

THE EFFECT OF ICT CONNECTIVITY ON  
INDIVIDUAL WORK PRODUCTIVITY: INVESTIGATING THE INFLUENCE OF  
ICT SELF-DISCIPLINE

BY

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“No matter what new technologies arise, no matter how overwhelming some of the new threats seem, humans have the capacity to deal with them”.

(Baumeister & Tierney, 2011, pg. 260)

## **Abstract**

Information and Communication Technologies (ICTs) in the workplace are increasingly connecting employees. This ICT connectivity has mixed effects on individuals' work productivity and it raises ongoing concern in literature and in the media. The goal of this research was to investigate ICT self-discipline in this context to better explain the effect of ICT connectivity on individual work productivity.

A review of existing literature on ICTs in the workplace took place, drawing from the disciplines of Information Systems (IS), Communications, Psychology and Organisational Studies. The literature review assisted with the development of a conceptual research model, which was subsequently used to guide this research.

The conceptual research model was validated and refined through the qualitative phase of this research. This phase used semi-structured interviews to expand views on the research phenomena. The updated research model was further validated during the model refinement phase of this research. This phase consisted of two focus groups. Collectively, the literature review, the qualitative phase and the model refinement phase assisted in transforming the updated research model into a testable form.

The quantitative phase of this research consolidated key themes from relevant literature and findings from the two prior research phases to develop a survey instrument. An online survey was conducted to test the research model and address the research goal.

The statistical analysis of the survey data provided useful results. First, the indicator and construct validity showed that the survey instrument was reliable and it accurately reflected the investigated phenomena. Second, the hypothesis testing showed support for the research model when tested in different contexts. The findings from this phase helped address the research goal.

Overall, findings from this research indicated that job requirement for ICT connectivity influences an individual's level of ICT connectivity for work, ICT connectivity positively impacts individual work productivity and ICT self-discipline positively influences individual work productivity. Additionally, ICT self-discipline can positively moderate the effect of ICT connectivity on individual work productivity for employees with low-interdependent jobs and/or working in large/multi-national firms. Further, ICT self-discipline can negatively moderate the effect of ICT connectivity on individual work productivity for employees with high-interdependent jobs and/or working in small firms. Thus, for enhanced productivity, it is important to assess an employee's work settings prior to determining how strictly to impose ICT self-discipline.

This research addresses concerns on the effects of ICTs raised in the literature and in the media. The research drew from IS and Psychology literature to develop the notion of ICT self-discipline – an individual's ability to regulate their behaviors towards ICTs. The research investigated how this notion could enhance the effect of ICTs on individual work productivity. Further, a model towards theory explaining productive ICT connectivity for work is contributed. This model goes beyond existing theories in IS and contributes knowledge to the literature on IS, Communications, Psychology and Organisational Studies. Finally, this study informs practice by providing employees with insights on how to deal with communication through ICTs to ensure they are continuously productive at work.

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# Table of Contents

Abstract .....	iii
Acknowledgements .....	v
Table of Contents.....	vi
1 Introduction .....	13
1.1 Research Motivation .....	13
1.2 Research Gap .....	15
1.3 Research Goal .....	18
1.4 Research Significance.....	19
1.5 Thesis Outline .....	21
1.6 Chapter Summary.....	22
2 Literature Review .....	23
2.1 ICT Connectivity Literature Review .....	23
2.1.1 <i>ICTs in the workplace</i> .....	24
2.1.2 <i>Background on the concept of ICT connectivity</i> .....	26
2.2 Employee Productivity Literature Review .....	30
2.2.1 <i>Overview of productivity</i> .....	30
2.2.2 <i>Individual level productivity in IS literature</i> .....	34
2.2.3 <i>The effect of ICT connectivity on employee productivity</i> .....	37
2.3 Individual Control Literature Review.....	39
2.4 Conceptual Research Model.....	43
2.4.1 <i>ICT connectivity</i> .....	46
2.4.2 <i>Employee productivity</i> .....	49
2.4.3 <i>Individual control</i> .....	50
2.5 Chapter Summary .....	52
3 Research Design.....	55
3.1 Research Paradigm.....	55

3.1.1	<i>Research ontology and epistemology</i>	55
3.1.2	<i>Research theoretical perspective</i>	57
3.1.3	<i>Research empiricism</i>	60
3.2	Research Methodology	60
3.2.1	<i>Methodology in IS research</i>	61
3.2.2	<i>Methodology in this research</i>	63
3.3	Research Design	65
3.4	Chapter Summary	66
4	Qualitative Phase	69
4.1	Qualitative Phase Data Gathering Method	69
4.2	Qualitative Phase Research Sample	71
4.3	Qualitative Phase Data Analysis	74
4.4	Qualitative Phase Findings	76
4.4.1	<i>Defining ICT connectivity from interviews</i>	77
4.4.2	<i>Defining individual work productivity from interviews</i>	80
4.4.3	<i>Defining individual control from interviews</i>	81
4.4.4	<i>Research proposition one from interviews</i>	83
4.4.5	<i>Research proposition two from interviews</i>	84
4.4.6	<i>Updated research model after interviews</i>	85
4.5	Chapter Summary	88
5	Model Refinement Phase	89
5.1	Overview of Model Refinement Steps	89
5.1.1	<i>Model refinement steps one and two – expert reviews</i>	89
5.1.2	<i>Model refinement step three – focus groups</i>	90
5.1.3	<i>Model refinement step four – expert reviews</i>	97
5.2	Updated Research Model after Focus Groups	98
5.2.1	<i>Job requirement for ICT connectivity</i>	99

5.2.2	<i>ICT connectivity</i>	101
5.2.3	<i>Individual work productivity</i>	104
5.2.4	<i>ICT self-discipline</i>	105
5.2.5	<i>Research domain</i>	109
5.3	Chapter Summary	110
6	Quantitative Phase	111
6.1	Data Gathering Method	111
6.2	Survey Instrument Development	112
6.2.1	<i>Instrument development process</i>	112
6.2.2	<i>Initial items for research constructs</i>	116
6.3	Survey Instrument Validation	130
6.3.1	<i>Pilot card sorting</i>	131
6.3.2	<i>Open card sorting</i>	135
6.3.3	<i>Closed card sorting</i>	138
6.4	Survey Instrument Design and Pre-Test	141
6.5	Survey Instrument Refinement	145
6.5.1	<i>Pilot survey sample</i>	145
6.5.2	<i>Pilot survey results</i>	147
6.5.3	<i>Refined survey instrument</i>	157
6.6	Survey Instrument Distribution and Results	164
6.6.1	<i>Online survey sample</i>	166
6.6.2	<i>Online survey results</i>	167
6.7	Chapter Summary	195
7	Discussion and Conclusion	197
7.1	Addressing Research Question One	197
7.1.1	<i>Contributions from the qualitative phase</i>	197
7.1.2	<i>Contributions from the model refinement phase</i>	199



7.1.3 Contributions from the quantitative phase.....	201
7.2 Addressing Research Question Two.....	203
7.2.1 Contributions from the qualitative phase .....	203
7.2.2 Contributions from the model refinement phase .....	205
7.2.3 Contributions from the quantitative phase .....	206
7.3 Research Contributions.....	211
7.3.1 Contributions to IS theory .....	211
7.3.2 Contributions to the literature .....	214
7.3.3 Opportunities for future research .....	217
7.3.4 Contributions to practice.....	223
7.4 Research Limitations.....	226
7.5 Research Conclusion .....	227
References .....	231
Appendix A – Defining Productivity in IS Literature .....	259
Appendix B – Interview Protocol .....	260
Appendix C – HEC Approval for Interviews .....	261
Appendix D – Interview Information .....	262
Appendix E – Research Validation Steps .....	264
Appendix F – Themes from Interviews .....	265
Appendix G – Focus Group Protocol .....	266
Appendix H – HEC Approval for Focus Groups .....	267
Appendix I – Focus Group Information .....	268
Appendix J – Themes from Focus Groups .....	270
Appendix K – Pilot Card Sorting Information .....	271
Appendix L – Open Card Sorting Information .....	272
Appendix M – Closed Card Sorting Information .....	273
Appendix N – HEC Approval for Online Survey.....	274

Appendix O – Online Survey Screenshots.....	275
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**List of Tables**

Table 1-1. Thesis Chapter Outline .....	21
Table 2-1. IS Theories Related to this Research.....	44
Table 4-1. Interview Research Participants.....	72
Table 4-2. Updated Research Definitions – Post Qualitative Phase .....	86
Table 5-1. Focus Group One Research Participants .....	92
Table 5-2. Focus Group Two Research Participants.....	93
Table 5-3. Updated Research Definitions – Post Model Refinement Phase .....	99
Table 5-4. Theories/Concepts Related to ICT Self-Discipline.....	105
Table 6-1. Job Requirement for ICT Connectivity Items from the Literature.....	118
Table 6-2. Initial Items for Job Requirement for ICT Connectivity.....	119
Table 6-3. ICT Connectivity Items from the Literature .....	121
Table 6-4. Initial Items for ICT Connectivity.....	122
Table 6-5. Individual Work Productivity Items from the Literature .....	124
Table 6-6. Initial Items for Individual Work Productivity.....	125
Table 6-7. ICT Self-discipline Items from the Literature.....	127
Table 6-8. Initial Items for ICT Self-Discipline .....	129
Table 6-9. Pilot Card Sorting Items Placement .....	132
Table 6-10. Pilot Card Sorting Inter-Rater Agreement .....	133
Table 6-11. Open Card Sorting Participants.....	135
Table 6-12. Open Card Sorting Items Placement.....	136
Table 6-13. Open Card Sorting Inter-Rater Agreement .....	137
Table 6-14. Closed Card Sorting Participants .....	138
Table 6-15. Closed Card Sorting Items Placement.....	139
Table 6-16. Closed Card Sorting Inter-Rater Agreement.....	140
Table 6-17. Survey Items – Post Validation .....	144
Table 6-18. Pilot Survey Demographic Information .....	148
Table 6-19. Pilot Survey Item Reliability.....	150
Table 6-20. Factor and Cross-Loadings of Pilot Survey.....	155
Table 6-21. Refined Survey Instrument – Post Pilot Survey .....	158
Table 6-22. Factor and Cross-Loadings for Final Survey Instrument .....	161
Table 6-23. Online Survey Demographic Information.....	168

Table 6-24. Online Survey Item Reliability .....	170
Table 6-25. EFA Factor and Cross-Loadings of Online Survey .....	173
Table 6-26. Multi-Collinearity Testing .....	173
Table 6-27. CFA Factor and Cross-Loadings of Online Survey.....	174
Table 6-28. Online Survey Convergent Validity.....	175
Table 6-29. Online Survey Discriminant Validity .....	176
Table 6-30. Final Survey Instrument Items .....	177
Table 6-31. Online Survey Path Coefficients .....	180
Table 6-32. Online Survey Moderation Effect.....	182
Table 6-33. IPMA on Individual Work Productivity.....	185
Table 6-34. Group Specific Analysis of H3a .....	188
Table 6-35. Comparison of H3a Confidence Intervals (CI) amongst Groups.....	191
Table 6-36. Job Requirement for ICT Connectivity as a Moderator .....	193

### **List of Figures**

Figure 2-1. Conceptual Research Model .....	45
Figure 4-1. Four-Step Interview Data Analysis Process .....	74
Figure 4-2. Updated Research model – Post Qualitative Phase.....	85
Figure 5-1. Updated Research Model – Post Model Refinement Phase .....	99
Figure 6-1. Likert Scales .....	115
Figure 6-2. Hypotheses Testing – Without Moderation .....	180
Figure 6-3. Hypotheses Testing – With Moderation .....	182
Figure 6-4. Moderating Effect in Entire Dataset .....	184
Figure 6-5. Performance vs. Impact on Individual Work Productivity.....	185
Figure 7-1. Model of Productive ICT Connectivity .....	212



# 1 Introduction

The purpose of this chapter is to introduce the topic of this research. The chapter begins by outlining the factors that motivated this research. The research gap in Information Systems (IS) literature is then identified. To follow, the goal of the research, the research questions and the research objectives are described. The research significance is then discussed. The thesis outline is then presented before the chapter is concluded. The chapter outline is summarised below:

- 1.1 Research Motivation
- 1.2 Research Gap
- 1.3 Research Goal
- 1.4 Research Significance
- 1.5 Thesis Outline
- 1.6 Chapter Summary

## 1.1 Research Motivation

Information and Communication Technologies (ICTs) are all around us. They are “the devices, applications, media, associated hardware and software that receive and distribute, process and store, retrieve and analyse, digital information, between people and machines or among people” (Rice & Leonardi, 2013, pg.4).

The uptake of ICTs in the workplace has been widely explored in the Information Systems (IS) literature (Karr-Wisniewski & Lu, 2010; Perlow & Porter, 2009; Perlow, 2012; Richardson & Benbunan-Fich, 2011; Tarafdar, Tu, Ragu-Nathan & Ragu-Nathan, 2007). ICTs provide *almost constant connectivity*, making individuals *always on* and *constantly connected* to people and information (Baron, 2010; Perlow, 2012; Renaud, Ramsay & Hair, 2006).

This ICT connectivity provides employees with added availability and reachability to colleagues and other sources of information (Cecez-Kecmanovic, Boell & Campbell, 2014; Dery, Kolb & MacCormick, 2014). Such changes are making the technology equipped workplace extremely inter-connected (Kolb, 2008). As a result, increased connectivity is attributed to causing changes in the work environment, positively – by providing employees information at their leisure,

but also negatively – through disruptions in personal workflow (Huarng, 2001; Mazmanian, Yates & Orlikowski, 2006; Perlow & Porter, 2009).

In response to this workplace shift, employees are pressured to develop strategies to manage their ICTs (Cameron & Webster, 2013; Parkin, 2014). For instance, employees should respond to emails only at certain times of the day or switch their smartphones off after leaving the office (Mazmanian, Orlikowski & Yates, 2013; Perlow, 2012). Technology applications such as *Selfcontrol*<sup>™</sup>, *CanFocus*<sup>™</sup> and *Asana*<sup>™</sup> are also used to moderate ICT connectivity in the workplace. Further, organisations in some countries, including Germany, Sweden and France, have implemented new workplace policies in an attempt to address the issue of over-connected employees (Fishwick, 2014; Mangan, 2014; Vasagar, 2013). These policies and applications assist in increasing the positive consequences of ICT connectivity to counteract the negative consequences.

Although the positive impacts of technology are frequently highlighted by researchers, there remains an ongoing concern in the media and in the IS and Communications literature about the effect of ICTs on employees (Burger, 2014; Cruickshank, 2014; Fried, 2005; Keleher & Boorer, 2013; Magid, 2009; Mazmanian et al., 2013; McKinsey Global Institute, 2013; NZ Herald, 2012; Pennington, 2014; Sarewitz, 2013; Shirky, 2008; Tarafdar et al., 2007; The Guardian, 2013). These ongoing issues caused by the highly connected workplace motivated this research.

The effect of ICTs is routinely investigated because ICTs impact workplace productivity, which is a critical component of organisational success (Hitt & Brynjolfsson, 1996). Steven Roach (1987) introduced the *Productivity Paradox*, which suggests that while the amount of implemented technology grows in the industry, productivity remains stagnant. The question remains – are ICTs making employees productive or have they brought about new obstacles that hinder employee productivity?

The points discussed above suggested three key motives for this research. First, ICT connectivity had mixed effects on employees. It seemed important to further investigate this notion so that employees gain the best of ICTs and not the worst. Second, there was a recurring concern in the media and in the IS and

Communications literature about the effect of ICTs in the workplace. This raised awareness of the topic and suggested that further investigation was needed to explain what was causing these concerns to be raised. Third, ICT connectivity was impacting individuals' work productivity, which is a significant factor in organisational success. Investigating phenomena affecting such a critical component in industry further motivated this research.

The following section underpins the research gap and delineates the topic of inquiry.

## **1.2 Research Gap**

ICTs were initially used in the workplace to make employees more efficient and effective and as a result more productive (Culnan & Markus, 1987). More recently, ICTs have become so widespread in the workplace to the extent that they have become embedded in employees' lives, making employees feel always connected (Leung, 2011; Mazmanian et al., 2006).

ICT connectivity can induce both positive and negative consequences, which in turn has an impact on an individual's work productivity. For instance, ICT connectivity allows for immediate access to information and can enhance decision-making (Davis, 2002). However, an excessive volume of information facilitated by the use of ICTs can increase job burnout and stress and thus, deter individual work productivity (Ayyagari, Grover & Purvis, 2011; Hung, Chang & Lin, 2011; Leung, 2011). Moreover, while smartphones may increase task efficiency and individual work productivity, they can also place interruptions and delays in work practices, lowering individual work productivity (Coursaris, Hassanein, Head & Bontis, 2007; Locke, 2005; Rennecker & Godwin, 2005; Venkatesh, Bala & Sykes, 2010).

To balance out these mixed consequences of ICTs, employees have to mitigate the negative consequences with the positive consequences of being connected. Mazmanian et al. (2006) found that while individual work productivity was expected to increase with the use of ICTs, other potentially negative consequences of ICTs hindered productivity. In such instances, the balance between positive and negative consequences can leave productivity unchanged. So, the key concern

remains – to what extent is ICT connectivity affecting individual work productivity?

