet allows individuals to leap over geographical boundaries and ... expand the ability of people with common interests to share ideas important to them.” (Bellamy and Hanewicz 2001).</p>	
Definition(s):	
<p><i>Intense intimacy</i> Intimacy is a close familiarity or friendship (Oxford dictionary).</p> <p><i>Loss of boundaries</i> The loss of guidelines, rules or limits that a person creates to identify for themselves what are reasonable, safe and permissible ways for other people to behave around him or her and how they will respond when someone steps outside those limits (wikipedia).</p> <p><i>Timelessness</i> The experience of transcending time and one's self by becoming immersed in a captivating present-moment activity or event (Oxford dictionary).</p> <p><i>Out of control</i> The power to influence or direct people's behaviour or the course of events (Oxford dictionary).</p>	
Extracted knowledge:	
Individual(s)	Intense intimacy – Loss of boundaries – Timelessness – Out of control
Original text:	
<p>“The mobility of current Internet access is based on our desire to have convenience and to have a sense of freedom and choice; it is this desire that fosters the illusion that more access and opportunity equals a better/happier lifestyle—that more is better” (Young and de Abreu 2011).</p>	
Definition:	
<p>The ability to move or be moved freely and easily (Oxford dictionary).</p>	
Extracted knowledge:	
Individual(s)	Mobility
Original text:	
<p>“... availability and low cost, appear to contribute to the total Internet experience.” (Greenfield 1999).</p>	
Definition:	
<p><i>Availability</i> The ability to be used or obtained; at someone's disposal (Oxford dictionary).</p> <p><i>Affordability</i> Inexpensive; reasonably priced (Oxford dictionary).</p>	
Extracted knowledge:	
Individual(s)	Availability - Affordability

Original text:	
We have seen this same phenomenon with the availability of a variety of food product choices. More is simply not better. The availability and variety of previously inaccessible, illegal, or hard-to- find content enhances the Internet’s attractiveness considerably (Young and de Abreu 2011).	
Definition:	
Different types and forms of content and services over the Internet, which can be accessible (Chou 2001).	
Extracted knowledge:	
Individual(s)	Availability of variety
Original text:	
A company that forms strong user habits enjoys several benefits to its bottom line. For one, this type of company creates “internal triggers” in users. That is to say, users come to the site without any external prompting. Instead of relying on expensive marketing or worrying about differentiation, habit-forming companies get users to “self-trigger” by attaching their services to the users’ daily routines and emotions (Eyal 2012b).	
Definition:	
Tending to cause or encourage addiction, especially through physiological dependence (Dictionary.com).	
Extracted knowledge:	
Individual(s)	Habit-forming
Original text:	
“A cemented habit is when users subconsciously think, “I’m bored,” and instantly Facebook comes to mind. They think, “I wonder what’s going on in the world?” and before rationale thought occurs, Twitter is the answer. The first-to-mind solution wins” (Eyal 2012b).	
Definition:	
A habit-forming technique in which emotions act as self-triggers to use specific services. That is to say, users come to the site without any external prompting by attaching the services to the users’ daily routines and emotions (Eyal 2012b).	
Extracted knowledge:	
Individual(s)	First-to-Mind Wins
Original text:	
“The interactivity component of the Internet may also be psychologically rewarding and different from other more passive forms of Gambling Addiction on the Internet entertainment (e.g., television). It has been shown that increased personal involvement in a gambling activity can increase the illusion of control” (Young and de Abreu 2011).	
Definition:	

Fundamental mechanism for knowledge acquisition and the development of both cognitive and physical skills. This includes both human-human and human-computer interaction (Sims 1997).	
Extracted knowledge:	
Individual(s)	Interactivity
Original text:	
“We developed an incentive-rewarding mechanism specific to SNSs in which users receive incentive rewards in proportion to their number of page views (how many times their page is browsed by others) but alters the reward amount for public and private content to compensate for the different perceived risks experienced. We expect our mechanism to motivate users...” (Yogo et al. 2012).	
Definition:	
According to Westin, privacy can be defined as “the voluntary and temporary withdrawal of a person from the general society through physical or psychological means” (Dienlin 2014).	
Extracted knowledge:	
Individual(s)	Privacy
Original text:	
The action phase in the hook mode proposed by Eyal (2014) “draws upon the art and science of usability design to reveal how products drive specific user actions. Companies leverage two basic pulleys of human behaviour to increase the likelihood of an action occurring: the ease of performing an action and the psychological motivation to do it”.	
Definition:	
“The extent to which a product can be used by specified users to achieve specific goals with effectiveness, efficiency and satisfaction in a specific context of use” (Standardisation 1997).	
Extracted knowledge:	
Individual(s)	Usability

Part 2: DA reference model validation (Ethics)

The Invitation email:

Hi all,

My name is Amen Alrobai, a research student in Faculty of Science and Technology. I’m conducting a card-sorting focus group to validate the ontology developed for “Digital Addiction”.

I hope you can take part in our session and provide your valuable comments.

Date: Friday the 24th October **Time:** 10:00 AM to 11:00 AM

Location: Room: PG143, Campus: Talbot, Building: Poole House

Notes: all documents mentioned in table 2 (see the introduction sheet) will be provided in the session. However, our recommendation is to perform the following tasks before the session to ensure better discussions and fruitful collaboration.

- Read the introduction sheet
- Fill the demographic form and send it via email or print it out and hand it in the session.
- Perform phase 2 in the table 1 (see the introduction sheet). You can use the provided ontology structure, concepts along with the glossary and the note form to provide information and comments.

Many thanks,

Amen Alrobai
Research student
School of Design, Engineering & Computing
Bournemouth University
P319, Poole House
Fern Barrow

Participant information sheet

Introduction

Given the multidisciplinary nature of Digital Addiction (DA), we selected ontological approach to conceptualise related concepts and factors. We have collected 82 concepts associated to DA and organised them in 20 different categories and sub-categories. The goal of this exercise is to validate and revise the structure of this ontology.

Procedures

The exercise will be based on hybrid card sorting technique. Participants will evaluate and modify predetermined concepts and categories, along with their created ones, then refine them offline though post-exercise questionnaire.

You will take part in exercise on Friday the 24th October between 10:00AM to 11:00AM at [PG143] in [**Campus:** Talbot – **Building:** Poole House]. Participants will be divided into two groups. Each one will have a leader while the researcher acts as a facilitator. The exercise setting will be as shown in the table below.

Table 1: Session structure

Phase No.	Activity	Description	Notes	Est. time
1	Preparation	The moderator briefed the participants about the exercise goals and structure.	-----	10 min
2	Reviewing	The participants were provided with a copy of the ontology structure to individually review and make notes in document two (i.e. the notes form).	Notes might include missing concepts or categorise, structuring issues and probably refinement suggestions.	15 min
3	Sorting	Each group was provided with the same set of concepts and categories cards to carry on with the sorting task. This was based on a group activity.	Participants were informed to remove concepts/categories and re-organise them as they think appropriate. Disagreements were expected to arise but resolved during the discussions. The remaining unresolved ones were not ticked in the notes form.	15 min
4	Presenting	Each group presented a version of the ontology with the refinement suggestions.	Each group was given five minutes	10 min
5	Discussion	Each group discussed the other group's card sorting findings and highlighted all disagreements and recommendations for further resolution.	Each group was be given five minutes	10 min

Table 2: The provided documents during the Focus group

Document No.	Documents	Description
1	Ontology structure	The drafted 1 st version of the ontology which was provided in an invitation email.
2	Notes form	Each participant should use this form to make notes about the provided version of the ontology.

3	Glossary	Most of the ontology concepts are self-explanatory. However, the participants were given a document listing all concepts' definitions accompanied with the original text from which concepts are extracted for further clarification. Participant might not need to refer to this document for all concepts definitions.
4	Cards	Predetermined cards with extra blank ones were provided to enable adding more concepts or categories.

Enquiries

For any further information and enquiries please contact me:

Name: Amen Alrobai

Email: aalrobai@bournemouth.ac.uk

Office: P319, Poole House

Consent form

We are asking for your kind help in validating the ontology through a focus group session. You have volunteered to take part in this study to improve the organisation of the ontology.

In order to have a complete record of participant's comments, the discussions in phases 4 and 5 only will be audio taped. While your privacy of identification will be safeguarded, no sensitive data will be collected. I plan to use these recordings to improve the quality of the ontology. Your participation is voluntary and your answers will remain strictly confidential.

I have volunteered to participate in this study, and I give permission for the collected data to be used for the purposes stated above.

Participant's Name: _____

Participant's Signature: _____

Date: _____

Background Information Form

Your gender: Male Female

Age group:

Please select ▼
<input type="radio"/> 25-35 <input type="radio"/> 35-45 <input type="radio"/> 45-55 <input type="radio"/> 55-65 <input type="radio"/> Above 65

Your title/position: _____

Field of study (e.g. HCI, Psychology): _____

Years of expertise: _____

Number of publications in this field:

Please select ▼
<input type="radio"/> 1-5 <input type="radio"/> 6-10 <input type="radio"/> 11-15 <input type="radio"/> Above 15

Please indicate your familiarity with Digital Addiction and other related:

	Very poor	poor	Fair	Good	Very good
Digital Addiction					
Social informatics					
knowledge representation and evaluation					
User Performance					

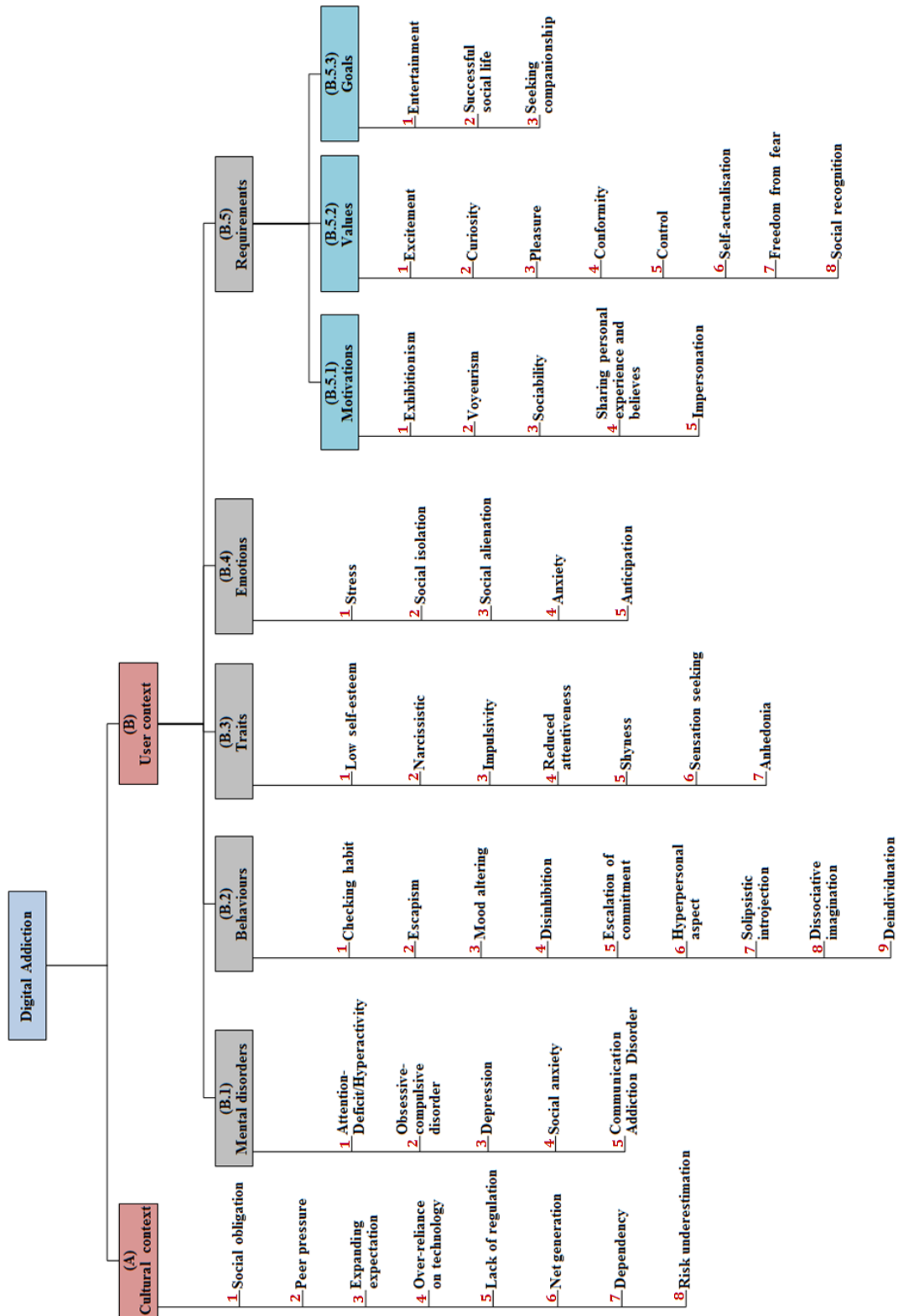
Human Computer Interaction					
Requirements Engineering					
Technology use for behaviour change interventions					
Internet marketing					
Human enhancement					
Other(s): _____					