The impact of ICTs on individual work productivity is frequently questioned in the IS literature (Edmondson, Bohmer & Pisano, 2001; Kraut, Dumais & Koch, 1989; Pitt, Berthon & Robson, 2011; Tarafdar et al., 2007; Venkatesh, et al., 2010). Such studies have shown that the effect will vary depending upon several influential factors such as social pressures and organisational support (Anandarajan, Simmers & Igbaria, 2000; Ou & Davison, 2011). While these factors have been studied, research in this area repeatedly suggested that *individual control* has an influence on the effect of ICTs on individual work productivity (Derks & Bakker, 2010; Leung, 2011; Mazmanian et al., 2006; Wajcman, Rose, Brown & Bittman, 2010).

The phenomenon of individual control towards ICTs emerged in a study carried out by Rennecker and Godwin (2005). The authors reviewed literature on delays and interruptions caused by the use of ICTs in the workplace. They were able to demonstrate the consequences of ICTs in three ways. First, the effect of ICTs was described as the improvement of work organisation – those were the intended consequences of ICTs. Second, the effect was explained as the unintentional increase of work interruptions – those were the unintended consequences of ICTs. Third, the consequences of ICTs depended on the way employees controlled their organisation of work (i.e. managing information flow through ICTs) – this explained the user's response to the intended and unintended consequences. This finding introduced the phenomenon of individual control in the context of ICTs in the workplace. Thus, the authors suggested that the consequences of ICTs on performance would differ depending on how employees managed information flow through ICTs.

Mazmanian et al. (2006) investigated the consequences of ICTs more deeply by carrying out a case study on the use of smartphones in a small investment firm. Employees highlighted that the positive experience of staying connected mitigated the negative consequences of ICTs. The study showed that there was a self-reinforcing cycle of ICTs framed by a matter of individual choice.



In their investigation on the impact of email in organisations, Derks and Bakker (2010) emphasized that because of the varying ways employees governed the use of ICTs it would be interesting to empirically test the influence of *personal control* of information flow through ICTs. In addition, the authors encouraged ongoing research on the effects of ICTs to examine their long-term effects on multiple factors, one of which being job performance or productivity.

Further, there were explicit calls from Communications and IS literature for further investigation on the influence of individual control on the effect of ICTs on individual work productivity. For instance, Leung (2011) investigated the effect of ICT connectivity on job burnout and job/family satisfaction. The study highlighted that the level of ICT connectivity may not be the main issue when assessing the consequences of ICTs. Instead, investigating individual control over the communication through ICTs would lead to more meaningful results. This was because individual control was expected to shape the consequences of ICTs that individuals experienced. Thus, Leung (2011) suggested “incorporating measures of individual control over how ICTs are used might be a fruitful direction for future research” (pg. 263).

Similarly, Kolb, Caza and Collins (2012) suggested “there is a need for continued development of the metrics within this field of research” (pg. 271). Wajcman et al. (2010) also explicitly called for more investigation on this phenomenon suggesting that “insights into how people manage their time and productivity in this environment of constant connectivity could be further developed” (Wajcman, et al., 2010, pg. 959).

The studies above identified a research gap, that is, to further investigate two key areas. First, it seemed necessary to understand the effect of ICTs on employee productivity. Second, it seemed useful to explore the effect of individual control in that context. As expected, IS scholars called for investigation on these topics. For instance, in a review of literature on mobile IS, Ladd, Datta and Sarker (2010) found a lack of research on the impact of ICTs on individual performance and they suggested this as an avenue for future research.

More recently, the Management Information Systems Quarterly (MISQ) journal called for papers on different ways to use ICTs to manage the paradox of their consequences (Majchrzak, Markus & Wareham, 2014).

The concept of individual control in this research was referred to as *ICT self-discipline* because discipline was viewed as the basis for the strategies that employees put in place to deal with the information flow through ICT connectivity. Justification for this is further explained in chapter five. The remainder of this chapter refers to individual control (or personal control) as ICT self-discipline.

The following section specifies the research goal that will address the knowledge gap mentioned previously.

### **1.3 Research Goal**

“Research begins with a problem that is to be solved or some question of interest” (Gregor, 2006, pg. 619). The primary goal of this research was to address the gap in the IS literature on ICTs by further investigating the effect of ICT connectivity on individual work productivity with studying how ICT self-discipline influenced that relationship. To achieve this, two research questions were developed:

RQ1: to what extent does ICT connectivity affect individual work productivity?

RQ2: how does ICT self-discipline influence the effect of ICT connectivity on individual work productivity?

In order to answer these questions, three research objectives were set:

RO1: to investigate the effect of ICT connectivity on individual work productivity,

RO2: to explore the phenomenon of ICT self-discipline within the use of ICTs,

RO3: to investigate the influence of ICT self-discipline on the relationship between ICT connectivity and individual work productivity.

Chapter three explains the research design used to meet these research objectives. The following section highlights the significance of this research.

#### **1.4 Research Significance**

The significance of this research lies within the potential contributions it offers to the literature, IS theory and practice. Each is explained below.

IS research is carried out to “develop and communicate knowledge concerning both the management and use of information technology for managerial and organisational purposes” (Zmud, 1995, pg. 21). This research contributes to the IS literature by providing new knowledge on the management and potential use of ICTs for organisational purposes in three ways.

First, this study investigated the influence of ICT self-discipline on the effect ICT connectivity has on individual work productivity. Investigating those factors that influence the consequences of ICTs in the workplace has previously been considered an “interesting product of future field research” (Rennecker & Godwin, 2005, pg. 263).

Second, previous studies encouraged examining various contexts to capture the effect of ICTs on individual work productivity (Derks & Bakker, 2010; Mazmanian et al., 2006). This research assessed a New Zealand (NZ) context to capture the effect of ICTs on individual work productivity.

Third, this research contributes to the understanding of a further developed phenomenon, ICT self-discipline, and its influence on the effect ICT connectivity has on individual work productivity. This contribution opens up avenues for future developments on this emerging phenomenon in many disciplines. Because the research topic concerned employee behaviours with IS at work, the knowledge gained from this research contributes to literature in IS, Psychology, Communications and Organisational Studies.

Theories in IS “can provide important and valuable contributions” (Gregor, 2006, pg.632). Based on the overview of literature on ICTs, the collective phenomena of ICT connectivity, individual work productivity and ICT self-discipline was a research gap worth exploring.

Following Gregor's (2006) taxonomy of theories in IS, this research contributes the development of a model towards future theory (Gregor – Type IV) for explaining and predicting the relationships amongst ICT connectivity, individual work productivity and ICT self-discipline.

Further, incorporating the notion of individual control (or as in this research, ICT self-discipline) into theoretical models can better explain the effects of ICT connectivity on individual work productivity than previous models of performance have done (Derks & Bakker, 2010; Leung, 2011; Mazmanian et al., 2006; Wajcman et al., 2010). More on the theoretical contribution of this research is explained in chapter seven.

ICTs have become embedded into individuals' daily lives (Leung, 2011; Vodanovich, Sundaram, & Myers, 2010). The recurrence of research investigating the impact of ICTs on employees illustrates the importance of ICTs at work (Ayyagari et al., 2011; Coursaris et al., 2007; Hung et al., 2011; Karr-Wisniewski & Lu, 2010; Locke, 2005; Richardson & Benbunan-Fich, 2011; Tarafdar et al., 2007). Weber (2004) suggested that one of the major research themes should be to articulate "improved protocols to guide our behaviours" when using ICTs and also to "develop improved personal and organisational protocols" for ICT use (pg. 7).

Additionally, concern in the media continuously raised issues on the effect of ICTs on employee productivity (Burger, 2014; Cruickshank, 2014; Fried, 2005; Keleher & Boorer, 2013; Magid, 2009; McKinsey Global Institute, 2013; NZ Herald, 2012; The Guardian, 2013).

To help address the concerns related to practice mentioned in the literature and in the media, this research contributes recommendations for practitioners. These contributions should guide employees towards more effective utilization of ICTs and smarter handling of information flow through ICT connectivity. In turn, this effective management of ICTs can improve employee productivity and in the latter, organisational productivity. The research findings could also guide the development of software and hardware applications to assist with ICT self-discipline.

These contributions are discussed fully in chapter seven. The following section describes the format of the thesis.

## 1.5 Thesis Outline

The thesis consists of six remaining chapters. The thesis outline is summarised in Table 1-1.

Table 1-1. Thesis Chapter Outline

Chapter	Key task(s)	Key outcomes
1 Introduction	Introducing the research	Research goal, research questions (RQ1, RQ2) and research objectives (RO1, RO2, RO3)
2 Literature Review	Review of literature related to research	Conceptual research model
3 Research Design	Research design	Three phases of research
4 Qualitative Phase	Interview protocol development, data gathering, data analysis and results	Updated research model
5 Model Refinement Phase	Expert reviews, focus group protocol development, data gathering, data analysis and results	Refined, testable research model
6 Quantitative Phase	Survey instrument development, refinement and distribution, data analysis and results	Survey instrument, hypotheses testing
7 Discussion and Conclusions	Discussion of consolidated findings from three research phases	Answers to RQ1 and RQ2, research contributions, limitations and conclusions

Chapter two is a literature review that explores the topics related to this study and highlights key concepts emerging from the literature on ICTs. The review of literature in chapter two assisted in the development of the conceptual research model. Chapter three describes the research design that was used to address the research objectives and to answer the research questions RQ1 and RQ2. Chapter four explains the method undertaken in the qualitative phase and it presents empirical findings and an updated research model. Chapter five explains the method undertaken in the research model refinement phase and it presents empirical findings and a refined research model. Collectively, chapters four and five addressed the first two research objectives RO1 and RO2. The quantitative phase is then explained in chapter six and covers the survey instrument development, data gathering and empirical findings. The results in the quantitative phase addressed the third research objective RO3 and answered the

two research questions RQ1 and RQ2. Chapter seven consolidates findings from chapters four, five and six and it provides a discussion of the overall research results. Chapter seven also discusses the research contributions, limitations and conclusions.

### **1.6 Chapter Summary**

The purpose of this chapter was to introduce the topic of the research. The chapter began by highlighting the key motives for undertaking this research. Then, the concern on the research topic in relevant literature and in the media helped highlight the research gap. The research goal was then identified, before the two research questions and three research objectives were set. The research significance was explained in terms of the contributions to the literature on ICTs, IS theory and practice. Finally, the thesis outline was presented.

The next chapter is a review of the literature on the topics related to this research.

## **2 Literature Review**

This chapter discusses the topics and themes that formed the foundations for this research. The literature review is a thematic summary of studies drawn from the disciplines of IS, Communications, Psychology and Organisational Studies. First, the concept of ICT connectivity is introduced through an investigation of literature on the impact of ICTs in the workplace. Research from IS literature on employee productivity<sup>1</sup> in the context of ICTs is then discussed. To follow, example studies related to the topic of individual control<sup>2</sup> are examined and summarised. A conceptual research model is then presented, reflecting the key themes found in the literature. The chapter ends with a summary of the key points discussed. The chapter outline is summarised below:

- 2.1 ICT Connectivity Literature Review
- 2.2 Employee Productivity Literature Review
- 2.3 Individual Control Literature Review
- 2.4 Conceptual Research Model
- 2.5 Chapter Summary

### **2.1 ICT Connectivity Literature Review**

The first research objective RO1 was to investigate to what extent ICT connectivity affects individual work productivity. In order to achieve this objective, it was necessary to first explain the concept of ICT connectivity as portrayed in the literature. This section commences with a discussion of literature on the use of ICTs in the workplace. The concept of ICT connectivity is then introduced and discussed.

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<sup>1</sup> Refers to 'individual work productivity'. This phenomenon was labelled 'employee productivity' during the initial stages of this research. It was later changed to 'individual work productivity' after the qualitative phase (more on this is discussed in chapter four).

<sup>2</sup> Refers to 'ICT self-discipline'. This phenomenon was labelled 'individual control' during the initial stages of this research. It was later changed to 'ICT self-discipline' after the model refinement phase (more on this is discussed in chapter five).

### ***2.1.1 ICTs in the workplace***

Communication is a critical process in the workplace (Scott & Mitchell, 1976). Electronically-mediated communication modes are used to successfully assist with information exchanges, enhancing the traditional telephone or face-to-face methods (Culnan & Bair, 1983).

In this research, electronically-mediated communication modes are the Information and Communication Technologies (ICTs) that refer to “the devices, applications, media, associated hardware and software that receive and distribute, process and store, retrieve and analyse, digital information, between people and machines or among people” (Rice & Leonardi, 2013, pg.4). Such ICTs, including networks, devices and applications, are used in organisations to act as the ‘channel’ in the process of communication (Rennecker & Godwin, 2005; Shannon, 1948).

An extensive body of literature illustrates how new generation ICTs such as the Internet, laptops, smartphones and tablet computers are widely embraced in organisations (Anandarajan et al., 2000; Fuller, Hardin & Davison, 2007; Pitt, Berthon & Robson, 2011; Wasko, Teigland, Leidner & Jarvenpaa, 2011). Such technologies provide employees with a wide choice of ICTs like social media, instant messaging and email (Mazmanian et al., 2006; Ou & Davison, 2011; Skeels & Grudin, 2009).

There is evidence that employees can be positively affected by the use of such ICTs. For example, relationships between employees are created and strengthened by the use of networks such as Facebook, LinkedIn and Twitter (Skeels & Grudin, 2009). Employees can become better decision makers when information is accessible through ICTs (Davis, 2002; Mazmanian, 2013). Further, employees can restart their cognitive load when they ‘surf the web’ every few minutes and subsequently be more productive (Coker, 2011). Additionally, time and space perceptions diminish as smartphones give employees the flexibility to respond to emails during dead time (Mazmanian, et al., 2006). Overall, these positive consequences of ICTs lead to an impression that the uptake of ICTs in the workplace is making employees more productive.



At times, the positive impacts of ICTs in the workplace are achieved at the cost of inefficient use of time. In this case, the positive impacts of ICTs lead to negative ones. For example, Anandarajan et al. (2000) found that Internet usage allows for instant access to information, however, at the same time it causes the need for re-work, wading through extraneous material and longer time for task completion. The authors found that Internet usage created inefficiency due to employees wasting time.

While the use of ICTs allows employees to stay in touch with their work colleagues, users of ICTs can be less aware of the extent of their constant checking and frequent responding to emails. This behaviour generates additional email traffic for others to check and respond to, which in turn creates more emails to deal with, resulting into a self-reinforcing loop (Mazmanian et al., 2006).

Additionally, while the increased flexibility enabled by ICTs increases productivity of employees, Derks and Bakker (2010) also found that flexibility facilitates long work hours and as a result, higher stress. This is referred to as technostress – the stress caused by the use of technologies. Technostress in the workplace has been shown to significantly reduce employee productivity (Ayyagari et al., 2011; Tarafdar et al., 2007).

At times, the downside of ICTs in the workplace is that they can eliminate the quality of information communicated. Media Richness Theory (MRT) posits that “the more learning that can be pumped through a medium, the richer the medium” (Daft & Lengel, 1986, pg. 226). Certain media such as email and phone calls prevent the users from seeing facial expressions and gestures, which are expressive behaviours that can explain richer information exchange. In turn, this could impact employee productivity.

Castells (2011) suggested that ICTs have evolved the workplace to a setting of *timeless time* and a *space of flows*. This means that new ICTs break down logical sequences of time and making physical distances seem closer (Castells, 2011). With these workplace changes, information can be easily transmitted from one point to another and employees can always be in contact and be reached (Mazmanian et al., 2006) – Katz and Aakhus (2002) refer to this as perpetual contact.

Because of the ubiquitous nature of new generation ICTs, employees are almost always connected to people and information. Consequently, employees' expectations have changed in terms of increased availability and responsiveness, which consequently fuels the compulsion to engage with their ICTs (Mazmanian et al., 2006; Towers, Duxbury, Higgins & Thomas, 2006). As for their behaviours, it is not surprising that employees now find themselves inadvertently frequently checking their emails and smartphones (Mazmanian et al., 2006; Renaud et al., 2006).

ICTs offer employees a wide array of information streams (Carr, 2011). They can make employees more connected by offering the ability to be always on and reachable (Leung, 2011; Perlow & Porter, 2009). Carr (2011) states that “depending on how many information streams we subscribe to and the frequency with which they send out updates, we may field a dozen alerts an hour, and for the most connected among us, the number can be much higher” (pg. 132). To put Carr's principle into the context of this research – the more connected employees are to streams of information (ICTs), the more connected they are and consequently the more exchanges of information can occur. This concept of ICT connectivity is explained in the following section.

### ***2.1.2 Background on the concept of ICT connectivity***

The previous section described how ICTs at work made employees more connected. The purpose of this section is to further explain the notion of ICT connectivity. Because this notion was an emerging topic, the literature review involved looking beyond IS studies and drawing themes from other informing disciplines including Psychology, Communications and Organisational Studies.

Previously, connectivity has been examined from a psychological perspective. For example, Kobler, Riedl, Vetter, Leimeister and Krömer (2010) suggested that a psychological need for connectivity is now emerging. By analysing Facebook asynchronous communication of individual posts, the authors found that status update messaging generates a feeling of connectedness between users.

Romero, Markopoulos, Baren, Ruyter, Ijsselsteijn and Farshchian (2007) suggested that through the use of ICTs individuals gain a sense or feeling of connectedness to their device, which emotionally connects them to others. This sense is described as an emotional experience characterised by a feeling of staying in touch within ongoing social relationships (Ijsselsteijn, Van Baren & Van Lanen, 2003; Rettie, 2003).

On the other hand, Ball-Rokeach, Gibbs, Jung, Kim and Qiu (2000) introduced the phenomenon of Internet Connectedness (IC) to illustrate how the communication infrastructures of daily life are evolving with the use of new communication technologies. The concept of IC originates from the Media Systems Dependency (MSD) theory which highlights that the more an individual depends on media to meet their needs, the more important the media will be and therefore the more effects the media will have on that individual (Ball-Rokeach & DeFleur, 1976).

Expanding Ball-Rokeach et al.'s research (2000), Jung, Qiu and Kim (2001) emphasized the conceptual distinction between Internet *use* and connectedness. They argue that Internet use is a conception of computer-based technologies that individuals use to gratify their needs, while Internet connectedness reflects a multi-level and contextual way of envisioning the relationship between individuals and technology. This includes common schemes of perception, conception and action that structure the ways in which individuals connect to ICTs with different goals, tastes, attitudes and expectations and cultural capital such as knowledge, competence, attitudes or a predisposition about cultural practices. Therefore, IC was defined as a multi-level concept that includes the consideration of the scope and intensity of the relationship that people develop with the Internet (Jung et al., 2001). The result of this was the development of the Internet Connectedness Index (ICI).

The ICI was developed to capture the relationship between individuals and the Internet. This included assessing factors such as the scope, intensity and the breadth of ICTs used. The ICI was implemented in studies by Loges and Jung (2001) and Leung (2009), however it was later modified by Leung (2011) to reflect the phenomenon of ICT connectedness.

According to Leung (2011) ICT connectedness is a multi-level construct that portrays the importance of ICTs in a person's everyday life. The notion was seen as a contextual reflection of how central and embedded ICTs are in an individual's life based on their use and need at home and in the workplace. Mazmanian et al. (2006) similarly emphasize how individuals have developed ways of embedding ICTs into their lives.

Leung (2011) renamed the ICI developed by Jung et al. (2001) to the ICT Connectedness Index (ICTCI) to ensure a wide range of ICTs are explored and not only one (i.e. the Internet). The reason for this could have been due to the idea that as ICTs evolve over time and their functionalities overlap (Richardson & Benbunan-Fich, 2011). Schroeder (2010) highlighted that the use of the same type of functionalities on different devices suggests more commonalities than differences between the devices themselves. Therefore, the concept of multimodal connectedness was introduced, which suggested examining a whole range of ICTs and not just one.

Similarly, Derks and Bakker (2010) suggested that it is the selection of devices that enable users to engage and communicate in new ways. So, because technology is rapidly changing it might be practical to examine the underlying technology capabilities instead of considering a single device (Dennis, Fuller & Valacich, 2008). Thus, Leung's views (2011) on exploring a wide range of ICTs as opposed to one seemed like a logical and meaningful idea.

The ICTCI developed by Leung (2011) was a multi-level and contextual approach to assessing the relationship between individuals and ICTs. The ICTCI comprised of three components:

- scope and intensity: the range of online applications a person used and the amount of time they spent on these activities to assist with office work and activities at home,
- centrality and goal: the subjective evaluation of how the Internet and mobile phones impacted people's lives (including the extent to which a person would miss these technologies if they disappeared), and the range of personal goals a person sought to meet through the Internet,

- breadth of ICTs at home: the access to and use of ICTs at home.

Leung (2011) used the ICTCI to investigate the effect of ICT connectedness on job burnout. It was found that individuals who owned more ICTs (such as mobile phones) were more likely to have higher job burnout. Although Leung (2011) did not particularly seek the effect of ICTs on employee productivity, the key findings from his study opened up opportunities to do so. This was because job burnout had previously been found as an antecedent of low employee productivity (Huang, 2001; Maudgalya, Wallace, Daraiseh, & Salem, 2006; Maslach, Schaufeli, & Leiter, 2001).

Literature on ICT connectivity shows an emerging concept of the *potential* to reach or be reached by people and sources of information (Dery & MacCormick, 2012; Kolb et al., 2012; Stephens, 2012). The term connectivity is often used to reflect this phenomenon and is explained as:

*“...the mechanisms, processes, systems and relationships that link individuals and collectives (e.g. groups, organizations, cultures, societies) by facilitating material, informational and/or social exchange. It includes geo-physical (e.g. space, time and location), technological (e.g. information technologies and their applications) as well as social interactions and artefacts.”*

(Kolb, 2008, pg. 128)

The potential to be reached is what Kolb (2008) refers to as *latent potentiality*. He explains that “connectivity ‘serves to connect’ (present tense) with options for the future” (pg. 129). This is as opposed to using ‘connectedness’ which could imply a past tense or emotional interpretation.

Kolb (2008) explains organizational connectivity as the “coordination between employees within various types of structural (e.g. centralized–decentralized) and spatial configurations (e.g. traditional offices, telework, hot-desking and ‘virtual organizations’)” through ICTs (pg. 135).

It is important to note that one's need to connect through ICTs is not always strictly personal but may be shaped by various social conditions or work conditions an employee is surrounded by (Rossi, 2002). Furthermore, different communication environments are said to either facilitate or restrict members' communication opportunities for social, cultural, and economic activities (Loges & Jung, 2001). Thus, certain contextual factors may influence an employee's ICT connectivity.

Overall, ICT connectivity has been viewed as a multi-level construct that reflects the extent to which ICTs are embedded in individuals' lives to assist in information exchanges (Leung, 2011). ICT connectivity has also been viewed as the ability of employees to be available to access data, people and conversations (Dery & MacCormick, 2012, Mazmanian et al., 2013; Stephens, 2012). From an organizational perspective, ICT connectivity is concerned with individuals connecting to one another through ICTs to collaborate (Kolb, 2008).

The first research objective RO1 was to investigate the effect of ICT connectivity on individual work productivity. Now that literature on ICT connectivity has been reviewed, the following section discusses key themes in literature on individual work productivity (or employee productivity).

## **2.2 Employee Productivity Literature Review**

The purpose of this section is to clarify the context of employee productivity in this research by first providing an outline of the different views of productivity. Employee productivity in IS literature is then explored before it is investigated within the context of ICT connectivity. It is important to note that the notion of employee productivity was later changed to individual work productivity during the qualitative phase of this research. Thus, the terms employee productivity and individual work productivity refer to the same concept in this chapter.

### **2.2.1 Overview of productivity**

In its simplest form, productivity is an output to input ratio (Campbell & Campbell, 1988; Ruch, 1982). This notion dates back to the use of the spinning wheel in labour work in the 11th century when machinery made people more efficient (Pacey, 1991). Further improvements in work productivity occurred

during the Industrial Revolution as the use of machinery in manufacturing replaced the manual and hand-crafted workforce. Consequently, outputs were produced with fewer resources consumed – therefore increasing productivity (Antras & Voth, 2003).

There are different threads of research that focus on productivity, each taking a different perspective (Brynjolfsson & Hitt, 1998; Burton-Jones & Volkoff, n.d; Dewan & Kraemer, 1998; Gupta, 1994; Hitt & Brynjolfsson, 1996; Sink, Tuttle & DeVries, 1984). This section will consider macro-, organisational- and micro-levels of productivity.

From a macro-level (also called country level) productivity is concerned with the economy's financial capital (Melville, Kraemer & Gurbaxani, 2004). For example the New Zealand Productivity Commission is interested in creating more capital from available resources. Their aim is to seek the right combination of resources such as raw material, labour and skills to produce goods and services. The macro view asserts that with the right choices, higher production, value and incomes can be achieved for every hour worked, and as a result would lead to a stronger economy (NZPC, 2012).

At the organisational-level, productivity is concerned with organising the workplace in ways that could maximise efficiency. This stems from the notion of *Taylorism*, which was initiated in the late 19th century by Frederick Taylor (Taylor, 1947). He studied the productivity of workers in manufacturing by precisely timing movements within factories.

The notion of Taylorism led to an increase in organisational productivity and since has been applied in many firms across the globe (Kanigel, 2005). Taylor's work led to further development of theories on organisational productivity such as Principles of Management by Henri Fayol and Principles of Coordination by Mary Parker Follett (Shockley-Zalabak, 1999). For productivity at the organisational level, managers, business owners and Chief Executive Officers (CEOs) focus on utilising the right resources for the best outcome – usually financial profits (Campbell & Campbell, 1988).

Lastly, at the micro-level, productivity can be viewed from the individual's perspective. People make personal choices every day about what to do and how to do it to satisfy their needs and wants. That process of maximising individual achievement is the essence of productivity in this case (Campbell & Campbell, 1988; NZPC, 2012).

The above discussion showed that the level in which productivity is being viewed plays an important role in how it is defined. Moreover, productivity can be assessed from different aspects.

Moore and Ross (1978) suggest that productivity can be separated into two aspects: performance and financial. They posit that performance productivity is concerned with the number of outputs produced, while financial productivity is based on the monetary value of outputs.

Financial productivity is common in research assessing country and organisational productivity as demonstrated in studies by Dewan and Kraemer (2000), Aubert and Reich (2009), Brynjolfsson and Hitt (1996, 2000, 2003) and Kempfala and Lonnqvist (2003). These studies assess the monetary value of total outputs to measure the productivity of an economy or organisation.

On the other hand, performance productivity is shown through work by Tarafdar et al., (2007), Torkzadeh and Doll (1999), Vuolle, Tiainen, Kallio, Vainio, Kulju and Wigelius (2008) and Yun, Kettinger and Lee (2012). They rely solely on the quantities of outputs (work tasks) performed.

There are studies that have assessed both financial and performance productivity, such as work by Aral, Brynjolfsson and Van Alstyne (2007), Bulkley (2006) and Bulkley and Van Alstyne (2007). For instance, some studies have determined employee productivity based on the total monetary value of contracts won or the total hours against value of inputs (Aral et al., 2007; Panko, 1991). Bulkley and Van Alstyne (2007) focus on both financial and performance type studies where they take into account both financial data and self-reports to determine employee productivity.



From the previously discussed views on productivity, it makes sense to conclude that the notion is seen as an essential indicator of overall performance, regardless of the level it is analysed at and the aspect that it is assessed from (Hitt & Brynjolfsson, 1996; Kempplila & Lonnqvist, 2003; Panko, 1991; Sink, et al. 1984).

This research was interested in the performance (non-financial) productivity of employees, meaning that it focused on the number of outcomes rather than their financial value. Assessing productivity from a financial perspective can give more accurate results but it usually requires access to organisational data that is sensitive and confidential (Bulkley & Van Alstyne, 2007; Hitt & Brynjolfsson, 1996). This restriction encouraged this study to assess productivity from a performance aspect. Assessing productivity from a performance perspective has been successfully used in previous research on individual productivity (Tarafdar et al., 2007; Torkzadeh & Doll, 1999), Vuolle et al., 2008; Yun et al., 2012).

Further, this research focused on productivity at the individual level because the topic investigated the effect of ICT connectivity on employees. There were several motives behind assessing productivity at the micro-, or individual, level.

Firstly, from an overarching view, “higher productivity leads to a better-performing economy, which generates higher average incomes, greater opportunities for people and improved wellbeing” (NZPC, 2012). This makes productivity in general a significant phenomenon to investigate. Individual productivity in particular is critical to assess as it contributes to the organisational, and in the latter, country level productivity (Campbell & Campbell, 1988). Assessing individual productivity provides the researcher access to the first-hand effects of ICTs (Gebauer & Shaw, 2004; Karr-Wisniewski & Lu, 2010; Tarafdar et al., 2007).

Secondly, research by Perlow and Porter (2009), Perlow (2012) and Coker (2011) has shown a great deal of interest on the effect of ICTs on employee productivity. These studies indicated an interest in the effect of ICTs at the individual level.

Thirdly, IS research encourages future studies at the individual level to assess whether ICTs make work easier for employees or demands longer work hours,

which may lead to burnout and low productivity in the long run (Derks & Bakker, 2010; Mazmanian et al., 2006).

Collectively, the points mentioned above encouraged analysing employee productivity at the individual level. The following section explores individual level productivity within the context of IS research.

### ***2.2.2 Individual level productivity in IS literature***

Employee productivity is a significant component of organisational success that is often used as one of the main success factors of technology adoption in the workplace (Francalanci & Galal, 1998; Hitt & Brynjolfsson, 1996). In IS literature, employee productivity is sometimes referred to as individual impact (Igbaria & Tan, 1997) or personal productivity (Davis, Naumann & Allen, 1999).

Employee productivity is a loosely defined factor due to the nature of the role of employees in the workplace. Primarily, the nature of roles in the manufacturing industry made productivity easy to assess. However, workplace environments consist of many more intangible inputs and outputs such as information and knowledge, which consequently make productivity more challenging to capture and assess (Drucker, 1999; Karr-Wisniewski & Lu, 2010; Locke, 2005; Ramirez & Nembhard, 2004; Vuolle et al., 2008).

This section discusses the interpretation of employee productivity in IS literature. These are summarised in Appendix A.

It is common for research on employee productivity to be associated with efficiency and/or effectiveness (Gebauer, Shaw & Gribbins, 2004; Locke, 2005; Panko, 1991; Straub & Karahanna, 1998). The nature of ICTs such as wireless handheld devices can lead to an increase in efficiency by reducing idle time and quick access with their anytime-anywhere functionality, raising employee productivity (Gebauer et al., 2004; Locke, 2005).

Davis et al., (1999) suggest that employee productivity means a change in work efficiency, effectiveness and better control and use of time. Gorgone, Davis, Valacich, Topi, Feinstein and Longenecker (2003) reiterate this by stating that productivity is determined by the efficiency and effectiveness of employees' work

tasks through the use of technology. Thus, in IS research efficiency and effectiveness play an important role in determining employee productivity.

Historically, these measures of efficiency and effectiveness have been used in studies across different contexts. For example, Scudder and Kucic (1991) suggest that productivity is a measurement of the resources consumed in producing a given application in a timely manner (efficiency) and the quality of the finished product and its appropriateness to the problem (effectiveness). They apply this to the context of software development and point out that measuring the number of lines of code and the effectiveness of the executed algorithm against its requirements is a common way of determining the productivity of software developers. These requirements are often pre-set criteria developed by the organisation (Mitra, Sambamurthy & Westerman, 2011).

Locke (2005) and Straub and Karahanna (1998) similarly assess employee performance while focusing on task completion (effectiveness) against time (efficiency) to reflect employee productivity. So, although the context changes, the underlying concept of effectiveness and efficiency continues to be used to reflect employee productivity.

In the software development example above, productivity reflects objective outputs (lines of code) against time. However, there are cases where output cannot be produced in a tangible form. For instance, general business tasks can be split into two concepts: non-routine and interdependent (Gebauer, Shaw, & Subramanyam, 2007). A non-routine task is dependent on the structure, repetitiveness and novelty of a task (Simon, 1960). Intuition and judgement tend to play a big role in non-routine tasks. On the other hand, task interdependence suggests that a task is related to other tasks or contributions from other colleagues, and therefore requires coordination (Fry & Slocum, 1984). An interdependent task might require employees to interact in order to fulfil the requirements, whereas tasks with low interdependence (e.g. telemarketing) can be individually carried out by an employee (Gebauer et al., 2004). These types of tasks make it difficult to attribute the outputs generated.

In cases such as the ones above, perceptual self-reports (subjective estimation) are used to determine the productivity of employees. For example, Igarria and

Tan (1997) measured employee impact by perceived performance impacts since objective measures in that context were unavailable.

Similarly, Tarafdar et al. (2007) explored the impact of technostress on employees by asking participants to report on their productivity by ranking their perception on technology and its ability to help improve the quality of work, improve productivity, accomplish more work than would otherwise be possible, and perform the job better. In such instances, productivity was not necessarily an objective assessment, yet it was indicated by a perceptual measure of outputs generated against specified goals within a set timeframe. In their study on the perceived impact of mobile services on mobile work productivity, Vuolle et al. (2008) precisely defined employee productivity. The authors explained mobile work productivity as a measure that can be calculated by dividing the quantities of outputs (the work tasks performed) by the quantities of inputs used (i.e. the number of working hours). From this, the higher the ratio, the more productive the employee was. The authors developed a survey to capture perceptual measures of productivity made by employees.

Similarly, in their study on the effect of instant messaging on employee productivity, Rennecker and Godwin (2003) adopted “a very generic definition of productivity: the work accomplished in a given time period with a given set of resources” (pg. 143).

In addition to assessing the input of effort (time) accumulated in performing the tasks, Rennecker and Godwin (2003) suggested considering the resources used in the process. This way, an employee with X tasks accomplished in Y days and Z resources would be more productive than an employee with X tasks accomplished in Y days and Z+1 resources.

Regardless of the context or type of output being measured, productivity induced by the use of ICTs is naturally guided by the traditional definition of inputs and outputs (Rennecker & Godwin, 2003; Scudder & Kucic, 1991; Vuolle et al., 2008). Inputs usually refer to time while outputs are mostly the number of tasks accomplished. Due to the variety of workplace tasks, the ratio of outputs to inputs is often indicated by perceptual measures (Igarria & Tan, 1997; Ramirez & Nembhard, 2004; Tarafdar et al., 2007). Perceptual measures have been found to

be a reasonable method to capture employee productivity in this context (Kemppila & Lonnqvist, 2003; Vuolle et al., 2008).