Name: _____

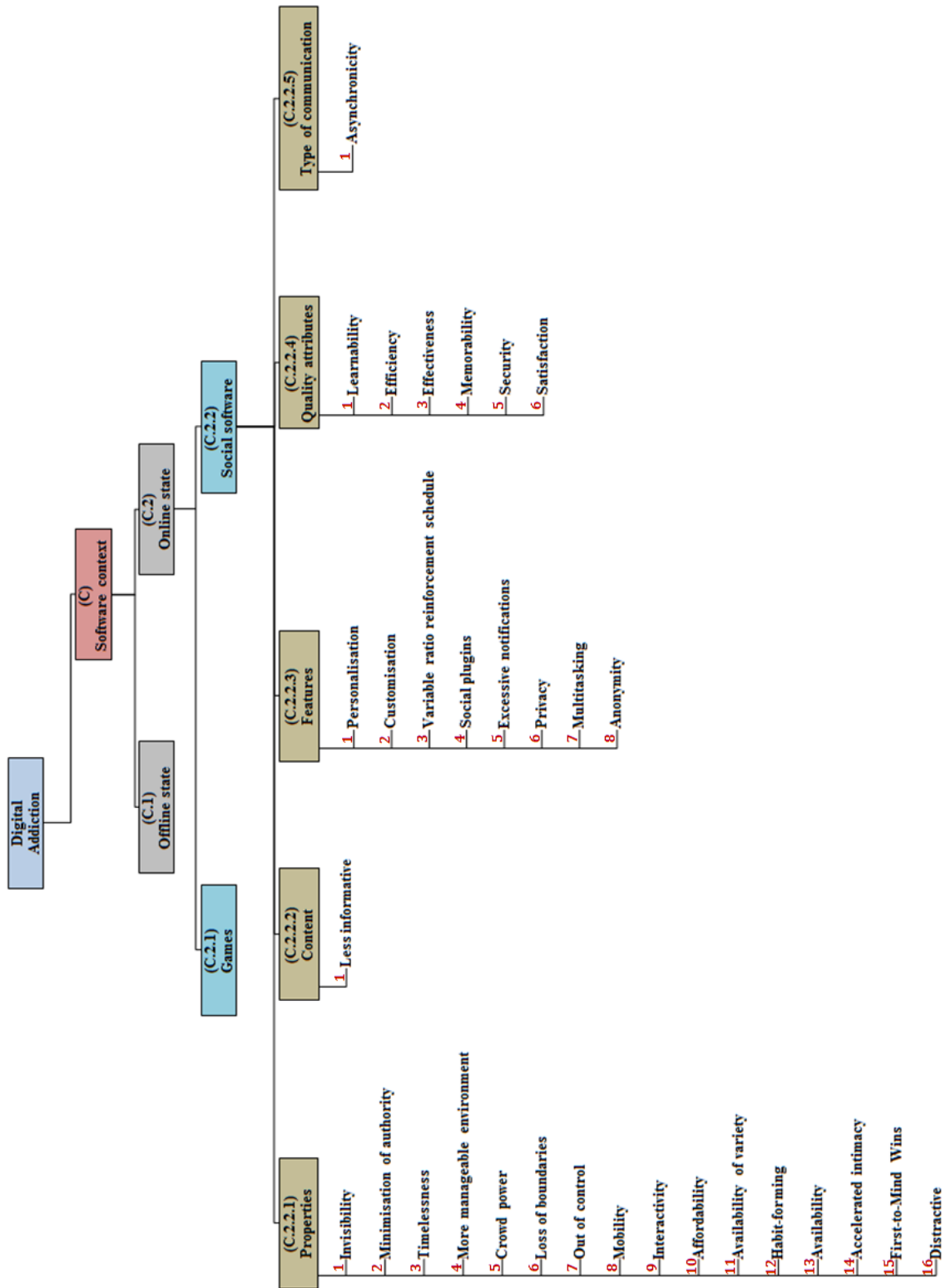
Email: _____

Thank you for your participation.

Ontology structure prior evaluation –Part (1)



Ontology structure prior evaluation – Part (2)

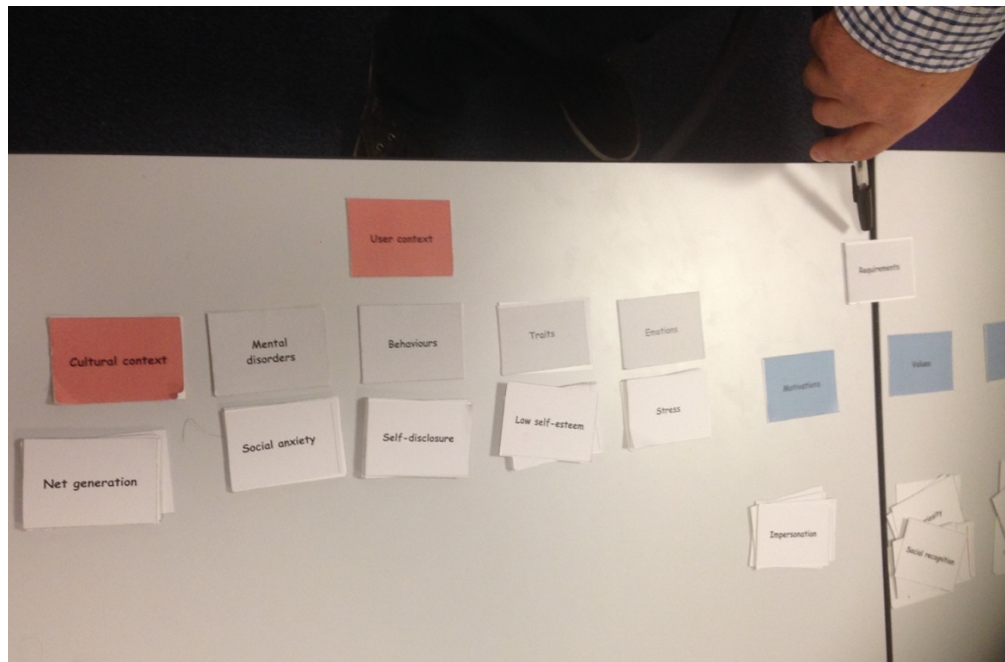


Notes form

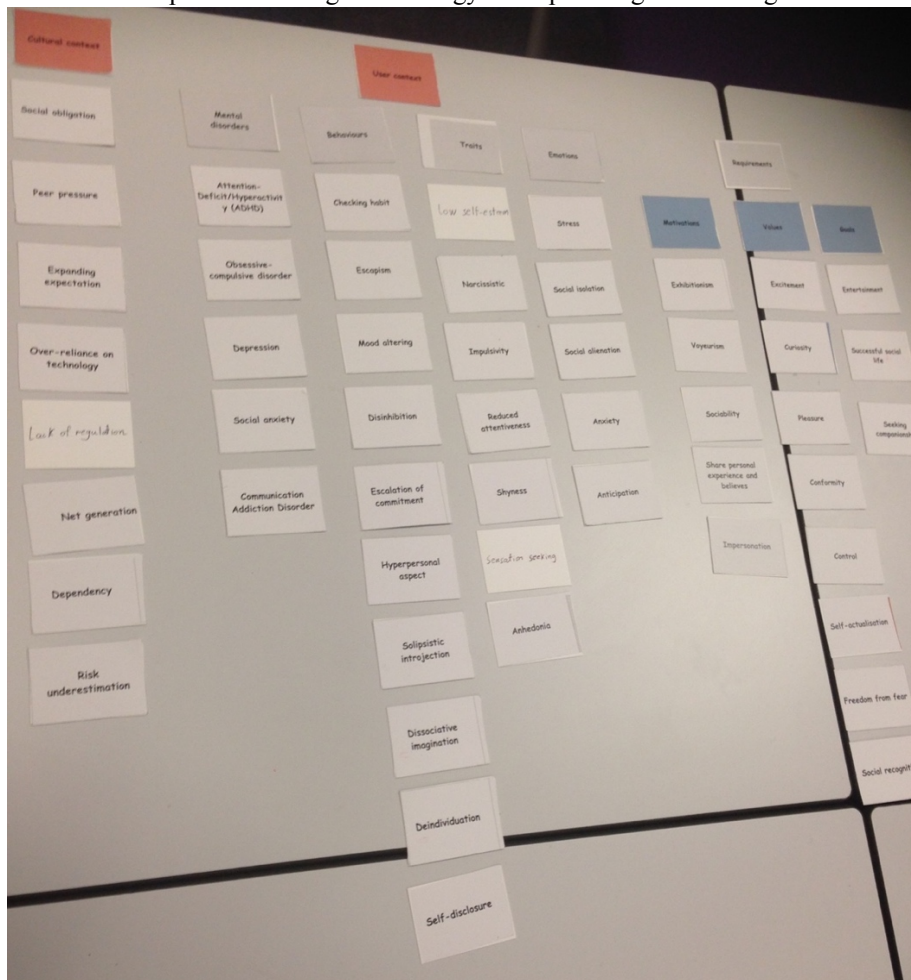
Use this form to make notes about the provided version of the ontology. In phase 3, the group members have to discuss each note. If no resolution needed, the note has to be ticked. This means it is not an issue anymore. (Two illustrative examples are provided below)

Item Ref.	Concept/category name	Notes	Tick if resolved in phase 3
C.2.2.3.5	Excessive notifications	It is just a synonym for the concept ...	<input type="checkbox"/>
C.2.2.1.9	Interactivity	Should go under the category C.2.2.3	<input checked="" type="checkbox"/>
			<input type="checkbox"/>
			<input type="checkbox"/>
			<input type="checkbox"/>
			<input type="checkbox"/>
			<input type="checkbox"/>
			<input type="checkbox"/>
			<input type="checkbox"/>
			<input type="checkbox"/>
			<input type="checkbox"/>
General Notes: use this space to highlight any other concerns or issues related to the ontology in general			

Part 3: DA reference model validation (Focus group session)



Experts discussing the ontology concepts using card sorting



Experts revising the ontology structure after suggesting new concepts using card sorting

Part 1: The CAGE questionnaire

Please place a tick next to all of the statements you believe to be true of you.

	Tick here if apply
I sometimes feel I should cut down my use of digital devices	
I sometimes feel bad or guilty about my use of digital devices	
I have tried to control my use of digital devices without success	
I would become restless or troubled if I stop using digital devices	
I sometimes use digital devices in a hasty and unthoughtful style	
I sometimes get annoyed by people when they are criticising my use of digital devices	
None of the above	

Part 2: They diary study

1. Instructions

- In order to get a screenshot of the app you need to hold down the bottom middle button at the same time as holding the lock button on your phone. This will then be saved in will your photos on your phone.
- On your computer, if you wish to share the link to your diary or screenshots through Dropbox you should go on your Dropbox account and click the share button next to the file you wish to send. Then just enter my email address and I will be able to view the file. You may also wish to share a whole folder with me. In this case right click on the folder then click on the share button. You can then either click on send the link and click on your email and send the link to me via email. There is also a copy the link option where

you can copy the link and then email the link to me that way. If you are using your phone to share the files, click on the arrow next to the file you wish to share. Then click on send a link to this file. Then click on your emails. Then enter my email address and send the link to me.

Part 3: The users' interview questions

Below is a sample of the questions informed by the diaries and used in the interview study.

- Before using the app, what did you think about your usage style so did you have a problem with it?
- Before using the app, what was your motivation to use it? Why?
- What would you think about incentives like an achievement or an award instead of using coercive techniques to stop you?
- Do you think there was enough personalisation in the app or do you think there could have been more?
- Would comparing your usage to your colleagues motivate you to change your behaviour.
- On day 6, you said that you failed with the app. Do you think using the app is hard to maintain?
- Do you think that the app is missing some features that should be added?
- You mentioned before about using the application, you were stressed. And you say this particularly in day 7 so do you think your phone has become like a way of de-stressing like a way of coping or something like that?
- In terms of the app's language, was it neutral or judgemental? And which one you prefer? why?
- You said that the app is annoying but effective, but would that encourage or discourage you to continue using it?
- Are the app's notifications annoying by itself or because it just reminds you of your failure to control?
- Do you think that you should be prepared before using the app? And what sort of preparation you think you need?
- Do you think the app would need to know more about you and your social life in order to help you?
- Do you think the app is like a long-term thing or just a short-term thing?

Part 4: Sample of the transcribed interview

Participant 9: I liked it because it gave you an **addiction score** so you could see how high or how low it was. And in the app usage you could see again track how long you were using each app for and which one you used most and which one you used least

Researcher 2: so what about **having a person on the other end who is helping you**? For example a specialist or a group co-ordinator if you see? So looking at all the groups and saying you guys are committed to all that and are now going to implement the strategy or a policy we all agreed on and say you have to stop and so on

Participant 9: yeah

Researcher 2: would that be better than a software doing that?

Participant 9: I suppose so cos it's an actual like **person helping you rather than just a computer well a phone yeah**

Researcher 2: I suppose a person is more intelligent usually. Usually a person is more intelligent than software. Or something like a game

Researcher 4: do you prefer the person is someone that you know or someone that you don't know?

Participant 9: I suppose a person you know you may be more likely to listen to than someone you don't know. I suppose you would take more notice of a person you do know rather than a person you don't know

Researcher 2: and what else do you think about a person you know? Disadvantages or advantages in comparison to a person you don't know?

Participant 9: a person you know I don't know may try and help you better than a person you don't know because they know you personally so they may know how they can help you and try and help you rather than a person you don't know who doesn't know you

Researcher 2: and would you like to share the score with other people online? Like with your colleagues or a certain group of colleagues?

Participant 9: I don't know. It depends how bad my score was. If it was really bad then probably not but if it was okay then maybe yeah

Researcher 4: are you more likely to share your usage data with someone you know or someone you don't know?