The following section puts employee productivity into the context of this research and considers the effect of ICT connectivity on employee productivity.

### ***2.2.3 The effect of ICT connectivity on employee productivity***

The empirical studies discussed in this section show the effect of ICT connectivity on employee productivity through perceptual measures. It is important to note that an individual's perception of their productivity may not be seen as productive by others in the workplace, or vice versa. Additionally, certain behaviour can be counterproductive – that is, while it makes the user productive it can make others unproductive or vice versa. This research focused solely on the user's perceived productivity assessed by him- or herself.

One of the main reasons often cited for ICT-deployment in organisations is to increase employee communication efficiency and enhance productivity (Jarvenpaa & Lang, 2005). Previously, this chapter explained how the use of ICTs in the workplace has enabled employees to be more productive due to increased connectivity (pg. 24). However, the following studies illustrate how such ICT connectivity can hinder positive effects on individuals' work productivity.

The increase in reach gained by the use of ICTs sets the expectation for employees to respond to emails and calls more quickly than before they had ICTs (Harmon & Mazmanian, 2013; Mazmanian et al., 2006; Mazmanian, 2013; Mazmanian et al., 2013; Rose, 2013). Consequently this connectivity adds to employees' workloads, which then can interrupt employee focus and delay work practices (Coursaris et al., 2007; Jarvenpaa & Lang, 2005). Having a high degree of ICT connectivity can also mean employees have information within easy reach. While this can imply employees are more efficient with decision making, it can also reduce decision-making abilities due to the information overload from an over reliance on technology (Karr-Wisniewski & Lu, 2010).

White and Dorman (2000) stated that information overload can in fact lead to a reduction in productivity. Similarly, Chan (2001) suggests technology can create information much faster than people can process it. This means that people find themselves unable to cope with an increasing amount of information and therefore a reduction in productivity occurs. This stems from the Cognitive Load Theory (CLT) which suggests that an individual performs well only when his/her working memory is minimal (Sweller, 1988).

Similar results were found in a study by Karr-Wisniewski and Lu (2010) where the phenomenon of “technology overload” illustrated that excessive use of technology can begin to crowd out individual productivity instead of enhancing it. Technology overload is influenced by the Law of Diminishing Returns (from economics), which posits that when there is an excessive amount of resource, inefficiency will start to take place. Likewise, Karr-Wisniewski and Lu (2010) suggest that overload of technology (including technology features, communication and information) will lead to lower individual productivity.

Excessive connectivity can also lead to interruptions, which can cause a decline in productivity (Carr & Lu, 2007; Rennecker & Godwin, 2005). This is illustrated by Karr-Wisniewski and Lu (2010), who explain that such interruptions stem from Human Interruption Theory (HIT) which draws from Yekres-Doson Law – when a certain level of arousal is reached, performance starts to decline. Similarly in this context, when a certain amount of interruptions take place, productivity starts to decline.

Another consequence of ICT connectivity is that employees have admitted to an increase in engagement with ICTs but disengagement from reality (Mazmanian et al., 2006). Gergen (2002) described this as the concept of *absence presence*. This is illustrated when employees take their laptops into meetings and withdraw themselves from the workplace to engage into a world of electronically-mediated communication, and hence they become *absent but present*. The negative impact of this is that employee focus is interrupted, affecting employees’ levels of productivity (Mazmanian et al., 2006).

Additionally, employees find that the use of smartphones makes it hard for them to disengage from work in general, which in turn makes it difficult for the work

day to end (Mazmanian et al., 2006). In such cases, the use of smartphones could lead to more work done and consequently increased productivity. However, this increase in productivity is often achieved at the cost of inefficiency, lower employee satisfaction and higher stress levels, which in the long run can lead to impaired performance (Anandarajan et al., 2000; Derks & Bakker, 2010). Generally, stressed employees tend to have lower productivity (Ayyagari et al., 2011; Tarafdar et al., 2007).

The following section discusses topics relevant to the concept of individual control, which is a factor that could reduce the negative effects of ICTs discussed in this section.

### **2.3 Individual Control Literature Review**

This section explores the notion of individual control in the IS and Communications literature. It is important to note that this research initially referred to this concept as individual control but later re-named it to ICT self-discipline during the quantitative phase of this research. Thus, the terms individual-control, self-control or personal-control mentioned in this section translates to the notion of ICT self-discipline in the later chapters.

Since the notion of individual control in the context of ICT connectivity was relatively new, the literature review of the phenomenon was limited to the small amount of existing, relevant literature in IS and Communications.

As described in chapter one, individual control in this research was influenced by the work of Rennecker and Godwin (2005) on individual control. The authors drew from prior research and suggested that there were several factors that influenced how employees dealt with workflows through ICTs. They argued that while communication technologies had the intention to improve work organisations by reducing communication delays, they unintentionally contributed to increased work interruptions. These consequences impacted how employees controlled their organisation of work (i.e. managing information flow through ICTs).

To better understand the effect of ICT connectivity on individual work productivity it was essential for this research to further investigate the influence of individual control in this context.

Derks and Bakker (2010) suggested that because of the way employees govern the use of ICTs it would be interesting to empirically test the influence of the experience of *personal control* in this context. Allen and Shoard (2005) found that employees chose to have the smartphone as a facilitator of the intrusion of work into personal lives in return for higher personal productivity. This illustrated how the choice made by the employee can consequently impact their productivity.

The choices made by employees on how to manage ICTs has resulted in an increase in autonomy by giving employees the flexibility of how and when to communicate (Mazmanian et al., 2006). However, while this individual control gives employees autonomy, it can also encourage a compulsive checking of email and inability to disengage from work. The constant monitoring of emails can actually reduce employee productivity (Mazmanian et al., 2006; Renaud et al., 2006). Thus, employee attentiveness towards ICTs could influence the consequences faced.

Employee responsiveness through ICTs can also explain another aspect of individual control. For instance, Mazmanian et al. (2006) grouped message responding behaviours of employees into two categories, constant responders and batch responders. Constant responders are individuals who respond to emails straight away, as soon as they are received. Batch responders are individuals who delay their responses to some later time when a number of email messages have accumulated or when they return back at their desktop or laptop computers (Mazmanian et al., 2006). Employees' level of responsiveness can alter their ICT connectivity and consequently impact their productivity (Rennecker & Godwin, 2005).

Ballard and Ramgolam (2011) proposed that time and space play a role in the presence and absence of employees. Time and space can define the strategies that



employees may implement on how to control the use of ICTs. Ballard and Ramgolam (2011) built on previous research and suggested four types of availability amongst employees which they referred to as genre repertoires:

- connecting: employee who provide high availability to their colleagues both with time (i.e. instant response) and space (i.e. geographically present),
- commuting: employees available in time but not geographically,
- separating: employees who are physically/geographically available but choose to delay their responses (also known as the closed-door effect), and
- screening: employees who choose to avoid contact by being neither available geographically nor responsive, suggesting that employees would prefer to direct all calls to voicemail.

Ballard and Ramgolam (2011) suggested that employee management of ICT-mediated information exchanges will depend on what type of availability an employee chose to offer to their colleagues. Consequently, these strategies will either allow for ICTs to interrupt employees or not and can influence the effect of ICT connectivity on employee productivity (Rennecker & Godwin, 2005).

In support of the notion of individual control, Shirky (2008) argues that it is not the technology but the *individual* that is responsible for information overload. Shirky suggested that if individuals can learn to filter the incoming exchanges then interruptions will be reduced. This is similar to what some researchers refer to as personal management strategies (Dabbish & Kraut, 2006; Dabbish, Kraut, Fussell & Kiesler, 2005; Malone, Grant, Turbank, Brobst & Cohen, 1987).

There are different strategies that individuals have in place to manage ICTs. Organisational research suggests that individuals use filtering mechanisms, response mechanisms (whether or not to respond to incoming exchanges) and technology applications to organise their work. These strategies are often performed by employees who are conscientious, organised and are well-disciplined with work (Dabbish & Kraut, 2006; Malone et al., 1987; Mazmanian, 2013; Mazmanian et al., 2013; Perlow, 2012). Further, research shows that individuals' behaviours towards technology use can stem from obsessive and

compulsive behaviours and addiction such as the need to continuously check or use ICTs, even when not needed (Mazmanian et al., 2006; Towers et al., 2006).

Further emphasizing the points mentioned above, Leung (2011) suggested that ICT connectivity was not the main issue for assessing the consequences associated with ICTs. Rather, control over what passes through the boundaries shapes the consequences people experience. Leung (2011) stated that incorporating measures of such control over how ICTs are used might be a fruitful direction for future research.

Derks and Bakker (2010) also suggested that it would be interesting to empirically test the influence of the experience of individual control on ICT use. Wajcman et al. (2010) similarly encouraged further investigation on how people manage their time and productivity within an ICT dominated environment.

It is important to note that there are certain factors that can influence the way employees controlled the use of ICTs. For instance the role (i.e. manager or administrator) of the employee may influence how responsive they are (Rennecker & Godwin, 2005).

The sense of affinity between employees (i.e. colleague or friend) may also have influence on the reaction of the responder (Rennecker & Godwin, 2005). Further, the expected reciprocity between employees can also moderate how employees interact through ICTs. This is influenced by Gouldner's theory (1960) which suggests that individuals would respond to a request for information based on the belief that he or she will benefit from the action in the future.

The culture of the organisation the employee worked in also appeared to have influence on how an employee controls his or her workflow through the use of ICTs (Markus, 1983; Orlikowski, 2008).

The organisational encouragement and support for using ICTs at work has also previously been seen to influence an employee's frequency of ICT use (Anandarajan, et al., 2000; Ou & Davison, 2011).

Thus, certain contextual factors may influence the way individuals control their work through ICTs. These factors can be classified into two groups – external and internal factors. For instance, factors such as organisational support are beyond employees’ control and are therefore external, whereas, relationships amongst employees’ control may be considered an internal factor, or, within an employee’s control.

This section explained the concept of individual control in the literature and described its effect on employees in the workplace. Individual control emerged as a new notion of how employees managed their information exchanges through ICTs. Researchers suggested further examination of individual control within the context of ICTs, hence why there was limited literature to review on the concept. The key themes from the literature review are what motivated this research to investigate the role of individual control on the effect between ICT connectivity and individual work productivity.

The following section consolidates the themes from the review of literature previously discussed and it presents the conceptual research model.

## **2.4 Conceptual Research Model**

This section brings together the three previous topics discussed and explains the conceptual model for this research.

“Concepts are the building blocks of all thinking” (Jaccard & Jacoby, 2010, pg. 11). A researcher synthesises ideas to build a basic understanding of the world or a particular phenomenon. Such concepts are generally illustrated in a model. Models are simplified representations of phenomena (the existence of things) reflecting key features of the world important to a researcher. Models are made up of constructs that are representations of a group of things as opposed to a particular attribute of a specific thing (Weber, 2012). Propositions are what represent the associations between these constructs. Many associations could occur, however not every one is represented in a model as researchers decide on which associations to include and which to eliminate based on their views (Weber, 2012).

The literature on IS and Communications was analysed to identify theories that can act as a foundation for this study. Little was found that accurately reflected or explained the combination of key concepts discussed previously. This may be the reason why researchers have called for further investigation on the topic of individual control in the context of ICT connectivity as well as employee productivity (Derks & Bakker, 2010; Leung, 2011; Mazmanian et al., 2006; Rennecker & Godwin, 2005; Wajcman et al., 2010).

Theories from the IS and Communications disciplines have investigated the impacts of ICTs, however, they have not assessed the concept of ICT connectivity that occurs in the workplace nor have they consolidated individual control in this context (Table 2-1).

Table 2-1. IS Theories Related to this Research

Theory	Key focus	Dependent variable(s)
Media Richness Theory (Daft & Lengel, 1986)	Certain media work better for certain tasks.	Communication effectiveness.
Task-Technology Fit (Goodhue, 1995)	The capability of technology to align with the task needs.	Individual performance and system utilization.
Media Synchronicity Theory (Dennis et al., 2008)	The capability of technology to support communication synchronicity.	Communication performance.

Theories relevant for this research included the Media Richness Theory by Daft & Lengel (1986), which is concerned with matching mode of communication with the equivocality of the message. Task-Technology Fit (TTF) by Goodhue (1995), which focuses on matching the task with the technology capabilities. Further, the Media Synchronicity Theory (MST) by Dennis et al. (2008) is concerned with matching the required synchronicity of the communication process with the medium's synchronicity capabilities.

The theories mentioned above are generally concerned with the effectiveness of the technology itself. Instead, the focus of this research was concerned with the effectiveness of the individual's behaviour by managing the communication through the technologies used. Further, this research was concerned with productivity at the individual level, however, the MRT and MST both assessed the effectiveness of communication as opposed to the individual's performance. Moreover, MRT, MST and TTF seem to be more concerned with the alignment or

fit of the communication medium for the task at hand. Instead, this research focused on the employee's ability to regulate such behaviour.

It seemed that further investigation on the concepts of this research was necessary prior to incorporating existing theories into the research model.

Because of the relatively new phenomena of ICT connectivity and individual control, this research presented a conceptualisation of the phenomena to begin with. Key themes from the literature review were used for the development of the conceptual research model (Figure 2-1).

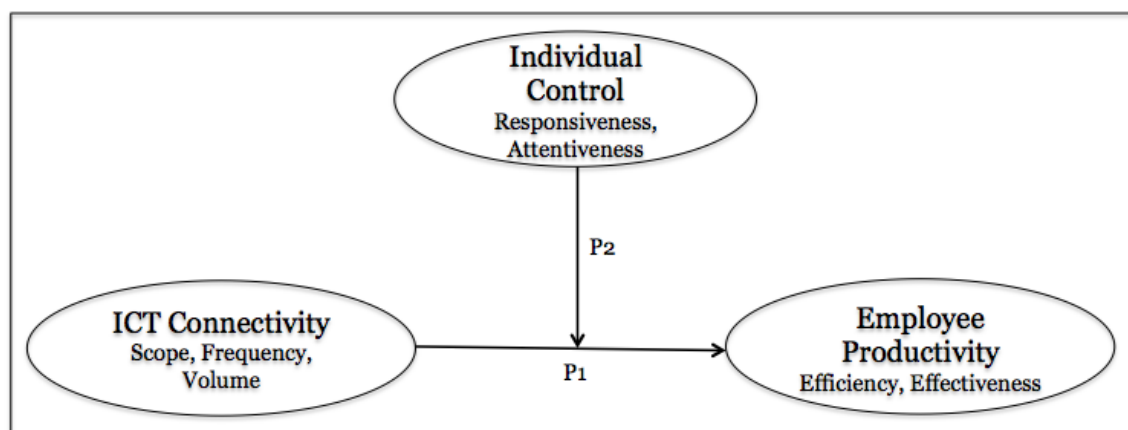


Figure 2-1. Conceptual Research Model

The conceptual research model derived from reviewing the available literature on the topic of investigation. The model consisted of three constructs: ICT connectivity, employee productivity and individual control. The model indicated that ICT connectivity influenced employee productivity. The candidate relationships also posited that individual control may have an influence on the effect between ICT connectivity and employee productivity. This model acted as a point of reference for upcoming data gathering phases to address the research questions RQ1 and RQ2 and contribute to IS theory, literature and practice.

The sections to follow will explain the development of this model by further describing the research constructs and propositions.

### **2.4.1 ICT connectivity**

This chapter previously highlighted the extensive adoption of ICTs in the workplace and how through their use employees can have more access and reach to information and people, thus increasing their level of connectivity. While influenced by definitions in the literature review in chapter two, in this research ICT connectivity was defined as *the extent to which an individual is connected to sources of information through ICTs*.

As an initial attempt, this research adopted some components from Leung's ICTCI (2011) to assist with capturing individuals' levels of ICT connectivity. This was the only existing set of items that reliably captured ICT connectivity. This research also considered the key themes that emerged in the literature review on ICT connectivity to identify other components related to this phenomenon. As a result, the components reflecting ICT connectivity in this research included scope, frequency and volume.

In the conceptual research model, scope referred to the number of ICT-mediated streams an employee used for information exchange. In the ICTCI by Leung (2011) scope reflected the range of online applications used. Research on the connected workplace suggested investigating a wider set of ICTs to cover a more complete set of information streams (Derks & Bakker, 2010; Leung, 2011; Schroeder, 2010). Research on ICTs also suggested that the underlying technological capabilities be examined instead of considering a device on its own to ensure overlapping technology functionalities are addressed (Dennis et al., 2008; Richardson & Benbunan-Fich, 2011). Therefore, scope of ICTs in this research included information streams through devices, the Internet, telephony and online applications to gain a more complete view of ICT connectivity.

Some of the ICTCI components by Leung (2011) previously discussed in this chapter were not adopted into the conceptual research model, as they did not assist in explaining to what extent an individual was connected to ICTs within the context of this study. These included the intensity, centrality and goal of ICTs and the breadth of ICTs at home.