Participant 9: I don't know it depends on how high it is I suppose again but I think

Part 5: Sample of the end-users' comments on the reviewed applications

Application name: Breakfree 542 Comments
Total comments: 549 (User = 512 - The app developer comments = 37)
Very useful I am using it on moto G 1st gen , lollipop 5.0.2 and it is working very well. The most useful thing is the application continuously reminds (after a set time) you that you are using the phone. It very useful application to save your eyes and time. Well done by the developers. Kudos to the team :). However the application can further be improved by reducing the switching time (lag) between daily, weekly and monthly options.
Annoying at first bit amazing It was annoying at first, like stop I'm on my phone deal with it. But that's the point of the app, to make you realize how addicted you are. So great app !!!!
I do like it It's really helpful to let me feel guilty when I use my phone a lot
Ten star from me ***** Best apps to keep u away from phn and help u to conc on ur study...most downloaded
Does what I want This app is fun to use. It gives me an idea of how long I use my phone.
Great! I find this app super handy, it really helps me keep in check how long I've used my phone for that day! Its a must have!!
It has made me more conscious about my phone addiction but...Sometimes you just need your phone right away and the warning messages may block you
Pretty cool Feature to share your score with friends really cool.
Great It works. Progress!
Works well! I plan on upgrading in order to have the more options of additional Times to restrict usage.
Gud 4me It works nice on my galaxy s3 but on mi4 I face some problem
Inaccurate I had my phone off for a day, and on the weekly chart, it's yellow and over 40 which makes no sense because my phone was completely off for the entire day
Makes you feel guilty It makes you feel guilty for being on your phone so long
Love it I got so tired of thinking in Facebook statuses (fellow addicts know what I'm talking about...). This app kept me off my phone almost completely from the first time I started using it. I'm slowly getting my life back. 5 stars from me!
Improvement required Nice app but actually its tools are not working for which these are supposed to. Like break free should close access to all apps. It doesn't doing so even giving access to restrict to apps through setting. Offtime stand good. Pls fix it for 5 stars
Very helpful Excellent application. Would recommend to everybody who feel they spend too much time staring at a 3X5 inch screen instead of the rest of the world.
Too inaccurate to be useful LG G4 - I bought the app to see how often I was using certain apps. The app usage measurement was so far off it wasn't of any use to me. Great idea just lacked execution.
Developer comment: Jon, I'm sorry about the issue. I'll surely look into what the issue could be. For now, can you please try to go to Phone Settings, Click on App Manager, BreakFree, Clear Data

Part 1: Sample of the questions about the online peer group approach

1st focus group:

- What do you think of the idea and why?
- What would motivate you to join and what would motivate you stay on the system?
- How do you think the software should be structured in terms of interaction and support group?
- What features do you think help contribute to the goal and what features do you think don't?
- What sort of messages would you expect and how would you like them delivered?
- What impact do you think social influence will have on the users?
- What type of information do you think the software should provide?
- What roles do you expect to see in this group?
- If you were to design this software what would you do to make this effective?

2nd focus group:

- Do you think an avatar will help contribute to user's motivation?
- Will you do what the arbitrator recommends /says? If yes, why if no why?
- What interactive features would you want from this software?
- What type of personalisation would you recommend?

Part 2: Sample of the answers about the online peer group approach

(Survey qualitative responses)

Q. What do you think groups moderators and how would you elect them (e.g. must be addict, ex-addict, therapist, each member takes a turn, etc.)?

A past addict who knows what you're going through would be an efficient and effective moderator
I really don't think random people's answers to these questions have any validity. If I was signing in in one of those groups I would trust the moderator if that person is chosen as in A.A. or other successful support groups systems after doing some research about that.
ex-addict
The moderator should have previously had a digital addiction yet overcome this problem
They should be a volunteer of the community like on fb groups and free cycle and the like
The moderator should be someone that used to have an addiction and now they don't
It depends on the intended outcome of the activity.
Someone who is respectable and can take charge; but also sympathizes. Otherwise things won't work.
As above
should be professional for serious addiction, for moderate all the rest are <u>fine..</u> voting is not necessary for small groups knowing <u>each others</u>
For Moderate addiction friends which is different from severe one Where specialists are needed
Therapist is the best but if not then addict or ex addict who understand us
Addicts might dictate their opinion and be biased to their own experience...
Would be useful if the moderator has some qualification to help others
Non addicts have no idea but they may give a perspective. ..indeed they may learn how it feels
Might be an idea to have the moderator as someone who has successfully overcome digital addiction
i see cases where all should apply. for more serious groups with serious addiction, moderator should be a therapist or a digital addict or an ex digital addict but with therapist expertise so they know what to say and how to say it. For light addiction anyone really, does not matter. i would say the same for early addiction and late addiction, that means to prevent it first or to recover from it .. not sure what i would prefer but I see difference
if they are anonymous then peer groups in liberal style is needed otherwise a therapist is needed to take that role.
friendliness in the group is a main requirement. these are not formal therapy so it needs to be light. For professional treatment through online groups yes a therapist is needed

Q. What do you think about the design features to sustaining the online peer group for digital addiction (e.g. interface design, privacy, competition, level of support, etc.)?

I have the impression that it is somehow paradoxical that you are proposing to fight digital addiction with a digital gamification. If I was a potential user, I might think that I am just translating my addiction from a kind of digital entertainment to another. Actually, most of the proposals I've seen during the survey reflect most of the additive components you can see in digital technologies. I guess playing with that is kind of the twist of your Bachelor Thesis, but I thought my opinion might help :).

Online support for digital addiction seems like an oxymoron.

Privacy with the group is not important if they know each other. competition is not very important as I would use it for fun sometimes

I think if privacy is an issue I will not join anyway

Privacy is dependent whether group members know each other

All addicts mean they admit that anyway so privacy is not major issue. Privacy out of the group is an issue

As I said privacy is not an issue in many cases. for formal groups where people know each other but not to an extent which allows them to behave casually then privacy is an issue but then why should they join a group! for messaging each other. Yes, they should be able otherwise the group will be dictated by the moderator and the software too much

level of support from online friends is important but not very sensitive because online is less demanding and expectations from others are generally less. So you would not get upset.

if privacy is a huge issue I would not join. of course I do not like to tell everything but I would expect that i have to open about my usage of digital media not what i am doing in it.

Part 1: Face-to-face peer groups (Ethics)

Participant information sheet

Study title

Online Peer Support Groups to Combat Obsessive and Excessive Digital Media usage

Invitation

You are being invited to take part in this research project conducted by Amen Alrobai, a research student at the Faculty of Science & Technology at Bournemouth University. This study is a part of his PhD thesis which is under the supervision of Dr. Raian Ali. Before you decide, it is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. You will be asked to sign a participant agreement form and at the end of the session you will be given a copy of this information sheet and a copy of the signed participant agreement form.

What is the purpose of the project?

This research study aims to understand how to design online peer groups to combat obsessive and excessive usage of digital media. By conducting this research, I hope to create platform that enables designing such online peer support groups' systems to regulate their usage.

What is obsessive and excessive usage of digital media?

It is an emerging issue that is expected to profoundly impact modern societies. Examples include, but not limited to, the obsessive and excessive usage of online gaming, smartphones and social media networks such as Facebook and Twitter. Such usage is associated with negative life experiences such as lack of sleep and focus, reduced performance and depression in extreme cases.

Why have I been chosen?

This is an open call to all “**anonymised data**” clients, who are already participating in peer support groups, to take part on this research study.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part, you will be given this information sheet to keep (and be asked to sign a participant agreement form). You can withdraw at any time, up to the point of the recording of your interview being transcribed and anonymized, without it affecting any benefits that you are entitled to in any way. You do not have to give a reason. Deciding to take part or not will not impact upon/adversely affect you.

What would taking part involve?

If you decide to take part in this study you will be asked to give permission for me (the researcher) to observe your group's interactions. This is to help me understanding how face to face groups interactions might differ as compared to online peer groups interactions. I will be introduced to

the group by your group's facilitator. I may invite you to an individual interview to share your opinions, but you will not be required to answer any question that you do not wish to answer. The interview will be supervised by a professional member from "anonymised data". All of the questions will be aimed to articulate common practices with a particular focus on the group practices, activities and communications within the groups and linking that to the attitudes that people may have.

What are the advantages and possible disadvantages or risks of taking part?

Whilst there are no immediate benefits for those people participating in the project, it is hoped that this work will improve the understanding of the development of technologies for online peer support groups to combat obsessive and excessive usage of digital media.

While the interview will be only focused on understanding how to design such systems, it is always a possibility that participants are open about parts of their personal life experience. This may lead to emotive discussions opened up by participants themselves due to the sensitive context of the topic of problematic behaviours. Hence, the researcher with the aid of "anonymised data" professional member will ensure appropriate and moral management of such events when occur. However, at some point, if any participant thinks that there is useful and relevant information he or she deliberately chooses to share for the benefits of the research, this will still be very appreciated.

Will my taking part in this project be kept confidential?

All the information that I collect about you during the course of the research will be kept strictly confidential. You will not be able to be identified in any reports or publications. All data relating to this study will be kept for 5 years on a BU password protected secure network.

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?

As outlined above you will be asked for your opinion on the topic of peer groups interactions, both in face to face settings and through an online system. This information will help me meet the research objective of developing a better understanding of these issues.

Will I be recorded, and how will the recorded media be used?

The recording will help me to capture the information that will be sought from you during the interview. However, you will be given the right to accept or reject recording the interview. The audio recordings made during this research will be used only for the analysis. No other use will be made of them without your written permission, and no one outside the project will be allowed access to the original recordings. The transcription of the interviews will not include your name or any identifiable information. Instead, each person will be identified by a participant number (i.e. participant 1, participant 2, etc.).

Contact for further information

If you have any queries about this research please contact Amen Alrobai by email on aalrobai@bournemouth.ac.uk or by phone on 01202 961217 or by post to:

Amen Alrobai
Department of Computing & Informatics
Faculty of Science and Technology
Bournemouth University
BH12 5BB

Complaints

If you have any complaints about this research please contact Professor Matt Bentley, Deputy Dean for Research and Professional Practice by email on mbentley@bournemouth.ac.uk or by phone on 01202 962203.

Thank you for taking the time to read this information sheet, and please do not hesitate to contact the researcher if you have any queries.

Participant agreement form (Observation)

Full title of project: Online Peer Support Groups to Combat Obsessive and Excessive Digital Media usage

Name, position and contact details of researcher:

Amen Alrobai, PhD student, Bournemouth University
 Email: aalrobai@bournemouth.ac.uk

	Please initial or tick here
I have read and understood the participant information sheet for the above research study	
I confirm that I have had the opportunity to ask questions.	
I understand that my participation is voluntary.	
I understand that I am free to withdraw up to the point where the data are processed and become anonymous, so my identity cannot be determined	
I am free to ask the researcher to leave the peer group session at any time without there being any negative consequences.	
I agree to take part in the above research project.	

Initials of Participant Date Signature

Initials of Researcher Date Signature

Participant agreement form (Interview study)

Full title of project: Online Peer Support Groups to Combat Obsessive and Excessive Digital Media usage

Name, position and contact details of researcher:

Amen Alrobai, PhD student, Bournemouth University
 Email: aalrobai@bournemouth.ac.uk

	Please Initial or tick Here
I have read and understood the participant information sheet for the above research project	
I confirm that I have had the opportunity to ask questions.	
I understand that my participation is voluntary.	
I understand that I am free to withdraw up to the point where the data are processed and become anonymous, so my identity cannot be determined	
During the interview I am free to withdraw without giving reason and without there being any negative consequences.	
Should I not wish to answer any particular question(s) I am free to decline.	
I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the outputs that result from the research.	
I understand that the interviews will be supervised by a member from “ anonymised data ”.	
I understand that the interviews will be audio-recorded so that it may later be transcribed and anonymised. I understand that once transcribing is completed the audio recording will be destroyed. I understand that the transcription will not include any information that could be used to personally identify myself or others.	
I understand that I am free to refuse recording my interview, the researcher will be taking note instead.	
I agree to take part in the above research study.	

Initials of Participant Date Signature

Initials of Researcher Date Signature

Part 2: Online peer groups (Ethics)

Research study overview

Study title

Online Peer Support Groups to Combat Obsessive and Excessive Digital Media Usage

Background

This research study is being conducted by Amen Alrobai and supervised by academic members of the faculty of Science & Technology at Bournemouth University. It aims to understand how to design online systems to host peer support groups for combatting obsessive and excessive usage of digital media such as that typically found with the usage of smartphone devices, online gaming and social media websites like Facebook and Twitter.

Study location and recruitment:

The study will be conducted in an online forum called **anonymised data** which is an online gambling therapy service that provides emotional and practical advice and support to people affected by problem gambling across the world. This online forum is a part of the Gordon Moody Association which offers an intensive residential treatment programme in the UK for those suffering problematic gambling. This association is supported by the Responsible Gambling Trust (RGT), the leading charity in Britain committed to minimising gambling-related harm. As an independent national charity funded by donations from the gambling industry, RGT funds education, prevention and treatment services and commissions research to broaden public understanding of gambling-related harm.

The researcher has obtained the support from Mr. **anonymised data**, the head of the **anonymised data** to conduct the study. This includes the agreement to obtain audio data of the peer support group sessions within the online therapy sessions. As such, the researcher will not join these sessions. Participants in the online therapy peer support sessions will be made informed about the study, and its objectives and procedures to ensure freely given and fully informed consent. The audio data will be obtained by the moderator, a staff from Gambling Therapy, without any explicit or implicit coercion. As researchers, we will ensure that the clients understand that they are not under any obligation to participate in the research. Consent form and participants' information sheets as well as the procedure to get it are carefully designed as we explain in the attachment and later in this document.

The participant information sheet and consent forms will be provided to participants by the moderator following the protocol below. The proposed start date of the study is 10/6/2016 and the proposed end date is 30/11/2016. This is to give us time to record multiple peer support groups and also to follow the evolution of certain groups and members. Consent will be obtained for each individual group again regardless of the agreement of the members to record previous sessions.

Study protocol:

- **Obtain audio recordings of peer groups interactions** to understand how interactions occur between groups' members and how these interactions are governed in an online environment. The researcher will obtain full consent over three phases outlined below:

Phase.1: The members of the selected groups will be provided with the information sheet and consent forms by the gatekeeper via email to allow enough time to read through.

Phase.2: Before the peer support group sessions start, the moderator will read out the individual agreement form and each participant in the online session under the online identity should verbally reply whether they agree to participate.

Phase.3: At the end of the session, the moderator will ask the participants if they give permission to the researchers to use their audio recordings. Each participant should verbally reply whether they agree to pass the audio file to the researcher.

In **phases.2.** and **3,** the audio file will be stored securely and kept for the relevant retention period. All online identities will be anonymised (as a real identity would be).

Participants vulnerability:

The study will not involve vulnerable participants. Those who will participate will not be under 18 years old and are not subject of regulated activity. The study will not involve any experiments or interventions. The focus will be on the current practices in online peer groups which are a kind of online forum.

Participants in the online peer group session will be encouraged and given the opportunity to discuss the information and consent documents with appropriate others.