Intensity was used in the ICTCI to gauge the time spent using ICTs to complete activities. The time spent using ICTs did not seem to be an accurate way of capturing connectivity because there could have been other factors influencing this, such as the complexity of the message sent or received. In this case this component would provide an incomplete picture of ICT connectivity. Additionally, the volume and frequency of communication through ICTs was going to be captured through ICT connectivity in the conceptual research model (discussed later in this section). Therefore, it seemed redundant to capture the time spent using ICTs. For this reason, the intensity component of the ICTCI by Leung (2011) was not adopted.

The centrality and goal of ICTs in the ICTCI captured the extent to which individuals would miss technologies if they disappeared and the range of personal goals a person sought to meet through the Internet. The centrality of ICTs seemed to be more concerned with emotional connectivity (Ijsselsteijn et al., 2003; Rettie, 2003). This was outside the context of ICT connectivity in this research and was not included. Further, there seemed to be no need for the goal of ICTs to be captured because the context of this research already defined the goal to be work-related use of ICTs. Therefore, it seemed redundant to adopt this component of the ICTCI.

Adopting the breadth of ICTs at home from the ICTCI would limit the assessment of other contexts in which work would be performed. This study addressed connectivity in all contexts not just at home because employees may perform work related tasks from various locations such as home, the workplace, and in between meetings (Ballard & Ramgolam, 2011; Richardson & Benbunan-Fich, 2011; Wajcman et al., 2010). Therefore, this component was not adopted in this research as it was too narrow in context.

The ICTCI components above were carefully considered before the decision was made to include or exclude each one. Deciding to not adopt certain ICTCI components did not imply their lack of importance. To the contrary, all the ICTCI components were viewed as potentially important contributors, however, some were not adopted because they were found to be outside the research domain.

Frequency in the conceptual research model was understood as the number of information exchanges over a unit of time. An example of this might be an employee receiving 15 emails and sending four emails within one hour. This would indicate the multitude of information flow through ICTs. Renaud et al.'s study (2006) on the use of email showed a vast difference between the frequency of perceived usage and actual usage of ICTs. Thus, it seemed that frequency would provide an accurate and meaningful reflection of an employee's level of ICT connectivity and was considered for this construct.

Volume was defined as the total amount of information exchanged over a unit of time. Kobler et al. (2010) found that being connected seemed to be the result of active information sharing modulated by the amount of information shared. An example of this might be the number of emails sent or received. This highlighted the need to indicate the magnitude of information exchanged (incoming and outgoing) to reflect an employee's level of ICT connectivity. Therefore volume seemed to provide another accurate and meaningful reflection of an employee's connectivity and was viewed as an important component of this construct.

Although Loges and Jung (2001) and Jung et al. (2001) argued that connectivity is not captured or described adequately by traditional use measures, investigating the scope, frequency and volume of ICTs has exposed key patterns in research such as the constant checking of emails, the role of ICTs in facilitating the overlap of work/personal life and the impact of ICTs on employee productivity (Chen & Karahanna, 2011; Renaud et al., 2006; Venkatesh et al., 2010; Wajcman et al., 2010). Thus, jointly, these three components were seen to provide an accurate and detailed view of ICT connectivity that can meaningfully be compared across employees, and therefore were the most appropriate set to include and begin with in this research.

Reviewing the literature confirmed that exploring employee interaction with ICTs was a useful way to study the effect of ICTs on employee productivity (Gebauer & Ginsburg, 2009; Mazmanian et al., 2006; Skeels & Grudin, 2009). This chapter discussed several studies that examined the effect of ICT connectivity on employee productivity. Those studies showed that the consequences of ICTs could be both positive and negative for employees (Ayyagari et al., 2011; Coursaris et



al., 2007; Jarvenpaa & Lang, 2005; Karr-Wisniewski & Lu, 2010; Huarng, 2001; Leung, 2011; Maslach et al., 2001; Maudgalya et al., 2006; Mazmanian et al., 2006; Tarafdar, et al., 2007; Venkatesh et al., 2010). These key themes suggested an effect between ICT connectivity and employee productivity. Thus, the first proposition of the conceptual research model was:

**P1:** *ICT connectivity has an influence on employee productivity.*

This proposition did not have directionality because both positive and negative effects have been found in literature (Allen & Shoard, 2005; Chen & Karahanna, 2011; Leung, 2011; Mazmanian et al., 2006). Testing this proposition would address the first research question RQ1.

#### **2.4.2 Employee productivity**

This chapter summarised some definitions of employee productivity in IS literature. This research considered the definitions concerned with subjective or perceptual evaluations of employee productivity because of the variety of tasks and outputs generated in the workplace. Thus, derived from literature, employee productivity in this research was defined as *the work accomplished over a unit of time with a given set of resources* (Rennecker & Godwin, 2003). This definition indicated the inputs and outputs required to capture productivity accordingly.

To reflect employee productivity, this study incorporated both the efficiency and effectiveness of employees in the context of using ICTs to exchange information.

Efficiency is a key component of employee productivity that explains the ratio of inputs to outputs (Gebauer & Shaw, 2004; Karr-Wisniewski & Lu, 2010; Tarafdar et al., 2007; Vuolle et al., 2008). In the conceptual model, efficiency indicated the accomplishment of tasks over a unit of time. Previous research demonstrated that efficiency was a key component of productivity to explain the throughput gained in the course of using ICTs (e.g. Davis et al., 1999; Panko, 1991; Straub and Karahanna, 1998).

In this research it was assumed that ICTs were deployed in the workplace to assist in the accomplishment of work related tasks including the two general business task components of non-routine and interdependent (Gebauer et al., 2007). Due

to the nature of such tasks, employee productivity was viewed as a perceptual representation of an employee's work accomplished.

Effectiveness was assessed to ensure tasks accomplished met their pre-set criteria (Gorgone et al., 2003; Igabria & Tan, 1997; Locke, 2005; Mitra et al., 2011). Thus, effectiveness was defined as a comparison of the work completed against pre-set criteria. The review of literature on productivity showed that while ICTs can make employees more productive they can also reduce the amount of accomplished work. Therefore, effectiveness was considered in this research to ensure employees' tasks mediated by ICTs met their pre-set criteria. These might include key project indicators or business objectives defined by the organisation and can vary from setting to setting (Mitra et al., 2011).

There was evidence in the review of literature on productivity that the combination of efficiency and effectiveness provided the foundations for employee productivity (Davis, 2002; Gebauer & Shaw, 2004; Gorgone et al., 2003; Scudder & Kucic, 1992). Efficiency indicated the ratio of tasks performed per unit of time and effectiveness ensured the tasks successfully meet the pre-set criteria. Assessing both components would provide more detail in cases where employees generate a large set of tasks but not meet pre-set criteria, or a small set of tasks but meet pre-set criteria. Thus, together efficiency and effectiveness provided a precise measure and best reflected employee productivity for the context of this research.

### **2.4.3 Individual control**

Individual control was considered an important phenomenon to further explore as it could change the consequences ICTs have on employee productivity (Derks & Bakker, 2010; Leung, 2011; Mazmanian et al., 2006; Rennecker & Godwin, 2005; Wajcman et al., 2010). This chapter discussed the ways various levels of individual control could influence the effect of ICTs on employee productivity. While no particular definition of individual control was provided in the reviewed literature, this research defined it by synthesising key themes on this phenomenon. Based on the discussion in the previous sections, this research defined individual control as *the extent to which employees proactively manage ICT-mediated information streams with the goal of maximising productivity.*

Low levels of individual control could mean an employee chose to follow an unstructured approach to managing information flow. Higher levels could indicate an employee exercised a structured strategy.

Two components were used to reflect individual control in this research – attentiveness and responsiveness.

Attentiveness referred to how often an employee checked ICT-mediated streams for information exchange. Attentiveness had been widely explored in terms of the behaviour of constantly monitoring ICTs (Hooper & Zhou, 2007; Renaud et al., 2006; Steelman, Soror, Limayem & Worrell, 2012; Towers et al., 2006; Turel, Serenkoe & Giles, 2011; Walsh, White, Cox & Young, 2011; Walsh, White & Young, 2008).

Generally, employee communication through ICTs is often seen as excessive or constant (Mazmanian et al., 2006; Turel & Serenko, 2010). Mazmanian et al. (2006) suggested that while such behaviour is common in the workplace, it is the result of individual choice. Similarly, Renaud et al. (2006) highlighted that excessive monitoring of ICTs requires increased attention by the user. These contributions from the literature underlined the association between attentiveness and individual control, which made it a useful component of this construct.

Responsiveness in this research referred to how quickly an employee responded to ICT-mediated information exchange events. The concept of responsiveness in the research model was influenced by the notion that employees choose to respond to information flows differently as they are often bounded by certain factors such as organisational relationships, culture and/or support (Anandarajan et al., 2000; Ballard & Ramgolam, 2011; Mazmanian et al., 2006; Orlikowski, 2008; Ou & Davison, 2011; Rennecker & Godwin, 2005). For instance, an employee might choose not to respond to one event (such as email or a notification), to respond immediately to another or decide to reply at a later time to a different event (Renaud et al., 2006). This indicated the choices made to manage information exchange events through ICTs such as emails and notifications, therefore it was an important component of this construct.

The constant checking of ICTs (Ballard & Ramgolam, 2011; Chen & Karahanna, 2011; Mazmanian et al., 2006; Renaud et al., 2006) and the speed at which employees respond to information flow (Allen & Shoard, 2005; Rennecker & Godwin, 2005) have both been shown to have an impact on employee productivity. Both these components indicated choices employees made to manage the information flow through ICTs to maximise productivity, hence their importance for this construct.

The way employees chose to manage information flow through ICTs could influence the effect of ICT connectivity on employee productivity (Ballard & Ramgolam, 2011; Derks & Bakker, 2010; Mazmanian et al., 2006; Wajcman et al., 2010). Leung (2011) suggested that ICT connectivity may not be the main issue when assessing the consequences associated with ICTs, instead, control over the exchanges through ICTs moderates the consequences people experience. Rennecker and Godwin (2005) similarly noted that the consequences of communication technologies on employee productivity may vary depending on the decisions employees made on how to manage information flow. From these contributions, the second research proposition was derived:

**P2:** *individual control moderates the relationship between ICT connectivity and employee productivity.*

Testing this proposition would address the second research question RQ2 and address the gap identified in the literature on ICTs (Derks & Bakker, 2010; Leung, 2011; Mazmanian et al., 2006; Rennecker & Godwin, 2005; Wajcman et al., 2010).

The following section summarises the key points discussed in this chapter.

## **2.5 Chapter Summary**

The aim of this chapter was to discuss the empirical foundations of this study. The chapter introduced ICT connectivity by exploring the use of ICTs in the workplace. The notion of ICT connectivity was then explained from multiple aspects including emotional connectivity, embeddedness and reach. Employee productivity was then explained and reviewed in IS research. Later, the notion of individual control was introduced and seen to have potential impact on the effect

of ICT connectivity on employee productivity. A high-level research model was then presented to collectively illustrate the key themes that emerged in the review of literature. The conceptual research model constructs and relationships were thoroughly explained with reference to relevant literature and were defined according to the context of this research. The propositions derived were aimed to address the research questions RQ1 and RQ2 and contribute to IS theory, literature and practice.

The following chapter discusses the research design used to validate and test the conceptual research model in order to address the research questions RQ1 and RQ2.



## **3 Research Design**

The purpose of this chapter is to explain the research design. The chapter commences with a discussion that establishes the research paradigm. The research paradigm then guides the development of the research methodology. Lastly, the research design describes the strategy used to meet the research objectives RO1, RO2 and RO3 and to answer the research questions RQ1 and RQ2. The chapter outline is summarised below:

- 3.1 Research Paradigm
- 3.2 Research Methodology
- 3.3 Research Design
- 3.4 Chapter Summary

### **3.1 Research Paradigm**

A research paradigm is a framework that sets the beliefs about the world and how it should be understood and studied (Denzin & Lincoln, 2005). This section discusses four key elements that help build the foundations of a research paradigm. This includes the research ontology, epistemology, theoretical perspective and empiricism (Bryman, 2008; Crotty, 1998; Denzin & Lincoln, 2005). With these key elements, a researcher is able to frame the methodological approach for their study (Orlikowski & Baroudi, 1991).

The following sections describe how each of the key elements of research paradigm are applied in this research.

#### ***3.1.1 Research ontology and epistemology***

Ontological considerations specify the nature of social entities and answer the question of what is real. Reality can be viewed in two different ways – objectivism, viewing social entities in an objective manner, or constructionism, where perceptions of the world are internally constructed in our minds as opposed to existing independent of perception (Bryman, 2008; Jonassen, 1991).

The research ontology frames the research epistemology, which is concerned with the theory or nature of knowledge (Crotty, 1998). An objectivist epistemology holds that “reality exists...understandings and values are considered to be objectified in the people we are studying...we can *discover* the objective truth” (Crotty, 1998, pg. 8). On the other hand, a constructionist epistemology posits that “meaning comes into existence in and out of our engagement with the realities in our world...meaning is not discovered, but *constructed*...different people may construct meaning in different ways, even in relation to the same phenomenon” (Crotty, 1998, pg. 9).

Bryman (2008) compares these contrasting views on social entities and explains them within the context of social research. He uses the example of an organisation and culture. From an objectivist perspective, an organisation is a tangible object comprised of rules, regulations, procedures and people who carry out tasks to perform their jobs. The organisation puts pressure on individuals to conform to these requirements. The same is seen with culture.

From a constructionist point of view, an organisation is a phenomenon that is negotiated and is more of a set of general understandings. Culture is not viewed as external reality that people conform to, instead it is viewed as “an emergent reality in a continuous state of construction and reconstruction” (pg. 20).

Thus, based on the points above, although the same social entities are being explored (organisation and culture), the way they are viewed depends on the epistemological stance undertaken by the researcher.

Crotty (1998) articulates that “what would seem to be problematic is any attempt to be at once objectivist and constructionist...to avoid such discomfort, we will need to be consistently objectivist or constructionist [in a given research project]” (pg. 15).

Careful consideration of the research problem and the research phenomena took place to assist with outlining the ontological and epistemological views of this research. Because this research was concerned with measuring relationships



amongst research phenomena, it made sense to adopt an objectivist ontology to *discover* the objective truth as opposed to constructing it.

This research was concerned with investigating ICT connectivity, individual control and employee productivity in the context of the workplace. In this research, the phenomena were seen to be shaped by contextual factors such as workplace regulations, as opposed to being constructed and reconstructed by individual parties. Thus, the research phenomena were viewed as objective entities of reality. This objectivist epistemology is supported by evidence of an objectivist view towards the use of ICTs for work, as illustrated in prior related research (Kobler et al., 2010; Leung, 2011, Rennecker & Godwin, 2005; Torkzadeh & Doll, 1999).

### ***3.1.2 Research theoretical perspective***

The theoretical perspective is a philosophical stance that is important to consider in research because it informs the research methodology to address the research problem (Crotty, 1998). The three key theoretical views used in social science research are interpretivism, critical theory and positivism (Denzin & Lincoln, 2005; Klein & Myers, 1999; Weber, 2004).

Interpretivism is a way of understanding human behaviour and attempts to interpret subjective matters such as how and why humans think the way they do (Klein & Myers, 1999). Critical theory is concerned with changing society and critiques phenomena with the belief that a phenomenon is viewed differently in specific social groups (Denzin & Lincoln, 2005). Positivism is a theoretical perspective common in IS research and is a way of explaining human behaviour and generates hypotheses from previous literature to test and validate them through the gathering of facts conducted in a way that is objective (Weber, 2004).

An extended view of traditional positivism, post-positivism, originates from philosophers such as Comte, Mill, Durkheim, Newton and Locke (Smith, 1983). “Post-positivism has the effect of turning laws of physics into relative statements and to some degree into subjective perceptions rather than an expression of objective certainties” (Crotty, 1998, pg. 29). Post-positivism therefore provides a

more lenient perspective towards positivist and it acknowledges that reality exists based on human conjectures and not unchallengeable foundations. Further, Popper (1963) emphasizes that post-positivists acquire knowledge through logical reasoning and bold conjectures.

Creswell (2003) succinctly summarises the problems studied by post-positivists. Post-positivist research studies generally undertake the following views:

- there is a need to examine causes that influence outcomes,
- there is a need to reduce ideas into a small, discrete set of ideas to test,
- knowledge through post-positivist lens is based on careful observation and measurement of the objective reality that exists “out there”,
- there are laws or theories that govern the world, and these need to be tested or verified and refined so that we can understand the world.

This research took a post-positivist theoretical perspective because the nature of inquiry similarly aligned with the four views of post-positivist research identified above. First, there was a need to examine the cause of ICT connectivity on individual work productivity with taking into account the influence of individual control (Derks & Bakker, 2010; Leung, 2011; Mazmanian et al., 2006; Rennecker & Godwin, 2005; Wajcman et al., 2010). Thus, there was a need to examine causes that influence outcomes such as employee productivity.

Second, the study put forward three key research objectives:

RO1: to investigate the effect of ICT connectivity on individual work productivity,

RO2: to explore the phenomenon of ICT self-discipline within the use of ICTs,

RO3: to investigate the influence of ICT self-discipline on the relationship between ICT connectivity and individual work productivity.

Collectively, the research objectives required an initial investigation of ideas related to the research phenomena, which would then be reduced to a smaller, discrete set so that it could be tested.