Contact for further information

Participants will be enabled to contact the researcher for any further information and enquiries by email on aalrobai@bournemouth.ac.uk or by phone on 01202 961217 or by post to:

Amen Alrobai
Department of Computing & Informatics
Faculty of Science and Technology
Bournemouth University, BH12 5BB

Complaints

Participants will be informed that in case of any complaints, they are able to contact Professor Matt Bentley, Deputy Dean for Research and Professional Practice by email on mbentley@bournemouth.ac.uk or by phone on 01202 962203.

Appendix:

Examples of the observations we are looking after

- How can the software systems capture the needs of different members to ensure personalised online peer support?
- What would be the negative behaviours in the online peer support groups that should be mitigated by the software systems?
- What are the key principles in facilitating online peer groups communication?
- Understand how objectives for behavioural regulation are planned and how can the software system support this process?

Data storage and handling:

The audio recordings of the groups sessions will be recorded by the gatekeeper. The audio files will be then encrypted and compressed in password protected file before the gatekeeper share it with us online. These recordings will be used only for analysis only.

Participant information sheet

Study title

Online Peer Support Groups to Combat Obsessive and Excessive Digital Media Usage

Invitation

You are being invited to take part in this research project conducted by Amen Alrobai, a research student at the Faculty of Science & Technology at Bournemouth University. This study is a part of his PhD thesis which is under the supervision of Dr. Raian Ali. But before you decide, it is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

What is the purpose of the project?

This research study aims to understand how to design online systems which can host peer support groups to help members combat their obsessive and excessive usage of digital media. By conducting this research, I hope to create methods and guidelines on how to create such online systems.

What is obsessive and excessive usage of digital media?

It is an emerging issue that is expected to impact modern societies. Examples include, but not limited to, the obsessive and excessive usage of online gaming, smartphones and social networks such as Facebook and Twitter. Such usage is associated with negative life experiences such as lack of sleep and focus, reduced performance and, in some extreme cases, depression.

Why have I been chosen?

This is an open call to “**anonymised data**” clients who are already participating in online peer support groups, to take part on this research study.

Do I have to take part?

It is up to you to decide whether or not to take part. You can withdraw at any time, up to the point when the recording of your peer support group session is transcribed and anonymized. Your withdrawal will not affect any benefits that you are entitled to in any way. You do not have to give a reason. Deciding to take part or not will not impact upon/adversely affect you.

What would taking part involve?

If you decide to take part in this study you will be asked to give permission for the group moderator, who will be a member of staff in the Gambling Therapy, to obtain the audio recordings of your peer support group session. Before the sessions start, the moderator will read out the consent form and you will be asked whether you agree to participate. At the end of the session, the moderator will ask you again if you give the permission to the moderator to pass the audio file to the researcher. You may choose not do so and in this case the moderator will delete the file. Please note the verbal agreement of all the group members will be required in order to go ahead with the recording and the utilization of the audio file.

What are the advantages and possible disadvantages or risks of taking part?

Whilst there are no immediate benefits for those people participating in the project, it is hoped that this work will improve the understanding of the development of technologies that can facilitate peer support groups to combat obsessive and excessive usage of digital media.

Will my taking part in this project be kept confidential?

All the information collected from you during the course of the research will be kept strictly confidential. You will not be able to be identified in any reports or publications. All data relating to this study will be kept for 5 years on a BU password protected secure network.

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?

As outlined above, obtaining how peer support group sessions are run will help me meet the research objective of developing a better understanding of building online platforms to host them.

Will I be recorded, and how will the recorded media be used?

Yes, the peer support group session will be recorded. The audio recordings will be used only for the analysis and research purposes. The transcription of the sessions will not include any identifiable information including your online identity. The audio files will be destroyed once the transcription and anonymization are completed.

Contact for further information

If you have any queries about this research please contact Amen Alrobai by email on aalrobai@bournemouth.ac.uk or by phone on 01202 961217 or by post to:

Amen Alrobai
Department of Computing & Informatics
Faculty of Science and Technology
Bournemouth University
BH12 5BB

Complaints

If you have any complaints about this research please contact Professor Matt Bentley, Deputy Dean for Research and Professional Practice by email on mbentley@bournemouth.ac.uk or by phone on 01202 962203.

Thank you for taking the time to read this information sheet, and please do not hesitate to contact the researcher if you have any queries.

Participant agreement form

Full title of project: Online Peer Support Groups to Combat Obsessive and Excessive Digital Media Usage

Name, position and contact details of researcher:

Amen Alrobai, PhD student, Bournemouth University

Email: aalrobai@bournemouth.ac.uk

- Before the peer support group sessions start, the moderator will read out the individual agreement form and you should verbally reply whether you agree to participate.

Tick here

I have read and understood the participant information sheet for the above research study.	<input type="checkbox"/>
I confirm that I have had the opportunity to ask questions.	<input type="checkbox"/>
I understand that my participation is voluntary.	<input type="checkbox"/>
I understand that I am free to withdraw up to the point where the data are processed and become anonymous, so my identity cannot be determined.	<input type="checkbox"/>
I am free to refuse audio recording of my peer support group session without there being any negative consequences.	<input type="checkbox"/>
I agree to take part in the above research project.	<input type="checkbox"/>

- At the end of the session, the moderator will ask you again if you give permission to the researchers to use the audio recordings of the group's interaction within the session and you should again verbally reply whether you still agree share the audio recording with the researcher.

Thank you for taking the time to read this information sheet, and please do not hesitate to contact the researcher if you have any queries.

Part 3: Sample of the observations

The following is a sample of notes taken from the observation documents used in the research. All data is anonymised to ensure the confidentiality and anonymity of personal information supplied by/obtained from participants. The anonymization process follows the format in the example below:

- **Before:** Amen data will be kept confidential.
 - **After:** “anonymised name” data will be kept confidential.
-

- The main objective of the session today is influence clients’ behaviour where the addiction incidents happen. Therefore, the sessions seem to be focused on high risk situations and how to cope when encounter them. These goals can be seen as the primary ones. Other goals are related to group work functioning such as cohesiveness and cooperation. These secondary goals can help to achieve clients’ primary goals. Norms, such as being on time, confidentiality, can be seen as secondary goals which the addiction counsellor were very strict about them as that would have a direct influence on primary goals. When introducing “anonymised name” as a new client. I noticed that all clients try to play the role model while “anonymised name” was just observing and trying to follow.
- I noticed that the clients’ day is very structured. This leaves very small opportunity for clients to socialize with their peers away from therapists or rehab staff. It seems that this is made for the purpose of avoiding building personal relationships. How about losing the value of clients helping others to develop social skills they may lack?!!
- Also ask if they allow that with some precautions such as making sure senior clients are around to play the role of helper in that risky situations where clients can make clique. This should be handled with care in the online peer support groups as well by eliminating the features that allow such group dynamics to occur.
- A new client was very tiered as it was her 2nd day of the detoxification from alcohol. Even though she was not allowed to sleep during the session. I noticed that some clients were supportive and understanding while others were criticizing here. The therapist pointed out the those who were criticizing that client were in fact having

some sort of deflecting which is a defensive mechanism of addiction. One note is that the group was in the performing stage according Tuckman's model which is describing groups stages (forming, storming, norming, and performing). I also noticed that all clients were familiar with what they should/shouldn't do and fresher clients had to observe and follow.

- I noticed a wide range of different types of clients in the groups, e.g. defensive, reserved, distractive, collaborator, competing, avoiding and follower. For example, a follower type always prefers to hide behind other clients, i.e. use other identities by agreeing with most of what they are saying. The online version should consider these different form of status or roles.
- The roles are subject to be influenced by the group status according Tuckman's model. I'd assume that online peer groups might allow people to join as "*observers*" like I do in the "anonymised name" centre. But it could be for the purpose of providing learning environment for other users who do not suffer from sever addiction but want to learn more to avoid.
- I noticed that the treatment doesn't follow the principles of "Harm reduction model" which require non-judgemental and non-coercive techniques.
- Clients were always asked to write each warning sign in their own language and based on what they were thinking o help them personalise it and then remember it better. For example, a warning sign called "Defensiveness" can be re-labelled as "Blaming my family".

Part 4: Sample of the interviews questions

The following is a sample of the transcribed interviews used in the research. All data is anonymised to ensure the confidentiality and anonymity of personal information supplied by/obtained from participants. The anonymization process follows the format in the example below:

- **Before:** Amen data will be kept confidential.
 - **After:** “anonymised name” data will be kept confidential.
-

Sample of the transcribed interviews

- **Researcher:** In terms of groups hierarchy. I felt that there is no hierarchy. It's more less a flat, just clients and their addiction counsellor. what is your opinion about that?
- **Therapist:** There is something I am glad you didn't notice it. This means that the clients were working in an equal way. If you have been in treatment longer, you will become a senior peer. As a senior peer, there is more expectations from you. The expectation is that you will be a role model. Probably, sleeping during the session will not be tolerated like someone who just started. Probably he will be expected to be very tired and feel sleepy if he is in the detox. But if you've been in treatment for six seven, eight weeks, and you still leave the session to your room and sleep, you are not taking it serious. They would be more challenged compared to someone who is just coming to the door.
- **Researcher:** In terms of the discharging process, how do you know that a client is recovered and ready to leave the rehab centre.
- **Therapist:** We never know when they are ready to go. There are some clues as they say in relapse prevention. The clues are the behaviour patterns. We have an agreement with clients to be here six months, hopefully the behaviours will be much more recovery behaviours, and if not we cannot force them to stay. We tell them that even if they are leaving to remember that they still need to work on themselves.
- **Researcher:** In terms of the interactions. I noticed that from time to time you allow clients to confront each other. Let's say, “Okay you did that, this is wrong, this is not

accepted,” and you tried to sit back and watch them while they are doing these things. Is this something important in the rehab treatment?

- **Therapist:** Yes, because this kind of people only know how to express their anger or happiness feelings. When they feel down or frustrated they get angry. We need to teach them how to express their feelings? this skill that they need to develop to live in society, because it would be one of the triggers for them to relapse because they don't say how they feel, they keep it inside and then later on, they drink on it, or they hurt somebody.
- **Researcher:** What do you mean by group goal?
- **Therapist:** Every week they have to have a goal, a smart goal. A goal that they can achieve in a week. Things that they can do to teach them that they need to learn how to have goals. It should not be that huge goals, like I want to get married and have house and children. Really small ones and achievable in a week.
- **Researcher:** A week?! Why?
- **Therapist:** That helps to build their self-esteem.
- **Researcher:** Do you ask them to decide these goals or to collectively decide?
- **Therapist:** Collectively.
- **Researcher:** Would everyone then follow the same goal?
- **Therapist:** No you will have yours and I'll have mine. We decide as a group, because the group knows better than I do because I'm so stuck in my own behaviours. You can see something that I might need to work at and I didn't even realize.

Part 1: Expert checking

To what extent you agree that the **roles** in the table below can be played in peer support groups?

Functional Roles: they refer to roles involving status, control and access to resources		Disagree	Neutral	Agree
Gatekeeper	A person who has the authority and control over particular resources			
Facilitator	Assigned person who is expected lead, guide and provide knowledge			
Peer	A person who shares similar behavioural issues and experience			
Role model	A peer who is expected to be an example to be imitated			
Helper	A peer who supports other peers and encourage a positive behaviour			
Observer	A person who is permitted to join temporarily for observational learning			
Leader	A temporary role played by all senior clients			
Stage-related Roles: they refer to roles associated with stage of treatment				
Recovered	A peer who can be described clinically as recovered			
Senior	A peer who spent longer time in the treatment program			
Fresher	A peer who is new to the group			
in-Detox	A peer who is in the process of medical removal of toxic substances			
Relapsed	A peer who experienced very recent relapse episode			
Communication Roles: they refer to roles associated with interaction process				
Isolates	A peer who refuses to interact with group's members			
Sociable	A peer who is willing to talk, engage and collaborate with others			
Rejected	A peer who is deliberately excluded on an individual or group basis			
Withdrawing	A peer who tends to withdraw from activities or participate passively			
Scapegoating	A peer who is blamed when things go wrong			
Competing	A peer who tends to compete in all tasks			
Disrupting	A peer who tends to prevent the continuity of group work			
Dominant	A peer who attain high degree of influence in a group			
Denying	A peer who is in extreme conscious denial to avoid consequences			
Emotional Roles: they refer to roles representing emotional themes				
Attention seeker	A peer who wants to be the centre of attention in the group			
Crisis	A peer who upsets other peers by expressing negative thoughts			
Follower	A peer who admires a particular person or believes in system of ideas			

To what extent you agree with *the influence of design concepts* in the table below and *the type of effect* of that influence?

Design concepts	Predicate	Dependent	Disagree	Neutral	Agree	Effect	Revise
Anonymity	builds	Trust				+	
	encourages	Self-discloser				+	
	encourages	Emotional expression				+	
	increases	Addictive experience				-	
	increases	Intimacy				-	
Gamification	increases	User engagement				+	
	increases	Addictive experience				-	
	usedAs	Quick fix of negative emotions				-	
Competition element	increases	User engagement				+	
	lowers	Self-esteem for users starting the rehab				-	
Matching based on addiction level	increases	Group cohesion				+	
	slowsDown	learning curve				-	
Mixing new addict with senior peers	activates	Follower role				+	
	maintains	Norms				+	
	reduces	Sense of belonging				-	
Group formation based on uses & gratification	facilitates	Relevant, meaningful and fair comparisons				+	
	leadsTo	Developing deviant behaviours				-	
Integrating detoxification with group therapy	provides	Emotional support				+	
	provides	Hope installation				+	
	provides	Norms maintenance				+	
	activates	Helper role				+	
	leadsTo	Sabotaging group work				-	
Ex-addicts	contributesTo	Hope installation				+	
	have	Positive empathy				+	
	initiates	Opinion dictation				-	
Helper role	contributesTo	Behavioural change maintenance				+	
	encourages	Reciprocity element				+	
	encourages	Relapse behaviour				+	
	leadsTo	Avoidance				-	
Proximal goals	enhances	Self-esteem				+	
Personal selection of goals	increases	Commitment and consistency				+	
	leadsTo	Biased selection of goals				-	
Group hierarchy	increases	Responsibility of senior members				+	
	violates	Equity principle				-	
Group cohesion	improves	Group performance				+	
	leadsTo	Risk of intimacy				-	
Open groups	activates	Helper role				+	
	decreases	Self-disclosure				-	
	leadsTo	Avoidance				-	
Facilitating Emotion expression	reduces	denial and defensiveness				+	
	abusedBy	Self-pitying individuals				-	

To what extent you agree with ***the influence of behaviour concepts*** in the table below and ***the type of effect*** of that influence?