Third, careful observation and measurement of the objective reality that exists “out there” was required to answer the two research questions in this research:

RQ1: to what extent does ICT connectivity affect individual work productivity?

RQ2: how does ICT self-discipline influence the effect of ICT connectivity on individual work productivity?

This aligns with the objective ontological and epistemological views of this research previously discussed in this chapter (pg. 55). In support of this, Crotty (1998) confirms that it is natural for post-positivist research to view reality from an objective perspective.

Fourth, in order to address the third research objective RO3, the study required the testing and verification of a model to ‘better understand the world’ (Handfield & Melnyk, 1998). Testing and verifying the conceptual research model would assist in better understanding the world.

Based on the justifications made above, it seemed clear that the nature of this research closely aligned with the views of post-positivist research. Therefore, this research adopted a post-positivist theoretical lens to assess the research phenomena.

In this research, the role of the researcher was to interpret the data objectively (Weber, 2004). Thus, it was necessary for the researcher to detach themselves from the research participants during data gathering. This was done by creating an emotional distance so that the researcher could make clear distinctions between reason and feeling (Carson, Gilmore, Perry & Gronhaug, 2001). It was acknowledged that it may be impossible to avoid the reflexivity of data interpretation in some cases. To address this, validation steps took place to

confirm the objectivity of results – these are presented in chapters four, five and six.

### **3.1.3 Research empiricism**

Empiricism is concerned with how knowledge is gained (Chisholm, 1948). Knowledge can be gathered in a deductive or inductive approach depending on how much knowledge already exists on the phenomena of interest (Denzin & Lincoln, 2005). “Deduction begins with an expected pattern that is tested against observations, whereas induction begins with observations and seeks to find a pattern within them” (Babbie, 2010, pg.52). In other words, a deductive approach to forming knowledge begins with a theory that is tested to provide findings. An inductive approach to forming knowledge begins with observation which then leads to theory development (Bryman, 2008). It is common for post-positivist social research to take both deductive and inductive knowledge-building processes (Bryman, 2008; Trochim, 2006).

In the case of this research, sufficient knowledge on the relationships between ICT connectivity, individual work productivity and individual control (ICT self-discipline) existed to deduce a conceptual model to guide the study. However, an inductive approach was also necessary to refine the proposed model to be able to form the hypotheses reflecting reality. In turn, a deductive approach to knowledge building seemed necessary to then allow for the hypotheses to be tested and to address the research problem. Thus, the empiricism of this research followed both inductive and deductive knowledge forming in order to answer research questions RQ1 and RQ2.

The previous sections discussed the ontology (objectivist reality), epistemology (objectivism), theoretical perspective (post-positivist) and empiricism (deductive and inductive) of this research. The following section considers these elements of research paradigm to guide the methodological choices made in this research.

## **3.2 Research Methodology**

Research methods “are at the basis of the production of knowledge in any given field” (Dubé & Paré, 2003, pg. 598). They are techniques used to gather and analyse data defined by a plan of action and should closely align with the research

goals (Creswell, 2003; Crotty, 1998). The purpose of this section is to first introduce some common methods of how knowledge is gained in IS research, then to identify the research methods used for this research.

### **3.2.1 Methodology in IS research**

There are three main approaches to carrying out research in IS: *quantitative*, *qualitative* and *mixed methods* (Denzin & Lincoln, 2005; Miles & Huberman, 1994, 2002).

Quantitative methods are typically concerned with testing and validating theory based on hypotheses generated from existing literature (Gefen & Straub, 2005; Punch, 2005). This approach is associated with pre-determined, objective measures which result in numeric data such as statistical figures. For instance, to seek a relationship between two constructs, quantitative methods are used to calculate the strength of the correlation between two variables used to operationalize the constructs (Gefen, Straub & Boudreau, 2000; Straub, Boudreau & Gefen, 2004). According to Creswell (2003), “if the problem is identifying the factors that influence an outcome, the utility of an intervention, or understanding the best predictors of outcomes, then a quantitative approach is best” (pg. 22). Usually, quantitative methods are conducted in post-positivist or positivist research (Crotty, 1998).

Qualitative methods are linked to theory building (Gregor, 2006; Miles & Huberman, 1994). They aim to gather a deep and rich understanding of human behaviour and the reasons behind them. This approach would be suitable for researchers investigating the way humans feel about a certain phenomenon (Myers & Newman, 2007). According to Creswell (2003), “if a concept or phenomenon needs to be understood because little research has been done on it, then it merits a qualitative approach” (pg. 22). Although qualitative research is often associated with interpretive (or constructionist) studies, there are positivist studies that use qualitative approaches to data gathering in order to address research problems (Aral et al., 2007; Ayyagari et al., 2011; Myers, 1997; Venkatesh, Brown & Bala, 2013). Thus, qualitative studies can be used in constructionist, post-positivist or positivist research.

The mixed methods approach to data gathering was established in the 1980s (Guest, 2013). The mixed methodology approach is a combination of both quantitative and qualitative methods that allows for the validation of findings (Johnson, Onwuegbuzie & Turner, 2007; Kaplan & Duchon, 1988; Mingers, 2001). This approach to knowledge building obtains a more complete picture of a phenomenon (Morse, 2003).

Mixed methods are applied in situations where the researcher has enough knowledge to build a candidate theory but not complete understanding to test the theory. Here, the “quantitative and qualitative components are reported together and, as a consequence, the insights gained from this integration may produce more than the sum of these two parts” (Molina-Azorin, 2011, pg. 9).

In some instances mixed methods are used in a sequential or simultaneous manner to best address the research goal(s). Mingers (2001) succinctly summarises the different types of mixed method designs:

- *sequential*: methods are employed in sequence with results from one feeding into the later one,
- *parallel*: methods are carried out in parallel with results feeding into each other,
- *dominant*: one method or methodology as the main approach with contribution(s) from the other(s),
- *multi-methodology*: a combination of methods, embodying different paradigms, developed specifically for the task,
- *multi-level*: research conducted simultaneously at different levels of an organization and using different methods.

In addition to the mixed method design, the order in which methods take place during mixed methods can vary. For instance, mixed methods can be *explanatory*, where the design starts with quantitative data to find significant (or non-significant) results and then follows up with qualitative data to further examine a particular concept. Mixed methods may also be *exploratory*, also known as the qualitative to quantitative method (Morse, 1991), where the design

“starts with qualitative data to explore a phenomenon, and then builds to a second, quantitative phase” (Creswell, 2006, pg. 77).

Having introduced the key methodologies in IS research, the following section identifies and explains the methodology undertaken in this research.

### ***3.2.2 Methodology in this research***

Good methodological fit is required to generate rigorous and convincing research (Edmondson & McManus, 2007). Thus, it is important to let the nature of inquiry (the research problem), the research ontology, epistemology and theoretical perspective inform the research methodology (Crotty, 1998; Guba & Lincoln, 1994). Crotty (1998) articulates that “we should accept that whatever research we engage in, it is possible for qualitative methods or quantitative methods, or both, to serve our purposes” (pg. 15).

To serve the purposes of this study, a mixed method strategy was implemented in this research (Johnson et al., 2007; Mingers, 2003). Justification for this is explained below.

A key aspect of this research, individual control (or ICT self-discipline), was embryonic. This meant that although sufficient knowledge existed to develop a conceptual research model, not enough knowledge existed to build a testable model.

Although prior work related to the research questions sat at the intermediate level (i.e. the effect of ICTs on employee productivity), using only a quantitative study meant the research would risk being exposed to unreliable measures of the phenomena collectively. Further, having only a qualitative study meant there would be less support for a new model to contribute (Edmondson & MacManus, 2007, pg.1107). According to Handfield and Melnyk (1998), such state of research phenomena sits at the relationship building stage of the theory-building process to seek relationships amongst constructs. A mixed methodology is commonly matched with this type of work (Handfield & Melnyk, 1998).

The points above suggested a mixed method approach for this research to ensure there was a convincing degree of support and evidence in the findings (Edmondson & MacManus, 2007; Handfield & Melnyk, 1998).

Moreover, post-positivist research typically involves a mixed method data gathering approach (Denzin & Lincoln, 2011). Given that this research took a post-positivist theoretical perspective to assess the research problem, it made sense to adopt a mixed method approach.

According to Creswell (2011), there is continuous debate on which research paradigms mixed methods should be used for. To sum up the debate, one view suggests that mixed methods should be supported by mixed theoretical perspectives, while another view suggests that having multiple theoretical perspectives makes the research incompatible. A third view suggests that mixed methods are underlined by pragmatism, which is a theoretical perspective concerned with actions, situations and consequences, as opposed to antecedents (as in post-positivism).

Creswell (2011) summarises these views by stating that regardless of the paradigm underlining mixed methods research, it is important to remember that research paradigms influence the kinds of knowledge researchers seek and how they interpret it. Thus, researchers should focus on the fit of the research problem, paradigm and methodology. This supported this research in adopting mixed methods for post-positivist research, given how well the method aligned with the research problem (as explained earlier).

A sequential mixed methods approach was undertaken for this study where results from each phase fed into the later one (Mingers, 2001). Particularly, an *exploratory* sequential mixed methods approach was undertaken, as the phenomena of interest required qualitative data first prior to being tested through a quantitative manner (Creswell, 2006) – this aligned with using both inductive and deductive empiricism expected for this study. This research was exploratory of nature because it investigated an idea in order to understand more about it. It



assessed the research phenomena from a new angle, using new theoretical perspectives and new ways to measure them.

In general, mixed methods have shown to help give credible results in studies investigating the effects of ICTs (Karr-Wisniewski & Lu, 2010; Renaud et al., 2006). A mixed methodological approach is encouraged to provide useful insights on various phenomena (Lee, 1991; Mingers, 2003; Scandura & Williams, 2000; Tashakkori & Teddlie, 2010; Venkatesh et al., 2013). For instance, results from initial data gathering methods facilitate upcoming methods of data gathering (Bryman, 2008). This way, mixed methods are used to give researchers the confidence that they are addressing the key issues and they allow researchers to mitigate undue bias.

The combination of qualitative and quantitative methods also allows for validation of findings and for the corroboration of results by comparing multiple sources of data (Kaplan & Duchon, 1988; Johnson et al., 2007; Mingers, 2001; Venkatesh et al., 2013). Given the benefits of mixed method research, it is not surprising that a leading IS journal (MISQ) called for further research that combines qualitative and quantitative assessment (Majchrzak et al., 2014).

The following section explains the research design of the mixed method approach undertaken in this research.

### **3.3 Research Design**

To answer the two research questions RQ1 and RQ2, this study used a three-phase, sequential exploratory mixed method data gathering strategy.

First, a qualitative phase (chapter four) took place to gain a better understanding of the conceptual research model proposed in chapter two. This was to meet the first and second research objectives RO1 and RO2. The findings were used to update the conceptual research model through an inductive approach of knowledge-building.

Second, a research model refinement phase (chapter five) took place to further confirm and validate the updated research model. This involved further

qualitative data gathering (inductive knowledge-building) to ensure the concepts under investigation were correctly defined and reflected in the research model (Johnson & Onwuegbuzie, 2004; Weber, 2012). The findings addressed research objectives RO1 and RO2 and updated the research model from the previous phase.

Third, the quantitative phase (chapter six) used findings from phases one and two collectively to define the constructs and underpin their measures. A deductive approach to knowledge-building was used to develop, test and validate the research model. This helped meet the third research objective RO3.

The combination of qualitative and quantitative methods allowed for triangulation and ensured a more complete picture of the phenomena was obtained (Kaplan & Duchon, 1988; Mingers, 2001; Venkatesh et al., 2013). The results from all three phases were used collectively to interpret the research findings. This is a common method in post-positivist, mixed method research (Creswell, 2003, Venkatesh et al., 2013).

The research methodology influenced the techniques and procedures used to gather and analyse the data in this research (Crotty, 1998). The techniques and procedures used in this research are fully explained for each phase of the research in chapters four, five and six.

The following is a summary of the key points discussed in this chapter.

### **3.4 Chapter Summary**

This chapter began with a discussion of the key elements that formed the research paradigm. This research followed an objectivist ontology and epistemology, a post-positivist theoretical perspective and both inductive and deductive empiricism. The chapter then discussed research methods in IS and explained the exploratory, sequential mixed method approach that was undertaken in this research. Lastly, the chapter concluded with a high level explanation of the

research design to meet the research objectives RO1, RO2 and RO3 and to answer the research questions RQ1 and RQ2.

The following chapter discusses the qualitative phase of this research and addresses research objectives RO1 and RO2.



## **4 Qualitative Phase**

The purpose of this chapter is to explain the steps undertaken in the qualitative phase of the research. The chapter commences with an explanation of the data gathering method used in this phase. The research sample is then identified before a discussion of the data analysis takes place. To follow, the findings are presented and lastly the chapter is summarised. The chapter outline is summarised below:

4.1 Qualitative Phase Data Gathering Method

4.2 Qualitative Phase Research Sample

4.3 Qualitative Phase Data Analysis

4.4 Qualitative Phase Findings

4.5 Chapter Summary

### **4.1 Qualitative Phase Data Gathering Method**

The purpose of the qualitative phase was to address the first two research objectives:

RO1: to investigate the effect of ICT connectivity on individual work productivity,

RO2: to explore the phenomenon of individual control within the use of ICTs.

The exploratory nature of these research objectives required a data gathering method that could capture insightful experiences from employees. Interviews are a data gathering method known to capture such explicit data and are used to further explore a phenomenon (Molina-Azorin, 2011). In IS research, semi-structured interviews are routinely used to capture information in a complete manner and to also provide the flexibility to construct new knowledge by allowing nuance, conflict and uncertainty to be expressed by research participants (Myers, 1997; Myers & Newman, 2007). Using this method would help refine the research

phenomena descriptions and propositions from the literature review (see pg. 43) and possibly capture new concepts that may have been overlooked during the conceptual research model development.

Semi-structured interviews were carried out during the qualitative phase to elicit insights and descriptions of employees' experiences with the use of ICTs (Robson, 1993). This was to allow for further refinement of the conceptual research model so that it reflected employees insights (Johnson et al., 2007; Karr-Wisniewski & Lu, 2010; Tashakkori & Teddlie, 2010). This knowledge-gaining approach aligned with the inductive empirical approach used for this study as indicated in chapter three.

The development of a semi-structured interview protocol was guided by the initial conceptual research model (Creswell, 2003). This meant that each component of the interview protocol aligned with the corresponding research construct and proposition in the model. In doing so, every component of the conceptual research model was investigated. The interview protocol consisted of open-ended questions so each participant could share as much insights possible to address the research objectives (Johnson et al., 2007). Additional questions were asked to seek other constructs and propositions related to the research.

Validation steps for the interview protocol took place to ensure credible results were gained from interviews (Venkatesh et al., 2013). For validity, the interview protocol underwent five iterations of peer reviews by IS professionals to ensure it was reliable (Johnson, 1997). For design validity, the interview protocol was tested through informal interviews with practitioners outside the IS profession to ensure the terminology, timing and structure of the interview protocol was appropriate (Venkatesh et al., 2013). The modified interview protocol is shown in Appendix B.

Approval from the Victoria University of Wellington (School of Information Management) Human Ethics Committee (HEC) to conduct the interviews was granted in February, 2013 (see Appendix C). This added a further quality check

and triggered the initiation of the data gathering for this phase. The next section discusses the qualitative research sample.

#### **4.2 Qualitative Phase Research Sample**

In order to identify a research sample, the researcher needs to define a ‘group’ that can relate to the research questions and that will include examples of what is being studied (Miles & Huberman, 1994). Moreover, a full range of variation in some phenomenon is recommended to be able to cover the ‘whole thing’ as much as possible (Becker, 1998).

With these points in mind, the research sample consisted of employees from New Zealand (NZ) organisations whose roles consisted of carrying out business tasks with the support of ICTs. These included the general business tasks (non-routine and interdependent) identified by Gebauer et al. (2007). Employees with such characteristics were able to relate to the research questions and provided examples on the research topic (Miles & Huberman, 1994).

This research did not assess particular roles because they can be defined differently from setting to setting in addition to the possibility that tasks could overlap (Arthur, Bennett, Edens & Bell, 2003; Devine, 2002). Organisational studies underline that outcomes are generally influenced by work-related contextual factors (Anandarajan, et al., 2000; Gebauer et al., 2007; Loges & Jung, 2001; Ou & Davison, 2011). Therefore, potential participants needed to come from roles of different job interdependence and come from different working environments to ensure a variety of employees were approached. This was so the phenomena being explored could cover a wider sample and ensure a clear understanding of the research domain (Becker, 1998).

Since this research was concerned with employee productivity, the unit of analysis in this research was at the individual level. Each participant needed the support of ICTs for his/her portfolio of tasks. To ensure the participants met this requirement they were selected through purposive sampling (Miles & Huberman, 1994). Reaching these participants was carried out through selective sampling

where potential candidates were found through the researcher’s network of professionals (Miles & Huberman, 1994).

Potential participants were contacted via email with an information sheet summarising the research project (see Appendix D). After interest was shown from a potential participant, an interview time was organised and the interview took place. The process of interviews took place during March and June, 2013.

In qualitative research, a saturation strategy can be followed where interviewing stops when no new themes emerge (Glaser & Strauss, 1967). During the qualitative phase, a total of 15 interviews took place until saturation was reached. According to Bertaux (1981), this sample size was sufficient for qualitative research.

Demographic information on the fifteen participants is presented in Table 4-1.

Table 4-1. Interview Research Participants

Participant	Role	Industry	Age Group
P1	Builder	Construction	30-39
P2	Certified Surgeon	Health	50-59
P3	Project Manager	Banking	30-39
P4	Program Manager	IT/Government	50-59
P5	Software Developer	Software Development	20-29
P6	General Medical Practitioner	Health	30-39
P7	Software Front-End Developer	Design	30-39
P8	Test Manager/Project Manager	IT Services	30-39
P9	Associate Lawyer	Law	20-29
P10	Senior Lecturer	Education	50-59
P11	Project Coordinator	Finance	20-29
P12	Web Developer	Software Development	20-29
P13	Consultant	Security Services	20-29
P14	IT Analyst	Consulting	20-29
P15	Support Services	Government	20-29

The participants came from nine different industries including, construction, healthcare, banking and finance, IT, design, law, education, consulting and government services. The participants also came from three different age groups including, 20-29, 30-49 and 50-60. Overall, there was a variety of employee traits.



Each interview lasted between 60-70 minutes. During interviews, the researcher took notes of key concepts that had emerged. At the end of each interview, the researcher summarized the discussion in one page to ensure that key ideas were taken note of accurately. The researcher took note of any challenges that may have reduced the understanding of questions asked. Then, the interview protocol was modified where necessary. For instance question 2.3 was re-worded to “tell me” instead of “explain” as there seemed to be nothing to explain in this question and explanations were to be made by the sub-questions that followed.

It also became clear during interviews that using the term ‘employee productivity’ implied the views of the organisation and work colleagues. The reviewed literature identified terms to denote employee productivity, including individual impact (Igarria & Tan, 1997) or personal productivity (Davis et al., 1999). Thus, in this research employee productivity was referred to as ‘individual work productivity’ to emphasise the level of analysis (individual) and the context of analysis (work). This seemed necessary to avoid any confusion and possible data distortion in this research. This decision was also made to ensure that participants reflected on the insight of their own views as opposed to others’ views. The remainder of this thesis uses the label individual work productivity.

Each interviews was audio recorded and then was transcribed straight after it was completed. Each interview transcript was emailed to the corresponding participant within a 48-hour timeframe so it can be reviewed. A short timeframe was in place to ensure ideas were still fresh in the participant’s mind in the case they had more information to add to the transcript. This step of the review took place to ensure interpretive (inferential) validity so that the researcher accurately reflected participants’ insights (Venkatesh et al., 2013). This review was also to ensure that other key concepts were not left out during the transcribing of interviews.

The following section explains the qualitative phase data analysis.

### 4.3 Qualitative Phase Data Analysis

After every fifth interview the researcher stopped to first analyse each interview separately, then to analyse all five interviews collectively. The summary of the key findings was used as a checkpoint to ensure that the data gathered was relevant for the research. This was also a gesture of interview protocol validity to ensure that the qualitative data gathering method contributed credible results (Johnson, 1997; Scandura & Williams, 2000; Straub et al., 2004).

Each interview transcript was displayed in a data matrix where interview questions were placed horizontally across a table and participant responses were summarized beneath their corresponding question (Miles & Huberman, 1994). To verify the results of the qualitative phase, each round of five interviews underwent a four-step data analysis process before the subsequent round of interviews were initiated (Figure 4-1)

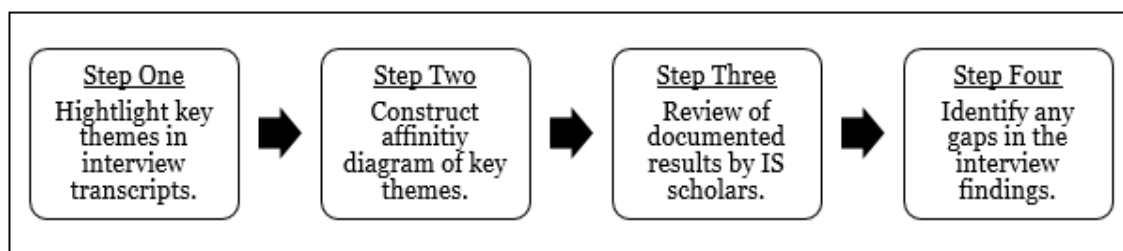


Figure 4-1. Four-Step Interview Data Analysis Process

The first step of the data analysis process was to bring together and highlight the key ideas that were presented in the data matrix.

The second step included constructing an affinity diagram to summarize the key themes for each interview question. Affinity diagrams are a technique in business modelling used to identify patterns and establish groups to gain additional insight (Shafer, Smith & Liner, 2005; Pyzdek, 2003). Each component in the affinity diagram was then analysed in the following order:

1. identify the candidate research constructs with their corresponding definitions,
2. identify sufficient elements of each construct so that the boundaries of the constructs are clear,
3. identify the potential relationships amongst constructs, sufficient to form an abstract representation of the model,
4. summarise and document results.

The third step of the data analysis process involved a review of the documented results by two IS scholars to verify the outcomes. It is important to note that the way the researcher describes, interprets and theorizes findings will influence the validity of the results (Miles & Huberman, 2002). Thus, to ensure the validation and reliability of conclusions from the interviews, the data analysis process interpretations were presented to IS scholars (Johnson, 1997).

Lastly, the fourth step of the data analysis involved identifying any further data that was relevant to provide knowledge for research objectives RO1 and RO2. During this step, modifications to the interview protocol were made where necessary to fill these gaps. For instance, after the first round of five interviews it seemed that it was necessary to gain more understanding on the concept of ICT connectivity and its respective elements, therefore there was emphasis on this construct in the second round. After the second round of five interviews there appeared to be a difference in views amongst participants from different age groups, therefore round three targeted a younger sample. After the third round of five interviews was completed, no new themes emerged and sufficient knowledge was gained to address the research objectives RO1 and RO2.

At the end of the third round of five interviews, all results from the 15 interviews were triangulated using the same four-step analysis process previously described. Sufficient convergence of findings suggested the end of data gathering for this phase.

The iterative process of data analysis used in this phase allowed for the researcher to make better sense of the data and learn more about the research phenomenon.

Such validation techniques are warranted to ensure reliable results (Scandura & Williams, 2000; Straub et al., 2004). Taking a rigorous approach also ensured analytical validity so that findings are dependable, consistent and plausible (Venkatesh et al., 2013). This was particularly important for this phase because, first, the aim of the research objectives RO1 and RO2 was to explore the research phenomena and required as much detail as possible. Second, this phase required an inductive form of reasoning, so seeking patterns iteratively until saturation was research was useful. Third, the results from this phase needed to be as accurate and reliable as possible so that they could inform the subsequent phases. Therefore, these validation steps gave added quality to the results from the interviews conducted in this phase. A summary of the validation steps undertaken during this phase can be found in Appendix E.

The findings from the qualitative phase are discussed in the following section.

#### **4.4 Qualitative Phase Findings**

The nature of the research objectives RO1 and RO2 required an inductive form of knowledge-gaining. Therefore, the purpose of this phase was to consider all the key themes that emerged during interviews with employees. Seeking patterns through observations is consistent with mixed methods and post-positivist research (Creswell, 2003; Mingers, 2001; Venkatesh et al., 2013).

The approach to the qualitative phase was to treat all the emerging themes equally, regardless of how many times they emerged or by whom. This was because the purpose of this phase was to explore the phenomena as broadly as possible and to identify all the patterns from these interviews, which would then be confirmed (or refined further) in the subsequent phase.

The following section explains the key findings from this phase. The discussed themes from this phase are fully presented in Appendix F. Later sections of this chapter will compare interviewees' perceptions to the literature review and to the conceptual research model presented in chapter two.

#### **4.4.1 Defining ICT connectivity from interviews**

The key perception of ICT connectivity that participants had was the ability to reach information and the ability to be reached by other sources of information through ICTs (theme ICN1). To assist in completing their jobs, individuals used ICTs such as landline telephones, cellular phones, laptops or tablet computers with the support of the Internet, Intranet or mobile networks to enable the exchange of information through email, phone conversations/VoIP, text messaging, social media, instant messaging, tele/video conferencing, and data repository or management tools. Employee ICT connectivity allowed for information exchange that was in-coming or out-going (bidirectional) through communication channels enabled by these ICTs. Information exchanges were either made synchronously or asynchronously. Participants also expressed the need for ICTs to perform their jobs.

Participants highlighted that the concept of ICT connectivity differed from the use of ICTs (theme ICN2). ICT connectivity gave employees the ability for information to be exchanged, even when an individual was not actively exchanging information through ICTs. For example:

*“If I have something really difficult to do I will just not check for hours, but it [instant messaging] still runs in the background it’s always there...I’m passively connected, like I’m always connected but I only check once every 25 minutes or something. So the idea is I’m connected and you can catch me but there’s a 25 minute lag” (P5).*

In this case, individuals may be reachable through ICTs to receive information but not necessarily actively engaged and responding to the exchange(s) made through ICTs. It seemed that it was the accessibility that was gained from ICTs that participants were concerned with. Therefore, ICT connectivity was thought of as a condition or a consequence of ICTs as opposed to the use of ICTs itself.

During interviews, four concepts emerged that helped to explain the degree to which individuals were connected to ICTs:

- the time spent connected to ICTs (theme ICN3),
- the scope of ICTs (theme ICN4),
- the volume of exchanges through ICTs (theme ICN5),
- the ubiquity of ICTs (theme ICN6).

A recurring theme in the data was that ICT connectivity was indicated by the time spent connected to ICTs. For instance as participant ten put it, committing oneself to information channels sets the expectation for an individual to monitor and process these ICTs, thus spending time to do so. Similarly, participant 15 explained that they would consider themselves constantly connected because of the amount of time they spent on ICTs in general. They indicated that not having access to ICTs for more than 20 minutes explained their lack of ICT connectivity. Thus, the time spent being connected to ICTs was portrayed as an indication of an individual's ICT connectivity.

The scope of ICTs that individuals were connected to also shaped employees' levels of ICT connectivity. For instance, a wide scope of ICTs entailed being exposed to a wider network and increasing the potential reachability and exchanges made by an individual. Whereas, with a smaller set of ICTs an individual may not be so exposed. For example:

*“If I’m advertising the fact that I do screen sharing and somebody [makes a] request then that’s over sharing, that would give me potential to be over connected. To disconnect myself I just wouldn’t offer that as an option, if I felt there was no benefit in being connected, then I wouldn’t advertise this as an opportunity for them [clients]”*  
(P13).

Participants repeatedly identified that the number of information exchanges made through ICTs per unit of time (i.e. the number of emails received per day) explained their level of ICT connectivity. Participants felt the need to compare

themselves to others' behaviours with ICTs in order to indicate their own level of connectivity. For instance, the volume of "tweets" made was used by participants as an indicator of individuals who were highly connected to electronic information channels such as Twitter. It was repeatedly stated by employees that being over-connected for them meant that too many exchanges are being made through ICTs. On the other hand, being less connected meant that there was a lack of exchanges made through ICTs. Therefore, the total amount of information exchanged helped to explain an employee's level of ICT connectivity.

Lastly, the ubiquity of ICTs was also seen as a form of identifying an employee's ICT connectivity. For example: *"in a physical sense – phone is always on me. My phone doesn't really go except when I'm in the shower but I leave on the bench."* However, when employees did not have their ICTs physically present they felt almost disconnected. This is exemplified by participant six (P6) who stated: *"you do feel almost emotional about it almost like it's your favourite shirt. Outside of work also if I don't have my phone on me I feel disconnected."* The ubiquity of ICTs enabled the physical presence of these devices and therefore the potential connectivity of an employee. Thus, this notion helped individuals identify their level of ICT connectivity.

The main difference between the findings from the interviews and the conceptual research model presented in chapter two was the components that reflected ICT connectivity. Initially, the conceptual research model suggested three components, based on the review of the literature related to ICT connectivity. These components were scope, frequency and volume. In the conceptual research model frequency was understood as the number of information exchanges over a unit of time. During the interviews there were no signs of this particular idea, however the 'time' individuals spent connected was mentioned instead. Additionally, the conceptual research model did not include the ubiquity or physical presence of ICTs as a component reflecting ICT connectivity. As exemplified earlier, the ubiquity of ICTs helped to explain an individual's level of ICT connectivity.

#### **4.4.2 Defining individual work productivity from interviews**

Individual work productivity in general was perceived as the amount of work complete per unit of time (theme IPD1). For example: *“I guess I start with a vision of what I want to achieve for the day and if I’ve achieved them then I’ve had a productive day”* (P10).

The way productivity was expressed differed depending on the nature of the work the individual carried out. Individual productivity was sometimes perceived as both a feeling and a metric. From a feeling perspective, participants explained that they felt productive because of the amount of work they had accomplished. From a metrics perspective, individuals stated that to-do lists, or in some cases software or project milestones, helped identify progress. Although the ‘feeling’ aspect of productivity was interesting, it was excluded from the study as it was perceived as a post-outcome of individual work productivity. However, the underlying concept was consistent in all interviews, that is – being productive meant assessing the amount of work complete in comparison with an expected output.

Interviews exposed two concepts that explained individual work productivity – efficiency (theme IPD2) and effectiveness (theme IPD3). Efficiency was explained as having the same level of output but with fewer resources used. To explain their work efficiency, participants stressed the importance of time in getting the job done. Being efficient to them meant that milestones were accomplished within a specified timeframe, if not in a time-saving manner. Contrastingly, effectiveness was perceived as the accuracy of work completed. To the participants, being effective meant that the appropriate information was gathered to meet their work goals. Collectively, the efficiency and effectiveness indicated a productive work day.

For some participants, productivity entailed producing work of value, or enhanced outcomes. This can be described as the quality aspect of productivity. This was referred to as a perceptual measure that is subjective to an individual. Although there were differences in opinion about whether quality was a part of productivity or not, participants confirmed repeatedly that quality was a result of



effectiveness and efficiency. For example: *“I would tie it [quality] back to efficiency, effectiveness, accuracy. The quality comes part of the effectiveness and I think part of that is partly perceived”* (P8). In this research, quality was seen as a separate construct that sat outside the scope of this study and therefore was not assessed as the third component of individual work productivity. This research viewed quality as the value of outcomes, which exceeds the notion of productivity (Belanger et al., 2001).

The findings from the interviews aligned with the views of employee productivity in the conceptual research model presented in chapter two.

#### ***4.4.3 Defining individual control from interviews***

In the interview discussions, participants were asked to comment on how they managed their behaviours towards ICTs (theme ICR1). In general, this was portrayed as the degree to which individuals managed their exchanges through information streams by following a strategy to maximize productivity. Some participants emphasized their ability to manage the exchanges through ICTs to prevent disruption to their work practices. For example:

*“The biggest problem with ICTs is the disruption, if you can ignore it then there’s no way you will have a negative effect...the only reason why I changed from Linux to Mac is...to have the ability to manage how I’m notified, by who I’m allowed to be notified”* (P5).

Interviews exposed two components that best explained Individual control – attentiveness (theme ICR2) and responsiveness (theme ICR3). Attentiveness to ICTs was commonly described by participants as how often they checked their ICTs. Although individuals were connected to ICTs, the level of how attentive they were to their information exchanges varied. For example:

*“Sometimes I’m checking emails coming and going if I have some time – but it’s at my choice not because I feel I have to...I leave email*

*running in the background but I check periodically because stuff moves quite quickly” (P4).*

This suggested that attentiveness was a choice made by the individual on how often to check their ICTs. Whether it was regular checking or less frequent checking, attentiveness was decided upon the individual him- or herself.

On the other hand, responsiveness was referred to as how quickly an individual responded to in-coming exchanges. The discussions in this phase showed that the response rates varied because of certain factors such as the urgency of the exchange, who the exchange was made by, whether the information was available to address that particular exchange and the importance of the task at hand. Generally, the response rate of information exchanges were controlled by the choices the receiver decided to make, making responses either instant or delayed. For example:

*“It depends on the request. It depends on the complexity of the cases that I have during the day. I don’t feel compelled to respond to an email once I receive it! I can take my time to respond. Medically I can’t do that for certain lab results I have to deal with it when they come, that’s another issue...With the use of technology you often feel compelled that things need to be sorted right here right now, but it’s a matter managing priority” (P6).*

This suggested that responsiveness was a meaningful indicator for individual control in this research, as it explained how engaged in communication an individual was.

In some cases, participants had workplace policies to adhere to, such as logging into specific platforms in order to view emails and forbidden access to social media and personal emails (theme ICR4). Restrictions were particularly visible in government organisations, for example: “[there is] *code of conduct basically around the confidentiality of information you are using*. [There are] *no physical implementation to stop you from using particular technologies*, [but] *other*

*government departments do, but we don't*" (P4). Such restrictions could influence employees' strategies with managing ICT connectivity, however they are beyond the individual's control.

The findings from the interviews on the notion of individual control were in line with the conceptual research model presented in chapter two. This confirmed the conceptualisation of the emerging phenomenon was suitable to move forward with.

#### **4.4.4 Research proposition one from interviews**

Participants' experiences showed that the fast accumulation of information and its instant accessibility through ICT connectivity could increase individual work productivity. Being connected to information sources through ICTs made individuals' work practices quicker, more accurate and at times easier. Being connected also allowed for collaboration and accuracy of information sharing, speeding up of efficiency of tasks, allowing for work to be complete and also improving quality.