Behaviour concepts	Predicate	Dependency	Disagree	Neutral	Agree	Effect	Revise
Self-disclosure	contributesTo	Emotional expression				+	
	builds	Trust				+	
	increases	Addictive experience				-	
	increases	Intimacy				-	
Self-presentation	helps	Showcase the improved self-image				+	
	encourages	Persona maintenance				-	
	leadsTo	Selective and optimized presentation				-	
	provides	False self-esteem				-	
Commitment	reflects	Control over urges				+	
	indicates	Relapsing sign (compulsive commitment)				+	
	contributesTo	Loosing balance (over commitment)				-	
Lapse	increases	Self-awareness (needs to revise the plan)				+	
	lowers	Self-esteem				-	
	leadsTo	Full relapse				-	
Task switching	indicates	Positive behaviour				+	
	indicates	Negative behaviour				-	
Self-confidence	improves	Self-esteem				+	
	leadsTo	High risk situations				-	
Help-seeking	indicates	Adequate level of motivation				+	
	overlooks	Users with lack of awareness				-	
Compliance	indicates	Adherence to treatment objectives				+	
	indicates	Denial behaviour (defensiveness)				-	
Increased usage of intervention platform	indicates	Commitment				+	
	indicates	Tolerance				-	
Decreased usage of addiction of choice	indicates	Effective intervention design				+	
	indicates	Passive usage (e.g. preoccupation)				-	

To what extent you agree with *the heuristics* in the table below?

Heuristic principles	Description	Exemplar implementation	Disagree	Neutral	Agree
Social equality rather than hierarchy	Users enjoy more "democratic" atmosphere where privileged positions are not explicit in group interactions. This is to boost the equity principle and to give users freedom to interact without pressure from higher-status peers.	<ul style="list-style-type: none"> - Avoid implementing features for earning social status, e.g. number of "followers" which leads to social hierarchy. - Fresh users should not have to worry when confronting senior peers. 			
Instinct to survive	The system should avoid triggering denial and defensive attitude.	<ul style="list-style-type: none"> - Take objective stance by providing fact-based messages (e.g. usage frequency) to breakthrough denial. - Use plural pronouns "We" in messages that have negative connotations to reduce fear and to give sense of belonging, support and empathy. The singular pronoun "I" may be used for self-judgment. 			
Focus on the self	The system should help users to focus on the self rather than "walking others' program". Also, avoid interactions that change priorities and shift the focus away from self-improvement.	<ul style="list-style-type: none"> - Do not emphasise peers' evaluation to reduce self-avoidance as users more reluctant to discuss personal issues. - Allow users to comment on others' tasks relevant to group work only. 			
Prevent selective and optimized self-presentation	The system should discourage the motive of self-presentation and use the true-self. On social situations, users often try to showcase themselves to influence others perception and to aim a specific impression.	<ul style="list-style-type: none"> - Twitter has less emphasis on self-presentation in terms of provided features. Facebook on the other hand enable associating pictures and attitude statements to personal profile. - Groups can be provided with more freedom to feature their positive ideology, but not for individuals. 			
Avoid emotional intimacy	The system should avoid interactions that facilitate one-to-one relationships. Users worry about others more than self to escape personal feeling and thoughts.	<ul style="list-style-type: none"> - Detect users who intentionally like posts of a specific person which could be a tactic to drag attention. Such interaction may lead to romance as a way for easing pain. - Avoid private communication which may lead to one-to-one relationships (e.g. add friend and poke). 			

Group know better when it comes to alternative selection	The system should utilise group's collective decision support. Users might experience unconscious bias in selecting among alternatives that require willpower.	- While a user can be allowed to choose, for example, visualization format of his/her performance, goals should be selected by the group.			
Learning before doing	The system should always start with learning-oriented tasks, goals, and actions. Users require reasonable time and order of tasks that matches their current treatment level.	- Add competition elements in the later stages of treatment. This is to allow time for group development, norms stabilization and group cohesion. In the early stages, users may also lack coping skills.			
User self-labelling and personalization	The system should use self-labelling for a behaviour that its effect remains within the individual level to increase relevancy and memorability.	- Offer options for users to rephrase messages in the way that describe their behaviours. - For behaviours that well be seen by others, self-labelling may be manipulated to maintain reputation and self-image.			
Emphasis dispositional attribution	The system should persuade users to always relate the responsibility to individual factors rather than external factors.	- "Consequences" terminology stresses personal choices, while punishment diverts the attention away from self-responsibility. - Assessment of an individual's low quality performance should start with addressing personal causes, while user relocation can be last remedy. - Evaluating what members adds to the group rather than what the group adds to them. For example, the system may reduce the functionalities where members judge qualities of the activity (e.g. suitability and difficulty) and focus on evaluating members' performance in that activity.			

Part 2: Ethics for the evaluation study

Full title of the study: Online Peer Support Groups to Regulate Digital Media Usage

The evaluation study will be divided into two parts. In part 1, you will work collaboratively with your peers to create an adequate design for a given case without using our method. In part 2, you will work collaboratively with your peers to refine the design created in part 1. The refinement will be guided using the proposed method.

The rationale of this evaluation approach:

We are evaluating the method in terms of:

- To what extent it enhances the design decisions?
- Does it enlighten and reveal new constructs?

To achieve this, we will perform the evaluation using the same group of participants to:

- Collect reactions and reflections on design process with and without the method.
- Investigate how the participatory approach will contribute to the outcomes of the design process.

Evaluation procedures:

- **Phase 1: Participants preparation (day 1)**

The moderator will:

1. Present a quick introduction to the online peer support groups as a motivational approach.
2. Introduce the proposed reference architecture to understand the full picture of designing for regulating digital media usage.
3. Explain the study purpose and focus (Some materials will be provided to help you).
4. Explain the evaluation activity steps.

- **Phase 2: Design activity (day 1)**

1. You will be given a design case and tasks.
2. You will play the role of addiction expert and its the development team task to utilise your knowledge the way they think it is appropriate.
3. The design process will start.

▪ **Phase 3: Refinement activity (day 2)**

1. The moderator will introduce the proposed method and its guidelines (materials will be provided to help you).
2. The outcomes of phase 2 will be provided to re-design/refine the online platform created in day1.
3. Each participant will be given a specific role to play within the design team.
4. The design process will start.

▪ **Sample of the interview questions:**

You may be invited for a short interview to collect some feedback. Below sample of the questions:

- In what way did the method impact the design process? Why?
 - What challenges did you face when you used the method? why?
 - How did you find the sequence and transition between the steps of the method?
 - Are there steps where you felt practitioners or end-user's involvement was needed? What are they? Why?
 - What do you suggest to improve the method and its heuristics?
-

Participant Information Sheet

Full title of the study: Online Peer Support Groups to Regulate Digital Media Usage

Invitation

You are being invited to take part in this research study conducted by Amen Alrobai, a research student at the Faculty of Science & Technology at Bournemouth University. This study is a part of his PhD thesis which is under the supervision of Dr. Raian Ali. Before you decide, it is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. You will be asked to sign a participant agreement form, and at the end of the session, you will be given a copy of this information sheet and a copy of the signed participant agreement form.

What is the purpose of the project?

The aim of the research study is to evaluate an engineering method created to design platforms for online peer groups to regulate digital media usage. The method outlines the processes should be followed to design such platforms. The evaluation will assess if the guidance provided through the method is satisfactory.

What do we mean by regulating digital media usage?

Problematic usage of digital media is an emerging issue that is expected to impact modern societies. Examples include, but not limited to, the obsessive and excessive usage of online gaming, smartphones and social media networks such as Facebook and Twitter. Such usage is

associated with negative life experiences such as lack of sleep and focus, reduced performance and depression in extreme cases.

Why have I been chosen?

This is an open call that aims to reach those who have experience either in software development, or behavioural awareness, and feel they can contribute to the research by trying the method and provide their feedback.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a participant agreement form. You can withdraw at any time, up to the point where the data are processed and become anonymous, so your identity cannot be determined, without it affecting any benefits that you are entitled to in any way. You do not have to give a reason. Deciding to take part or not will not adversely affect you.

What would taking part involve?

As a participant in this study, there will be some activities to undertake. Firstly, you will fill a short pre-selection survey to gather your demographic data (e.g. age, gender, profession, etc.) and yours of experience either in software development or behavioural awareness. If you are selected for the next stage of the study, you will be asked to participate in one or more design activities. You will be given a brief tutorial to understand how to use the method and its artefacts, and what is your role within this activity. To clarify, you might be invited for an interview.

What are the advantages and possible disadvantages or risks of taking part?

Whilst there are no immediate benefits for those people participating in the project, it is hoped that this work will improve the understanding of the development of technologies for online peer support groups to combat obsessive and excessive usage of digital media.

Will my taking part in this study be kept confidential?

All the information that we collect about you during the course of the research will be kept strictly confidential. You will not be able to be identified in any reports or publications. All data relating to this study will be kept for 5 years on a BU password protected secure network.

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?

As outlined above you will be asked for your opinion on the proposed method. This information will help me meet the research objective of evaluating the method in terms of to what extent it guides the process of designing platforms for online peer support groups.

Will I be recorded, and how will the recorded media be used?

Yes, the recording will help me to capture the information that will be sought from you during the evaluation session. However, you will be given the right to accept or reject recording the design activity and the interview part. The audio recordings made during this research will be used only for the analysis. No other use will be made of them without your written permission, and no one outside the research study will be allowed access to the original recordings. The audio recordings made during this study will be deleted once transcribed and anonymised. The transcription will not include your name or any identifiable information. Instead, each participant will be identified by a number (i.e. participant 1, participant 2, etc.).

Contact for further information

If you have any queries about this research, please contact Amen Alrobai by email on aalrobai@bournmeouth.ac.uk or by phone on 01202 961217 or by post to:

Amen Alrobai
Department of Computing & Informatics
Faculty of Science and Technology
Bournemouth University
BH12 5BB

Complaints

If you have any complaints about this study please contact Professor Tiantian Zhang, Deputy Dean for Research and Professional Practice of the Faculty of Science & Technology at Bournemouth University at the following address:

Professor Tiantian Zhang
Dorset House DG02
Talbot Campus, Fern Barrow, Poole, BH12 5BB
E-mail: tzhang@bournemouth.ac.uk
Tel: 01202 965721

Thank you for taking the time to read this information sheet, and please do not hesitate to contact me if you have any queries.

Participant Agreement Form

Full title of the study: Online Peer Support Groups to Regulate Digital Media Usage

Name, position and contact details of researcher: Amen Alrobai, PhD Student,
Department of Computing and Informatics, Faculty of Science & Technology, Bournemouth
University. Email: aalrobai@bournmeouth.ac.uk

**Please Initial
or Tick Here**

I have read and understood the participant information sheet for the above research project.	
I confirm that I have had the opportunity to ask questions.	
I understand that my participation is voluntary.	
I understand that I am free to withdraw up to the point where the data are processed and become anonymous, so my identity cannot be determined.	

During the tasks of the study, I am free to withdraw without giving a reason and without there being any negative consequences.	
Should I not wish to answer any particular question(s), complete a test I am free to decline.	
I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the outputs that result from the research.	
I understand taking part in the research may include being recorded (audio) but that these recordings will be deleted once transcribed and anonymised.	
I agree to take part in the above research project.	

Name or Initials of the Participant Date Signature

Name or Initials of the Researcher Date Signature

Part 3: Evaluation activity documents (Day 1)

(Design scoping)

Design Scoping

Description:

This document highlights the aspect that may help you to scope your analysis for the requirements needed to create a prototype for the design case (D.1). However, feel free to suggest any other aspects you think they may help you in this task.

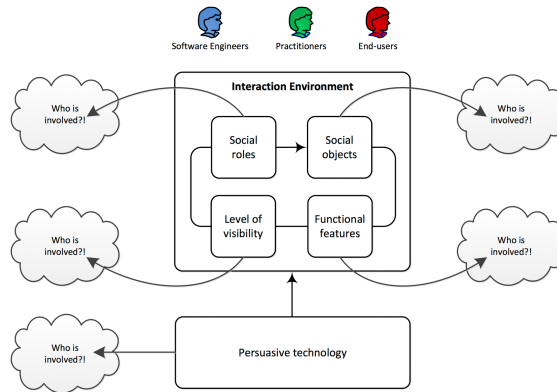


FIGURE 1: OVERVIEW OF THE DESIGN SCOPE

1) Social Roles:

Different social roles can exist within peer support groups. Social roles can be defined as a social status within a social structure. Different roles might have an implication on the design/customisation of the online peer group. In other words, each role may influence what features should be offered to the group. Roles can be:

- **Acted:** roles that can be associated with a set of expectations, rights, and skills (e.g. *group facilitator*).
- **Accidental:** roles that can be unconsciously played, evoke complex feelings and sometimes arise during the course of interaction, (e.g. *relapsed*).

Classifying social relationships and behaviours into a smaller set of roles reduces the complexity to design and manage social systems. Thus, the identification of different roles and mapping users to them is a critical step to be able to design more effective behavioural change peer support group systems.

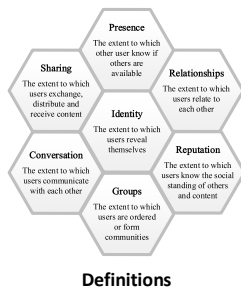
2) Social Objects:

Different activities and tasks can be introduced to peer support groups. We call them "**Social Objects**". Social interactions are driven by or revolve around a shared object(s), e.g. topics, ideas, events or public figures. Social objects help to maintain the focus of social interactions. Social objects are expected to be selected by group's facilitators and negotiated with representative groups' members. Read the design case and then decide what tasks and activities would you introduce to the group during the period of the treatment. Below is a list of examples.

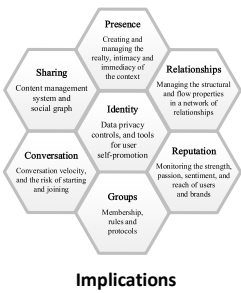
- **Problem solving**
- **Diaries**
- **Group competition**
- **Individual competition**
- **Peer pressure (monitoring)**
- **Open discussions**
- **Stories sharing**
- **Role play situations**

3) Using the Honeycomb framework to support the selection among functional features:

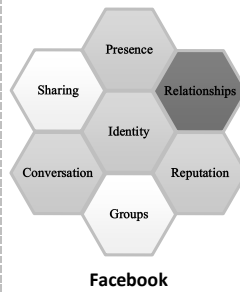
The classical Honeycomb framework was proposed by Kietzmann et al. (2011) as a way of understanding and classifying social media platforms from a functional perspective. The framework consists of seven building blocks which can be configured differently to satisfy different engagement needs of the targeted audience. Figure 2 outlines each building block of the framework and its implication. Figure 3 provides some examples.



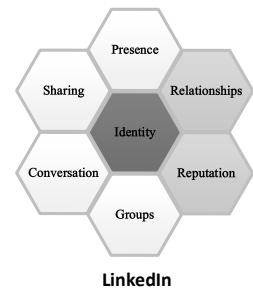
Definitions



Implications



Facebook



LinkedIn

FIGURE 2 :THE HONEYCOMB FRAMEWORK BUILDING BLOCKS

FIGURE 3: TWO EXAMPLES WHERE THE FRAMEWORK IS APPLIED

(Design activity)

1) Selecting functional features:

Decide what features can be implemented considering the social roles, behavioural characteristic and **social objects**.

- Legend:

<input type="checkbox"/>	A level of visibility that cannot be selected due to a conflict, (E.g. group chat cannot be only visible to specific members of the group)
<input checked="" type="checkbox"/>	A level of visibility with imperative level(s) of visibility due to the functional nature. (e.g. group chat should be visible to all members by default)

#	Potential features	Visibility			
		Tick to include	Practitioner only	Specific peer(s)	My group Friends & family
Main Features					
1	Setup goals: this includes different parameters such as type, duration, value, required steps and status				
2	Goals progress				
3	Treatment progress				
4	Accomplishment: an area on user's profile where collected points and badges are listed				
5	Compare my usage with selected peer(s)				
6	Contextualised usage tracking: associating time and location to the usage				
7	Contextualised content tracking: associating time and location to the consumed/generated content				
8	Self-assessment: featured questionnaires to evaluate the self				

#	Potential features	Tick to include	Visibility			
			Practitioner only	Specific peer(s)	My group	Friends & family
Main Features						
9	Addiction scoring					
10	Leaderboard: scoreboard showing the names and current scores of the leading peers				<input checked="" type="checkbox"/>	
11	Group dashboard: an area on group's profile to help to learn the overall limiting states of others				<input checked="" type="checkbox"/>	
12	Enforce rule: e.g. Locking Screen					
13	My mood: expressing current state of mind or feeling					
14	Reminders: reminding a user about goals, tasks and exceeding limit of usage					
15	Auto-responding: returning a prewritten message to inform peers that you are unavailable					
16	Mute: hide a specific peer's communication					
17	f Post content: status, suggesting rules, photos or videos, discussion topics					
18	f Ask a question: navigate through topics where the question belongs. others can answer					
19	f Private messaging: a user can send messages and interact with selected peers		<input checked="" type="checkbox"/>			
20	f Create personal group: a user can create his personal group					
21	f Group chatting				<input checked="" type="checkbox"/>	
22	f Create relationships: e.g. adding a friend					
23	f Creating events: a calendar-based resource used to notify others of upcoming occasions					
24	f Wall: area on personal profile where the user and his peers can post thoughts for everyone to see					
25	f Live streaming: broadcasting real-time video					
26	f Creating a page: Unlike personal profile, page aims at getting fans rather than friends					
27	f Announcing current location: share real physical location (e.g. Enjoying a cup of tea –at Green Tea)					
28	f Poke a peer: a way of saying hello to get a particular peer's attention. The poked peer will be notified.					

#	Potential features	Tick to include	Visibility			
			Practitioner only	Specific peer(s)	My group	Friends & family
Options that can be embedded to some of the features above						
29	f Post activity: find out how viewers engaged with a post (i.e. clicking anywhere on the post)					
30	f Comment: an option to enable a user to comment on posts					
31	f Sharing others' content					
32	f Hashtagging: labelling technique to identify messages on a specific topic					
33	f React to content: rate how you feel towards certain content					
34	f Follow discussion: to receive updates on a specific post					
35	f Mention: attach a peer's name to a post to get his/her attention (e.g. @Amen see this funny video)					
36	f Poll option: providing users with a poll option to add to posts to determine opinions					
37	f Updates notifications: prompting a user about peers' achievements, goals or posts					
38	f Tagging: attach a peer's name to a post. It involves ownership (e.g. was at cinema –with Amen)					
39	f Personal profile picture					
40	f Personal skills					
41	f Personal contact info					
42	f Personal family relationship					
43	f Personal biography					
44	f Showing list of mutual supporters					
45	f Showing number of supporters					

2) Selecting persuasive techniques:

Below a list of different persuasive techniques which can be tailored and implemented to the design. Decide what persuasive techniques **needed the most**. This can be based on the gathered knowledge and design decisions made during the previous steps.

Primary Task Support	
Principle	Example implementation
Reduction: A system that reduces complex behaviour into simple tasks helps users to perform the target behaviour, and it may increase the benefit/cost ratio of behaviour.	A system monitor usage and lists most addictive social software features. E.g. most excessively used features on Facebook.
Tunnelling: Using the system to guide users through a process or experience provides opportunities to persuade along the way.	A system offers information about treatment opportunities after a user has taken an interactive test to measure addiction level to digital technology.
Tailoring: Information provided by the system will be more persuasive if it is tailored to the potential needs, interests, personality, usage context, or other factors relevant to a user.	A system provides different information content for different user groups. E.g. a senior peer may receive content differs from what new peers may receive.
Personalization: Systems personalized services have a greater capability for persuasion.	A system presents most relevant arguments first rather than in random order.
Self-monitoring: A system that keeps tracking performance or status will support a user in achieving goals.	A system presents smartphone usage statistics.
Simulation: A system that provides simulations can persuade by enabling users to observe immediately the link between cause and effect.	Before-and-after stories of people who have gained control over their urges.
Rehearsal: A system providing means with which to rehearse a behaviour can enable users to change their attitudes or behaviour in the real world.	A simulator to help a user practising how to deal with seemingly irrelevant decisions (SIDs). SID's are the poor judgements addicts make which lead them to sabotage their recovery. For example: Going to the local supermarket without deciding what to buy, so an addict is carrying too much money. Then, using checkout where the alcohol is sold, and then being triggered, developing an urge to purchase.

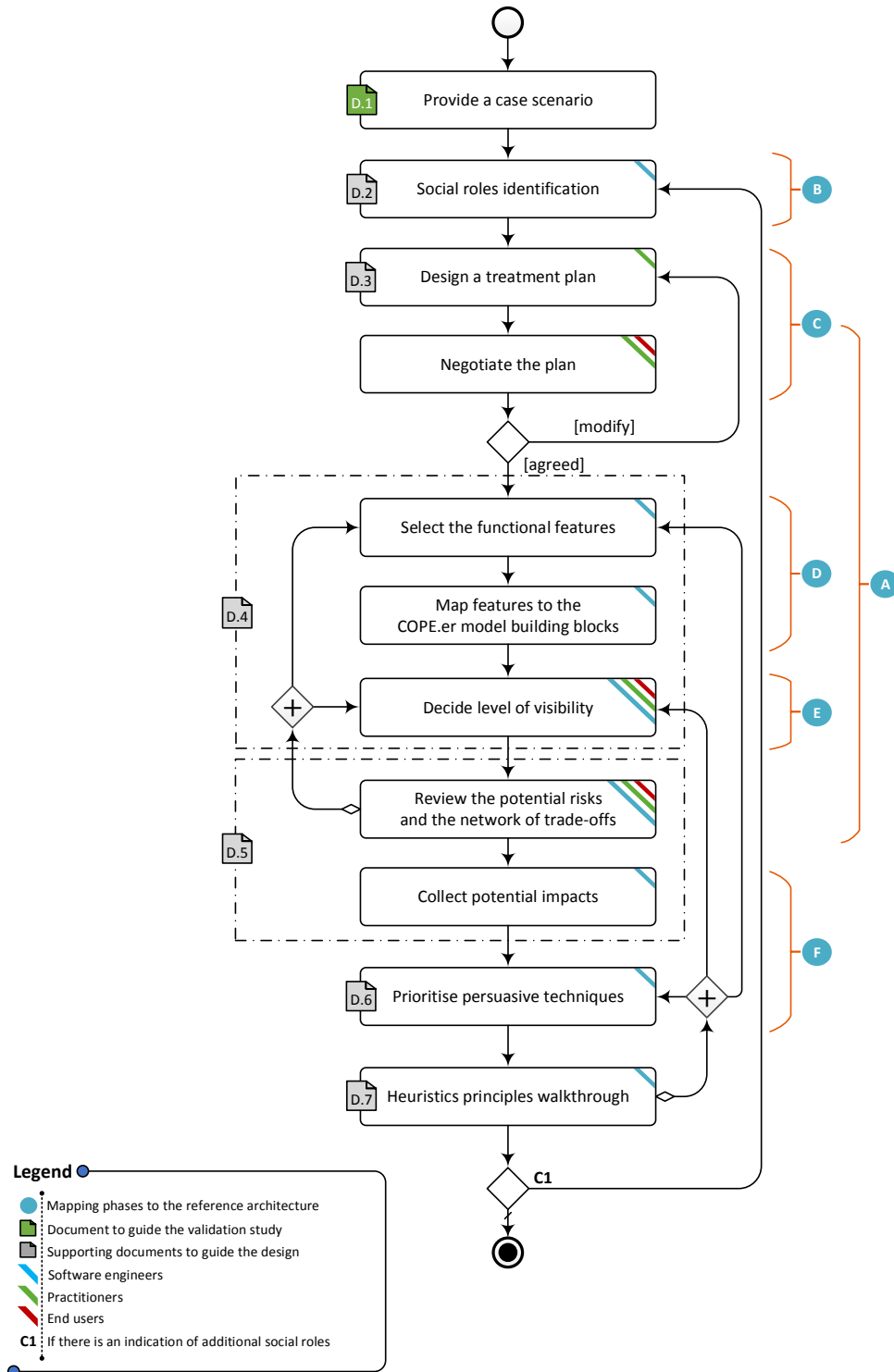
Dialogue Support	
Principle	Example implementation
Praise: A system that praises target behaviours is likely to have more persuasive power.	A system aims at motivating users to reduce their usage praises top three users in the leaderboard.
Rewards: A system that rewards target behaviours is likely to have more persuasive power.	A system gives users a virtual trophy or avatars if they follow their program or achieved their goals.
Reminders: A system that reminds users of their target behaviour is likely to be more persuasive for them to achieve their goals.	A system sends text messages to remind users about their daily usage limit.
Suggestion: A system that offers fitting suggestions is likely to be more persuasive.	A system suggests relevant activities instead of spending leisure time social media.
Similarity: A system that reminds users of themselves in a meaningful way is likely to be more persuasive.	Slang names are used in a system which aims at motivating teenagers to exercise or engage in more healthy habits.
Liking: A system that is visually attractive for its users is likely to be more persuasive.	A system that aims at encouraging parents to spend more time with their kids rather than on social media may use attractive pictures of kids playing at parks.
Social role: A system that adopts a social role for its users is likely to be more persuasive.	A system has a virtual specialist to support communication between users and health specialists.

Social support	
Principle	Example implementation
Social learning: Users will be more motivated to perform a target behaviour if they can observe others performing the same behaviour.	A system can help users to observe how recovered peers are planning their goals and managing their digital life.
Social comparison: Users will be more motivated to perform a target behaviour if they can compare their performance with others.	Users can share and compare information related to their digital usage.
Normative influence: Users will be more motivated to perform a target behaviour if the system can leverage normative influence or peer pressure.	A system enables peer monitoring, i.e. surveillance.
Social facilitation: Users will be more motivated to perform a target behaviour if they discern via the system that others are performing the behaviour along with them.	A system can help users to recognise how many peers are doing shared computer-based activities at the same time.
Cooperation: Users will be more motivated to perform a target behaviour if the system motivates them to adopt a target attitude or behaviour by leveraging human beings' natural drive to co-operate.	A system enables users to collaborate in order suggest SMART goal for a user instead of self-selection
Competition: Users will be more motivated to perform a target behaviour if the system motivates them to adopt a target attitude or behaviour by leveraging human beings' natural drive to compete.	Online competition, such as Quit and Win (reduce usage to a challenging limit for a month and win a prize)
Recognition: Users will be more motivated to perform a target behaviour if the system offers public recognition for them or their groups.	Names of awarded people, such as "user of the week," are published on the system. Or, Personal stories of the people who have succeeded in their goal behaviour are published on the system.

System Credibility Support	
Principle	Example implementation
Trustworthiness: A system that is viewed as trustworthy will have increased powers of persuasion.	A system provides information related the risks of some social media applications rather than simply providing biased advertising or marketing information of other apps.
Expertise: A system that is viewed as incorporating expertise will have increased powers of persuasion.	A system provides information about facilitators level of experience.
Surface credibility: People make initial assessments of the system credibility based on a first-hand inspection.	A system should have a limited number of advertisements on the system and for logical reasons only.
Real-world feel: A system that highlights people or organisations behind its content or services will have more credibility.	A system provides possibilities to contact specific people through sending feedback or asking questions.
Authority: A system that leverages roles of authority will have enhanced powers of persuasion.	A system quotes an authoritative body, such as a statement by government health office.
Third-party endorsements: Third-party endorsements, especially from well-known and respected sources, boost perceptions of system credibility.	A system shows a logo of a certificate that assures that they use secure connections or refers to its reward for high usability and privacy.
Verifiability: Credibility perceptions will be enhanced if a system makes it easy to verify the accuracy of content via outside sources.	Claims on the system are supported by offering links to creditable websites.

Part 4: Evaluation activity documents (Day 2)

The COPE.er method



The social roles



D.2 – Social Roles

Description:

This document provides a list of social roles can exist within peer support groups. Roles can be:

- **Acted:** roles that can be associated with a set of expectations, rights, and skills (e.g. *group facilitator*).
- **Accidental:** roles that can be unconsciously played, evoke complex feelings and sometimes arise during the course of interaction, (e.g. *relapsed*).

Classifying social relationships and behaviours into a smaller set of roles reduces the complexity to design and manage social systems. Thus, the identification of different roles and mapping users to them is a critical step to be able to design more effective behavioural change peer support group systems.

How to use this document?

Identify social roles exist in the given design case. The scenarios will provide hints to help in identifying the social roles.

Considerations:

- Each of these roles might have an implication on the design/customisation of the online peer group. In other words, each role may influence what features should be offered to the group.
- The negative effect of a particular role does not always entail negative outcomes to a peer group. In fact, some negative effects can create opportunities that will lead to a good outcome. In other words, the negative sign (–) only indicates the importance to address the implication of that role. For example, having a peer who is in the detoxification phase may disrupt group work, but it may also provide senior peers with a sense of purpose. Senior peers will try to offer help and care to those peers. Therefore, negative effects may require specific customisation to make them useful to group work.


- Legends:

+	A role that is <i>likely</i> to provide positive outcomes to group work
–	A role that is <i>likely</i> to provide negative effects to group work, but it may create opportunities for positive outcomes
±	A role that <i>may</i> provide positive and negative outcomes to group work
⊖	A role that <i>always</i> provides negative outcomes to group work and requires urgent action

Functional Roles: they refer to roles involving status, control and access to resources		Effect	Tick if exists
Gatekeeper	A person who has the authority and control over particular resources	+	
Facilitator	Assigned person who is expected lead, guide and provide knowledge	+	
Co-Facilitator	Assigned person who is expected help and support the facilitator. (One co-facilitator is recommended as a maximum)	+	
Peer	A person who shares similar behavioural issues and experience	+	
Role model	A peer who is expected to be an example to be imitated and inspire others	+	
Helper	A peer who supports other peers and encourage a positive behaviour	+	
Observer	A person who is permitted to join temporarily for observational learning. Positive unless peers start to avoid self-disclosure	±	
Leader	A temporary role played by all senior clients	+	
Stage-related Roles: they refer to roles associated with stage of treatment			
Recovered	A peer who can be described as recovered based on the current behaviours (e.g. having balanced lifestyle)	+	
Senior	A peer who has spent longer time in the treatment programme, adopted healthier behaviours and already started practising them	+	
New peer	A peer who is new to the group	+	
in-Detox	A peer who is in the process of medical remodelling (e.g. removal of toxic substances). No more than 3 in a group of ~12	±	
Relapsed	A peer who experienced very recent relapse episode	⊖	

Communication Roles: they refer to roles associated with interaction process			
Isolates	A peer who refuses/has not developed the ability to interact with others. The isolation can be emotionally and/or physically	–	
Sociable	A peer who is willing to talk, engage and collaborate with others	+	
Complying	A peer who adhere to rules and norms only to achieve their own goals rather than to recover	±	
Scapegoat	A peer who is deliberately excluded on the group basis and usually blamed when things go wrong	–	
Rejected	A peer who is deliberately excluded on the individual basis.	–	
Withdrawing	A peer who tends to withdraw from activities or participate passively (e.g. only listening)	–	
Competing	A peer who tends to compete in different tasks for the sake of having power.	–	
Disrupting	A peer who disrupt group natural development and prevents process from continuing as expected	⊖	
Dominant	A peer who attain high degree of influence in a group and wants to have the control	–	
Denying	A peer who is in extreme conscious denial to avoid consequences	–	
Victim	A peer who believe that he is always treated unfairly or taken advantage of and consequently isolate him/her self	–	
Emotional Roles: they refer to roles representing emotional themes			
Attention seeker	A peer who wants to be the centre of attention in the group	±	
Crisis	A peer who upsets other peers by expressing negative thoughts. Positive unless using aggression and blaming tone	±	
Follower	A peer who admires a particular person or believes in system of ideas	±	
Fixer	A peer who prevent other peers from expressing their emotions by saying words such as "do not worry, you will be alright."	⊖	

The social objects



D.3 – Social Objects

Description:

This document lists different activities that can be introduced to peer support groups. We call these activities “Social Objects”. Social objects encapsulate three aspects:

- **Purposes:** the immediate motivator(s) of the assigned task or activity
- **Qualities:** The interaction orientation that mediates planned purpose(s), i.e. the mode of delivery.
- **Functionalities:** The functional activities that support achieving planned purpose(s), i.e. the method of delivery.

Social interactions are driven by or revolve around a shared object(s), e.g. topics, ideas, events or public figures. Social objects help to maintain the focus of social interactions. Social objects are expected to be selected by group’s facilitators and negotiated with representative groups’ members.

How to use this document?

Read the design case (D.1) and then use this document to decide what tasks and activities would you introduce to the group during the period of the treatment. Tick (✓) from column (A), then use columns (B) and (C) to decide the qualities and functionality of selected element. This document will then be used by software engineers to decide the features and functionalities that can facilitate those social objects.

Considerations:

- Feel free to add/remove from the table or even comment on the document itself.
- The table below is just to provide an example on how you should use this document. Only use symbols, e.g. Selecting Goals = (Q2,Q6,F6)

Tick	Purposes:	Qualities	Functionalities
✓	Selecting goals	Q2 (Discussion), Q6 (Collaboration)	F6 (Open discussions)
✓	Enhancing self-confidence	Q3 (Confrontation), Q5 (Competition)	F3 (Group competition), F5 (Peer pressure via monitoring)

The social roles

Building blocks	<input checked="" type="checkbox"/>	A feature with great implication on a given building block. (E.g. Announcing location has a greater implication on the Presence block)
	<input type="checkbox"/>	A feature with less/indirect implication on a given building block. (E.g. Announcing location has an indirect implication on the Reputation block)
	<input type="checkbox"/>	A feature with insignificant implication on a given building block. (E.g. Announcing location has an insignificant implication on the Conversation block)

#	Potential features	Visibility				Social Software Building Blocks								
		Tick to include	Practitioner	Specific peer(s)	My group	Friends & family	Identity	Reputation	Sharing	Presence	Assessment	Conversation	Collaboration	Awareness (Self & Social)
Main Features														
1	Setup goals: this includes different parameters such as type, duration, value, required steps and status													
2	Goals progress													
3	Treatment progress: this is the overall progress in the treatment program, goals progress is embedded													
4	Accomplishment: an area on user's profile where collected points and badges are listed													
5	Compare my usage to others													
6	Contextualised usage tracking: associating time and location to the usage													
7	Contextualised content tracking: associating time and location to the consumed/generated content													
8	Self-assessment: featured questionnaires to evaluate the self													
9	Addiction scoring													
10	Leaderboard: scoreboard showing the names and current scores of the leading peers													
11	Group dashboard: an area on group's profile to help to learn the overall limiting states of others													
12	Enforce rule: (e.g. Locking Screen, a feature)													
13	My mood: expressing current state of mind or feeling													
14	Reminders: reminding a user about goals, tasks and exceeding limit of usage													
15	Auto-responding: returning a prewritten message to inform peers that you are unavailable													
16	Mute: hide a specific peer's communication													
17	Posting: e.g. posting status, suggesting rules, photos or videos, discussion topics													
18	Ask a question: navigate through topics where the question belongs. others can answer													
19	Private messaging: a user can send messages and interact with selected peers													
20	Create personal group: a user can create his personal group													

#	Potential features	Visibility				Social Software Building Blocks								
		Tick to include	Practitioner	Specific peer(s)	My group	Friends & family	Identity	Reputation	Sharing	Presence	Assessment	Conversation	Collaboration	Awareness (Self & Social)
Main Features														
21	Group chatting													
22	Create relationships: for example, adding a friend, follow someone													
23	Creating events: a calendar-based resource used to notify others of upcoming occasions													
24	Wall: area on personal profile where the user and his peers can post thoughts for everyone to see													
25	Live streaming: broadcasting real-time video													
26	Creating a page: Unlike personal profile, page aims at getting fans rather than friends													
27	Announcing current location: share real physical location (e.g. Enjoying a cup of tea –at Green Tea)													
28	Poke a peer: a way of saying hello to get a particular peer's attention. The poked peer will be notified.													
Options that can be embedded to some of the features above														
29	Post activity: find out how viewers engaged with a post (i.e. clicking anywhere on the post)													
30	Comment: an option to enable a user to comment on posts													
31	Sharing others' content													
32	Hashtaging: labelling technique to identify messages on a specific topic													
33	React to content: rate how you feel towards certain content													
34	Follow discussion: to receive updates notification on a specific post													
35	Mention: attach a peer's name to a post to get his/her attention (e.g. @Amen see this funny video)													
36	Poll option: providing users with a poll option to add to posts to determine opinions													
37	Updates notifications: prompting a user about peers' achievements, goals or posts													
38	Tagging: attach a peer's name to a post. It involves ownership (e.g. was at cinema –with Alrobal)													

#	Potential features	Visibility					Social Software Building Blocks						
		Tick to include	Practitioner	Specific peer(s)	My group	Friends & family	Identity	Reputation	Sharing	Presence	Assessment	Conversation	Collaboration
Options that can be embedded to some of the features above													
39	Personal profile picture												
40	Personal skills												
41	Personal contact info												
42	Personal family relationship												
43	Personal biography												
44	Showing list of mutual supporters												
45	Showing number of supporters												

D.5 – Network of Trade-offs and User Experience Concerns

Description:

This document provides a list of trade-offs and User Experience (UX) concerns related to some design concepts. It is the role of the development team to handle these trade-offs based on their importance and their level of negative/positive impact.

Considerations:

- Development team might decide to address an identified trade-off at different levels:
 - I. **Functional features level:** by adding/removing/replacing a feature or modifying its level of visibility.
 - II. **Persuasive technology level:** by adding/removing/replacing a persuasive technique or modifying how it should be implemented.
 - III. **Group moderation level:** by utilising human elements, e.g. one-to-one counselling or adopting more strict governance style.

A) Network of Trade-offs:

This table list some trade-offs which you need to consider in order to update the features you selected so far.

Design concepts	Predicate	Potential effects	Type	Tick (✓)
Anonymity	facilitates	Building trust	+	
	encourages	Self-disclosure and emotional expression	+	
	increases	Alternative addictive experience (e.g. Negative habit forming)	-	
	increases	Romantic intimacy (i.e. People act out when they can separate their online actions from their identity)	-	
Digital rewards/ Gamification	improve	User engagement	+	
	increases	Alternative addictive experience	-	
	usedAs	Quick fix to negative emotions	-	
	lowers	Self-esteem if competition element is used with users starting the rehab	-	
Usage measurement	discourages	Denial and refusal to admit the reality	+	
	leadsTo	False assertions if biased and non-standardised methods used	-	
The power within a group (i.e. social status)	increases	Responsibility of senior peers to be role models (status here refers to longer period in a group)	+	
	introduces	Social hierarchy within a group	-	
	violates	Equity Principle	-	
Facilitating emotion expression	reduces	Denial and defensiveness	+	
	abusedBy	Self-pitying individuals	-	
Self-presentation (digital persona)	improves	Gamified experience by enabling users to build online reputation	+	
	encourages	Persona maintenance	-	
	encourages	Self-promotion	-	
	provides	False self-esteem	-	
Self-disclosure	facilitates	Building trust	+	
	increases	Friendship intimacy	+	
	leadsTo	Romantic intimacy	-	

This table list some trade-offs which you need to consider in order to make general **design decisions** or adding constraints to some features.

Design concepts	Predicate	Potential effects	Type	Tick (✓)
Personal selection of goals	increases	Commitment and consistency	+	
	leadsTo	Biased selection of goals (e.g. selecting easy goals)	-	
Open and public groups (i.e. highest level of visibility)	activates	Helper role (i.e. peers try to help and guide those who join to learn, e.g. in contemplation stage)	+	
	leadsTo	Avoidance (i.e. focusing on others rather than self, which may lead to relapse)	-	
	discourages	Self-disclosure	-	
Integrating users who are in the stabilization stage to join group therapy	provides	Emotional support environment for those in the stabilization stage	+	
	provides	Hope installation and inspiring to those in stabilization stage	+	
	provides	Norms maintenance (i.e. new peers follow established norms via observing senior peers)	+	
	activates	Helper role (i.e. senior peers feel empathy and try to support those in stabilization stage)	+	
	leadsTo	Sabotaging group work if more than three peers who are in stabilization stage exist	-	
Enabling recovered addicts to join groups	reduces	Sense of belonging (i.e. in online new peers feel less important and impact their self-esteem)	-	
	contributesTo	Hope installation and inspiring recovering peers	+	
Advocate and promote Helper role	encourages	Positive empathy of recovered addicts which help behavioural maintenance	+	
	initiates	Opinion dictation (i.e. controlling how others must behave which can be intimidating)	-	
	contributesTo	Behavioural change maintenance for peers who provide help	+	
Different customization based on social objects	encourages	Reciprocity (i.e. exchange help and support)	+	
	leadsTo	Avoidance (i.e. focusing on others rather than self, which may trigger some relapse symptoms)	-	
	canBe	Intimidating by making others nervous and less confident	-	
Different customization based on social objects	improves	The quality of different tasks and activities	+	
	violates	Consistency & standards heuristic principle	-	


B) User Experience (UX) concerns

Look at the source of concerns (2nd column) and judge to what extent you think your decision so far could cause





	UX concerns	Source of concerns
1	Lack of interest	* Experience fails to engage (e.g. leaderboard)
		Ineffective rewarding system
		Poor levelling design
		Willingness and readiness to change
2	Biased decisions	* Downward social comparisons
		* Self-set goals
		* Denial of reality
		* Past experience and performance influence
		Flight into health
3	Lowering self-esteem	* Peer-pressure
		* Upward social comparisons
		* Low sense of self-efficacy
4	Creating misconceptions	* Assigning to non-matched groups
		* Unreliable addiction scoring
		Minimising the seriousness of the addiction
		Providing non-stage matched interventions
5	Lack of trust	* Unreliable addiction scoring
		* Lack of transparency
		Lack of verifiability


	UX concerns	Source of concerns
6	Creating addictive experience	* Pull and push feedback approaches
		* Gamified experience
		* Creating pre-occupation
7	User experience impact	Poor stimulus control
		* Obtrusiveness
		* Distraction
		* Coercive techniques
		* Affecting workflow
8	Unsustainable change	* Lack of requirements negotiations (excluding some apps from monitoring)
		Neglect personalised experience
9	Self-image impact	Social elements (e.g. conformity effect)
		Losing interest
		Labelling as addict
		Experiencing relapse


(Mock-up interfaces)





Facilitator:
Miss Anna Watson ●


























Dashboard


Meeting room


Group wall


My Profile

	Today Usage	Weekly goal progress	Socialise
1 ●  Emily	01:33:12	 74%	
2 ●  Adam	02:12:00	 49%	
3 ●  Katie	02:22:67	 97%	
4 ●  Tim	03:00:00	 32%	
5 ●  Sophia	04:44:00	 61%	
6 ●  Matthew	05:02:44	 42%	



Facilitator:
Miss Anna Watson ●

Check in | Check out | Status

3
 1

Dashboard

Meeting room

Group wall

My Profile

Emily

Adam

Katie

Tim

Sophia

Matthew

Emily
(20:14:54)

Guess Katie, doesn't feel like taking much

Tim feels guilty & lonely today, give some support!

Katie
(20:16:43)

Well, I think you have started to make changes. Maybe it feels you are not getting anywhere. But one day at a time you can make changes

Tim
(20:17:67)

Yah, I have a good heart, I try to help others but cannot help myself 😞 !

4

Katie
(20:18:00)

I have had enough. I cant deal with this anymore.. this thinking all the time about how people perceive me on Facebook 😞

Emily
(20:18:88)

We all know that sometimes we are our own worst enemy Katie.

Miss Anna
(20:19:44)

That's right Emily. I can tell you from my own personal experience that it does get better once you hit the rock bottom.

Tim
(20:17:67)

Is your life personally affected by this behaviour or just all in your head?

6

Sophia
(20:18:00)

Oh dear, I really feel sorry for that. Hey I'll continue speaking I'm tiered of chatting 😞

SEND

Page | 407

Check in | Check out | Status



Facilitator:
Miss Anna Watson ●



Dashboard



Meeting room




Group wall







My Profile


Check in


Aggressive	Angry	Anxious	Ashamed	Bashful	Bored	Cautious
Confident	Confused	Curious	Depressed	Determined	Disappointed	Disbelieving
Disgusted	Ecstatic	Embarrassed	Enraged	Envious	Exasperated	Exhausted
Frightened	Frustrated	Grieved	Guilty	Happy	Hopeful	Hurt
Indifferent	Interested	Jealous	Joyful	Lonely	Loved	Loving
Miserable	Optimistic	Overwhelmed	Pained	Puzzled	Regretful	Relieved
Sad	Satisfied	Shocked	Shy	Smug	Sorry	Stubborn
Stupid	Surprised	Suspicious	Thoughtful	Withdrawn		





Name: Katie
Level 5

 3
 1




Dashboard


Meeting room


Group wall

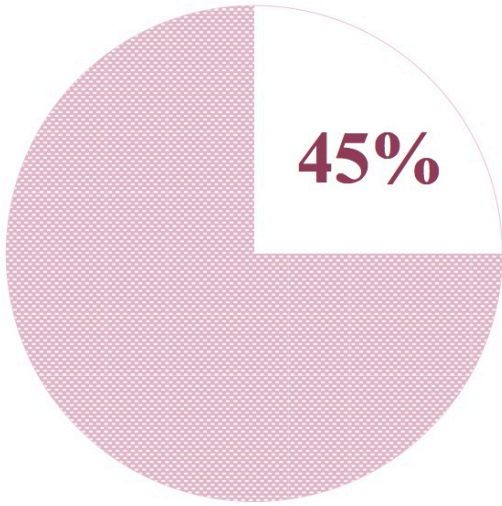

My Profile

Addiction score

Usage stats

Personal goals

To do list!




45%

Compare to my past

Compare to a peer

Compare to my group



Well done Katie, You are doing great!

Miss Anna Watson

Accomplishments

Family and friends

Settings



Name: Katie
Level 5



Dashboard



Meeting room



Group wall



My Profile

Addiction score

Usage stats

Personal goals

To do list!

Daily view

Weekly view

Insights

	Applications	Duration	Frequency	Features usage	Actions
1	Instagram	276 min	22 times	Detailed analysis	
2	Snapchat	60 min	32 times	Detailed analysis	
3	Google Chrome	44 min	4 times	Detailed analysis	
4	Facebook	42 min	76 times	Detailed analysis	
5	YouTube	30 min	2 times	Detailed analysis	

Compare to my past

Compare to a peer

Compare to my group



Miss Anna Watson

Hi Katie, You may reconsider your Instagram usage. Happy to discuss it in next group meeting or on the private room.

Accomplishments

Family and friends

Settings

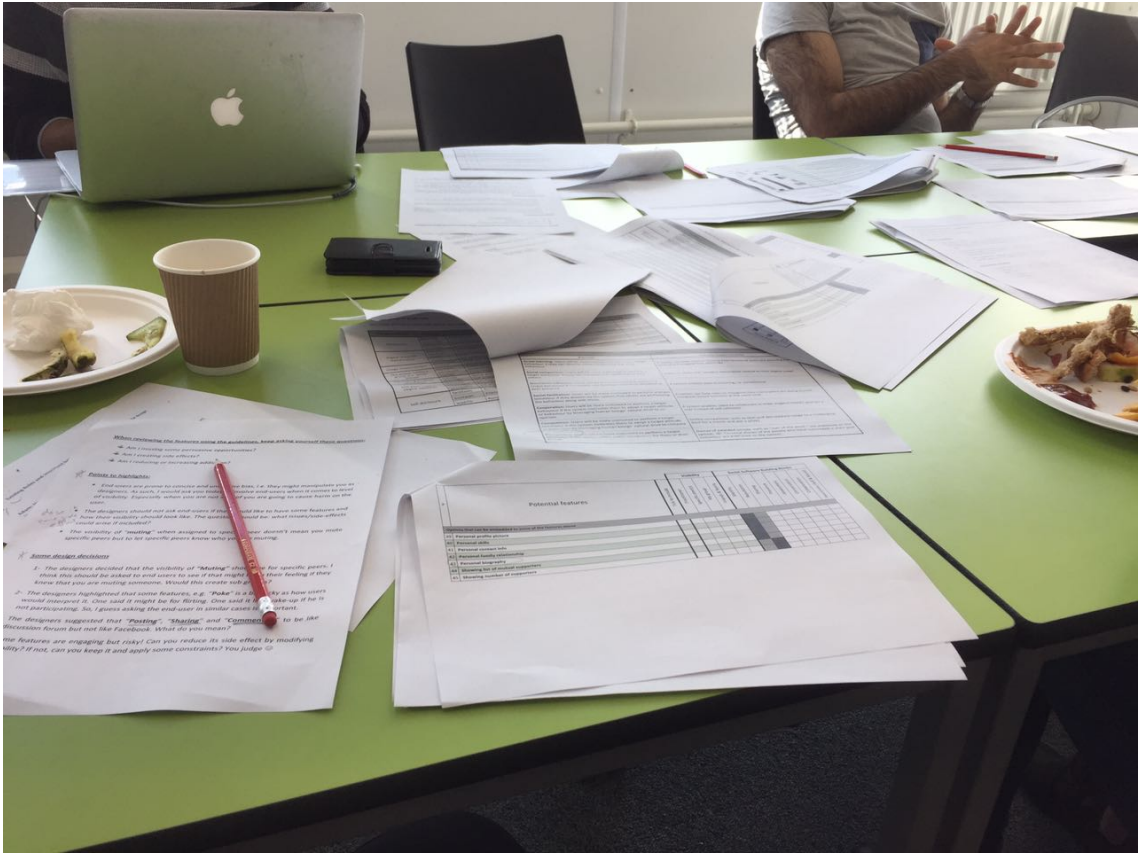
The COPE.er Model Building Blocks

This thesis provides some modifications to the classical Honeycomb framework to transform it from Social Computing into Socially **Aware** Computing. The new model is devised to help building platforms for online support groups. We view this type of platforms as a special type of social networking medium. As such, we propose that peers support groups should be built upon the COPE.er eighth building blocks. The heart of the model is the components that should guide the customisation of the eighth building blocks. Below is a brief definition of each building block.



- ❖ **Group factors:** refers to collective characteristics that define a group, e.g. norms, needs and goals.
- ❖ **Individual factors:** refers to attributes that define an individual, e.g. qualities and vulnerabilities.
- ❖ **Shared goals:** refers to goals defining the focus of social interactions within a group.
- ❖ **Social objects:** refers to tasks maintaining the focus of social interactions within a group.

- + **Assessment:** refers to tools people can use to rate interactions and content. (New)
- + **Awareness:** refers to aspects that increase users' knowledge and perception. (New)
- + **Collaboration:** refers to the ways users use to enhance their ability to collaboration. (New)
- + **Identity:** refers to the way users present and profile themselves.
- + **Conversations:** refers to degree and type of communicate amongst members.
- + **Reputation:** refers to tools enabling and describing the social standing of user.
- + **Presence:** refers to ways people can use to express their availability and status.
- + **Sharing:** refers to the scale and facilities offered to users to exchange digital content.
- + **Relationships:** (Removed)
- + **Groups:** (Removed)



Part 1: AWARE questionnaire

The AWARE Questionnaire (Advance WArning of RElapse) was designed as a measure of the warning signs of relapse, as described by Gorski (Gorski & Miller, 1982). The items are arranged in the order of occurrence of warning signs, as hypothesized by Gorski. It has been found that no evidence that the warning signs actually occur in this order in real time (Miller & Harris, 2000). Rather, the total score was the best predictor of impending relapse.

ADMINISTRATION: This is a self-report questionnaire that can be filled out by the client. Be sure that the client understands the 1-7 rating scale. When the client has finished, make sure that all items have been answered and none omitted.

SCORING: Total the numbers circled for all items, but reverse the scoring for the following five items: 8, 14, 20, 24, 26. For these five items only:

If the client circles this number: 1 2 3 4 5 6 7 Add this number to the total score: 7 6 5 4 3 2 1

INTERPRETATION: The higher the score, the more warning signs of relapse are being reported by the client. The range of scores is from 28 (lowest possible score) to 196 (highest possible score). The following table shows the probability of heavy drinking (not just a slip) during the next two months, based on our prospective study of relapse in the first year after treatment (Miller & Harris, 2000).

AWARE Questionnaire 3.0

Please read the following statements and for each one circle a number, from 1 to 7, to indicate *how much this has been true for you recently*. Please circle one and only one number for every statement.

	Never	Rarely	Some- times	Fairly often	Often	Almost always	Always
1. I feel nervous or unsure of my ability to stay sober.	1	2	3	4	5	6	7
2. I have many problems in my life.	1	2	3	4	5	6	7
3. I tend to overreact or act impulsively.	1	2	3	4	5	6	7
4. I keep to myself and feel lonely.	1	2	3	4	5	6	7
5. I get too focused on one area of my life.	1	2	3	4	5	6	7
6. I feel blue, down, listless, or depressed.	1	2	3	4	5	6	7
7. I engage in wishful thinking.	1	2	3	4	5	6	7
8. The plans that I make succeed.	1	2	3	4	5	6	7
9. I have trouble concentrating and prefer to dream about how things could be.	1	2	3	4	5	6	7
10. Things don't work out well for me.	1	2	3	4	5	6	7
11. I feel confused.	1	2	3	4	5	6	7
12. I get irritated or annoyed with my friends.	1	2	3	4	5	6	7
13. I feel angry or frustrated.	1	2	3	4	5	6	7
14. I have good eating habits.	1	2	3	4	5	6	7
	Never	Rarely	Some- times	Fairly often	Often	Almost always	Always

	Never	Rarely	Sometimes	Fairly often	Often	Almost always	Always
15. I feel trapped and stuck, like there is no way out.	1	2	3	4	5	6	7
16. I have trouble sleeping.	1	2	3	4	5	6	7
17. I have long periods of serious depression.	1	2	3	4	5	6	7
18. I don't really care what happens.	1	2	3	4	5	6	7
19. I feel like things are so bad that I might as well drink.	1	2	3	4	5	6	7
20. I am able to think clearly.	1	2	3	4	5	6	7
21. I feel sorry for myself.	1	2	3	4	5	6	7
22. I think about drinking.	1	2	3	4	5	6	7
23. I lie to other people.	1	2	3	4	5	6	7
24. I feel hopeful and confident.	1	2	3	4	5	6	7
25. I feel angry at the world in general.	1	2	3	4	5	6	7
26. I am doing things to stay sober.	1	2	3	4	5	6	7
27. I am afraid that I am losing my mind.	1	2	3	4	5	6	7
28. I am drinking out of control.	1	2	3	4	5	6	7
	Never	Rarely	Sometimes	Fairly often	Often	Almost always	Always