Contrastingly, the interview discussions indicated that the increase in ICT connectivity could result to lowering individual work productivity through distractions, information overload and added time spent for monitoring communication streams.

During interviews, there was recurring speculation on the idea that ICT connectivity can have both a positive and negative effect on individual productivity. For example, ICT connectivity could affect individual work productivity positively in some areas while at the same time it could negatively affect individual work productivity in other areas. For example:

*"There are pros and cons. Like in meetings you can do things then and there, but in terms of the human touch, like if we are in the same office we don't get up to talk we use instant messaging. You are missing the body language through ICT. And as a project manager if you hear people talking about the project in a group you can walk up to them*

*and say hey what's going on... Sometimes it gets a little left too late if we wait for the team members to share project issues. You're productive in meetings, but inefficient when you don't mention issues at the time it does [happen]...it's a mix really" (P3).*

This view consolidates both the positive and negative impacts of ICT connectivity on individual work productivity.

Employees' insights on the effect of ICT connectivity on individual work productivity provided support for the first research proposition in the conceptual research model, P1 – ICT connectivity has an influence on individual work productivity. This confirmed the first research proposition in the conceptual research model from chapter two.

#### **4.4.5 Research proposition two from interviews**

Interviews illustrated that having individual control could influence the effect of ICT connectivity on individual work productivity. It was stated repeatedly by participants that it is a matter of how the communication tool is managed that determines the consequences of ICT connectivity. Participants explained that managing their information flow through information streams would result to improved performance. For example:

*"If you can foresee that this email correspondence is going to be of a significant length, longer than 2 or 3 paragraphs or it will become a huge chain, lots of exchanges, include more people, then I think it's wise to pull all those people in a room and solve the matter...Every tool is a good tool if it is used in the right manner and in the manner it was intended for" (P8).*

With strategies such as choosing the appropriate ICTs for communication, knowing how and when to be connected to ICTs, managing attentiveness and responsiveness, ICT connectivity can lead to a positive effect on individual productivity.

Individuals also chose to reduce their attentiveness to their ICTs and/or delay responses to maintain focus on the task at hand. For instance, participant six (P6) explained how reducing their attentiveness to ICTs and responsiveness to exchanges through ICTs ensured a doctor-patient-screen relationship as opposed to a doctor-screen[ICT]-patient relationship. This was done to be observant of patients' expressions and to ensure accuracy of the clinical information gathered by the doctor.

The discussions during interviews emphasized the need for employees to manage their information exchanges through ICTs to balance the range of effects ICT connectivity placed on their work productivity. These suggestions provided support for the second research proposition in the conceptual research model, P2 – individual control can have influence on the effect of ICT connectivity on individual work productivity. This confirmed the second research proposition in the conceptual research model from chapter two.

#### **4.4.6 Updated research model after interviews**

Findings from this phase confirmed the three main research constructs from the conceptual research model in chapter two. The interviews also provided further insight into the construct definitions and their key elements. The two key research relationships from the conceptual research model also emerged consistently throughout interviews. The updated research model is presented in Figure 4-2 and the updated research definitions are presented in Table 4-2 below.

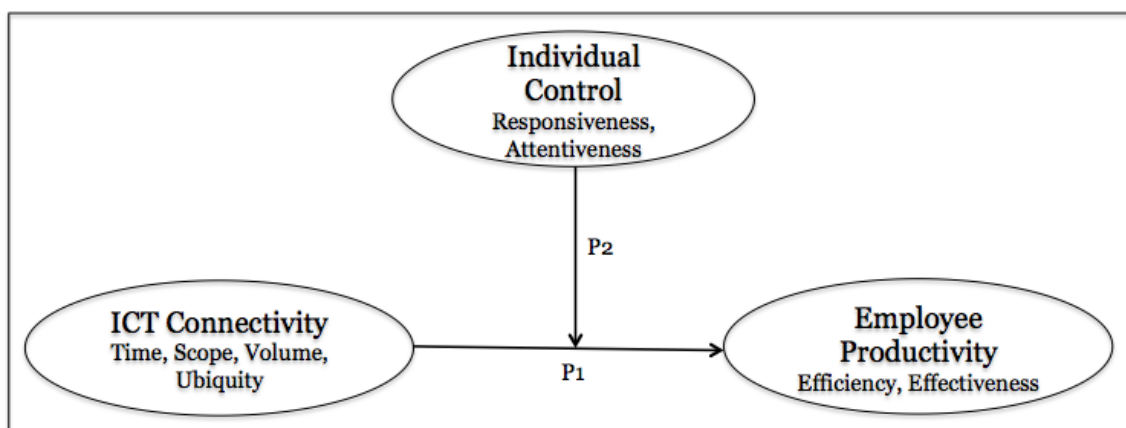


Figure 4-2. Updated Research model – Post Qualitative Phase

Table 4-2. Updated Research Definitions – Post Qualitative Phase

Model component	Updated definition
ICT connectivity	The ability to reach and be reached by sources of information through ICTs.
Individual work productivity	The amount of work complete per unit of time.
Individual control	The degree to which individuals manage their exchanges through information streams by following a strategy to maximize productivity.
Research proposition one	ICT connectivity has an influence on individual work productivity.
Research proposition two	Individual control has an influence on the effect of ICT connectivity on individual work productivity.

ICT connectivity was defined as *the ability to reach and be reached by sources of information through ICTs*. This definition was more mature than the definition proposed in the conceptual research model in chapter two (pg. 43). This updated definition was also consistent with the literature on this notion (Castells, 2011; Dery & MacCormick, 2012; Kolb, 2008; Kolb et al., 2012; Mazmanian, 2013; Mazmanian et al., 2006; Perlow & Porter, 2009; Stephens, 2012; Towers et al., 2006).

During the qualitative phase, ICT connectivity was reflected by four key components including the time spent connected to ICTs, scope of ICTs, the volume of exchanges through ICTs and the ubiquity of ICTs.

The time spent connected to ICTs was similar to the intensity component in the ICTCI by Leung (2011). Although, previously, the frequency of times ICTs was suggested as a way to indicate ICT connectivity (Anandarajan, et al., 2000; Carr, 2011; Ou & Davison, 2011), the interview participants focused more on the time they spent being connected instead. Thus, the notion of the time spent connected to ICTs replaced the frequency component that was initially proposed to reflect ICT connectivity in the conceptual research model from chapter two.

The findings during this phase expanded the set of three components reflecting ICT connectivity in the initial conceptual research model in chapter two (pg. 43). Further, the findings expanded the knowledge on ICT connectivity and provided useful insight on the phenomenon to help address the call for new measures of ICT connectivity (Kolb et al., 2012).

Individual work productivity was a perceptual measure of *the amount of work complete per unit of time*. The two components reflecting this construct were the efficiency and effectiveness of employees. This was consistent with previous research that has investigated individual work productivity (Ayyagari et al., 2011; Hung et al., 2011; Rennecker & Godwin 2003, 2005; Tarafdar et al., 2007). Contrasting to literature (Tarafdar et al., 2007; Yun et al., 2012), quality was not viewed a component of productivity during interviews, rather it was seen as a phenomenon determined by productivity. These findings were consistent with the conceptual research model in chapter two.

Individual control was defined as *the degree to which individuals manage their exchanges through information streams by following a strategy to maximize productivity*. This definition expanded the general definition of ‘individual control’ in the literature, which was concerned with how individuals managed information flow (Derks & Bakker, 2010; Leung, 2011; Mazmanian et al., 2006; Wajcman et al., 2010). Discussions during interviews illustrated two components that reflected this phenomenon – attentiveness and responsiveness. Previous research had not assessed this notion from this view, therefore the interviews contributed a significant portion of knowledge on understanding the phenomenon. These findings were consistent with the conceptual research model in chapter two and they emphasized the strategies of attentiveness and responsiveness when managing communication through ICTs.

The interview discussions illustrated an effect from ICT connectivity to individual work productivity in both positive and negative form. This was consistent with previous findings from the literature concerned with the effect of ICTs on employees (Huang, 2001; Mazmanian et al., 2006; Perlow & Porter, 2009). The interviews also illustrated the influence of individual control on the effect of ICT connectivity on individual work productivity. This also confirmed the emerging influence of individual control in the literature (Derks & Bakker, 2010; Leung, 2011; Mazmanian et al., 2006; Wajcman et al., 2010).

Overall, the findings from the qualitative phase provided clarification on the three key research phenomena ICT connectivity, individual work productivity and

individual control. The findings also provided insight on the relationships amongst these constructs. Collectively, these findings addressed the two research objectives RO1 and RO2. This phase gave the researcher confidence to continue investigating the research phenomena. The updated research model acted as the basis for the subsequent data gathering phase.

#### **4.5 Chapter Summary**

The purpose of this chapter was to explain the steps undertaken in the qualitative phase of the research. The chapter began by explaining the data gathering method used in this phase. To follow, the research sample was introduced before the data analysis was explained. Later, the key findings from the qualitative phase were discussed. These results were used to update the conceptual research model that was initially presented in chapter two.

The following chapter explains the model refinement phase, which builds on the updated research model from this phase and refines it into a testable form to answer the research questions RQ1 and RQ2.



## **5 Model Refinement Phase**

The purpose of this chapter is to explain the steps taken to further develop the research model from chapter four into a testable form. The chapter begins by providing an overview of the steps involved in refining the research model. This includes explaining the research model validation and confirmation steps. The final version of the research model is then presented before a chapter summary concludes the key points. The chapter outline is summarised below:

5.1 Overview of Model Refinement Steps

5.2 Updated Research Model after Focus Groups

5.3 Chapter Summary

### **5.1 Overview of Model Refinement Steps**

During this phase there were four rounds of model refinement. The rounds consisted of a combination of expert review and focus groups. The reason for these refinement steps was to validate and confirm the research model prior to testing it in the third, quantitative phase of this research. The model refinement steps were also an opportunity to achieve inferential validity, which is concerned with how well findings are confirmed or corroborated by others (Venkatesh et al., 2013).

The following sections explain each model refinement step taken to help modify the research model into a testable form.

#### ***5.1.1 Model refinement steps one and two – expert reviews***

In the first round of model refinement, the research model from the qualitative phase was presented to an audience of experts within the IS profession during the New Zealand Information Systems Doctoral Consortium in July, 2013. Feedback suggested the need to further extract the concept of ICT connectivity and individual control. In turn, the data from the qualitative phase were revisited and further analysis took place to better reflect the findings into the research model. For instance, the components that reflected ICT connectivity (time, scope, volume

and ubiquity) were further questioned as to how accurately they could be captured and whether they were an appropriate reflection of the construct. Further, the notion of individual control was still being questioned on whether it reflected a set of workplace strategies that employees implemented or whether it was a reflection of controlling impulsive behaviours.

The second round of model refinement involved reviewing the conceptualisations of ICT connectivity and individual control to a panel of experts within the IS profession during the Queensland University of Technology Internal Doctoral Consortium in early November, 2013. The discussions emphasized the relevance of the research model in the workplace and the notion of ICT connectivity was well understood. However, it was suggested that the specific reflection of volume of exchanges was more a reflection of active use behaviours and not necessarily a reflection of the condition of connectivity itself. On the other hand, individual control was perceived as an interesting phenomenon, but it was suggested that further analysis of the concept is necessary to drill down to what the construct is really capturing.

The feedback received during round two motivated the desire for further data gathering to clarify and confirm the concepts of ICT connectivity and individual control.

### ***5.1.2 Model refinement step three – focus groups***

The third round of model refinement involved conducting focus groups to confirm the understanding of the concepts of ICT connectivity and individual control.

Focus groups bring together several participants to discuss a topic (Kreuger & Casey, 2009). They differ from individual interviews because they allow for interaction between participants and yield more data for the researcher, revealing ideas that remain untapped (Morgan, 1996; Morgan & Spanish, 1984). Focus groups can help researchers explore and clarify their views and expand on an idea to “provide an opportunity to check the meanings intended” (Barbour & Schostak,

2005, pg. 42). This data gathering method is often used to increase the effectiveness of interviews (Morgan & Spanish, 1984).

The traits of a focus group aligned very closely with the purpose of model refinement step three – to further clarify and confirm the notions of ICT connectivity and individual control. Additionally, because ICT connectivity and individual control were relatively new phenomena, it made sense to take an additional data gathering step to further explicate their meanings. Adding another step of data gathering to refine phenomena is a typical approach in post-positivist and mixed method research (Creswell, 2003, 2006; Mingers, 2001).

The research model, along with the feedback from model refinement steps one and two, were used as a guide to develop the focus group protocol (see Appendix G). Kreuger and Casey's guide to developing focus group questions (2009) was also used when developing the protocol. For instance, questions needed to be clearly understood, short, clear and well thought out. The focus group protocol consisted of opening questions ("tell us who you are"), introductory questions (introduce the topic by gathering participants' understanding), transition questions (move the conversation into the key questions), key questions (2-5 questions to drive the study) and ending questions (closure to discussion "suppose you had one minute to talk to your boss on the topic, what would you say?"). The focus group protocol was reviewed by senior IS colleagues, pilot tested with practitioners and modified where necessary to ensure design validity (Kitzinger, 1995; Venkatesh et al., 2013). Approval for this data gathering phase was granted by the Victoria University of Wellington (School of Information Management) Human Ethics Committee in November, 2013 (see Appendix H).

To remain consistent with the preceding qualitative phase, the focus group participants also needed to be NZ employees that required the use of ICTs to perform their job. The potential focus group participants were selected through purposive sampling and selective sampling. The researcher's network of professionals were approached with an information sheet about the focus groups (see Appendix I). The potential focus group participants came from a diverse set

of job roles. This was to remain consistent with the previous data gathering phase and to cover a broad set of work skills (Kitzinger, 1995).

One of the biggest challenges with the focus groups was organising a date and time that was suitable for all the participants. So, although many employees showed interest in taking part, only five could attend during the time designated. This was not seen as an issue because the recommended focus group size is 5-8 participants (Kreuger & Casey, 2009). The focus group size is specified so that the moderator, the individual running the focus group, can control the discussions and also retrieve sufficient data.

The first focus group was conducted in mid-November, 2013. This first focus groups consisted of five participants (Table 5-1) and it lasted for 75 minutes.

Table 5-1. Focus Group One Research Participants

Participant	Role	Industry	Age Group
P16	Java Developer	Banking	20-29
P17	Risk and Insurance Analyst	Electrical Power	20-29
P18	IT Consultant	Consultancy	30-39
P19	Accountant	Wine	40-49
P20	Engineer	Electrical Power	30-39

The participants came from four different industries including banking, electrical power, consultancy and wine-making. The participants came from three different age groups, 20-29, 30-39 and 40-49 years of age. Overall, there was a variety of the employee traits.

To remain consistent with data analysis in the qualitative phase, the focus group discussion was audio recorded, transcribed and displayed in a data matrix where focus group questions were placed horizontally across a table and the participant responses were placed beneath their corresponding question. The responses were then analysed, summarised and documented for review and verification by two IS academics. This corroboration of results was to help make the focus group conclusions more valid (Venkatesh et al., 2013). A summary of the validation steps undertake during this phase is summarized in Appendix E. The focus group results are presented later in this section.

When using focus groups for data gathering, it is considered good practice to conduct more than one so that the ideas or themes from the previous focus groups(s) are confirmed (Kreuger & Casey, 2009). Therefore, a second focus group was conducted to seek if there were any other new themes expanding the findings from the first focus group. There was a one-week gap between the focus groups so that there was sufficient time to carry out an initial round of analysis on the results from the first focus group.

The second focus group took place late November, 2013. The second focus group consisted of five participants (Table 5-2) and it lasted for 65 minutes.

Table 5-2. Focus Group Two Research Participants

Participant	Role	Industry	Age Group
P21	Teaching Assistant	Education	20-29
P22	Claims Assessor	Insurance	30-39
P23	Research Associate	Recruitment	30-39
P24	Operations Manager	Postage & Delivery	60+
P25	Graphic Designer	Government	30-39

The participants were approached in the same manner as focus group one. The second focus group participants came from five different industries including education, insurance, recruitment, postage/delivery and government. The sample consisted of participants from three age groups, 20-29 age group, 30-39 and 60 years and over. Overall, the sample for focus groups two had a variety of employee traits.

Similar to focus group one, the second focus group discussion was audio recorded, transcribed, analysed, summarised and reviewed by two IS academics. The findings from the second focus group confirmed the research model and showed convergence of results with the previous focus group. This suggested that there was no need to conduct further focus groups at that point.

According to Kreuger & Casey (2009), there are two things to look out for when analysing empirical themes arising during a focus group:

- a) frequency – how often something is said, and
- b) extensiveness – how many different people say the same thing.

The higher the frequency and extensiveness of a particular theme that is mentioned in a focus group, the higher its significance. Focusing on the frequency alone is not sufficient because if a theme was mentioned 20 times by only one source, it is relevant to that one participant. Whereas, if that one theme was raised only once but by 15 participants, then there is consistent concern towards it. Therefore, it is necessary to take into account both the frequency and extensiveness of themes.

In this research, deciding which phenomena to include in the research model was based on assessing the frequency and extensiveness of themes during discussions. A summary of theme frequency and extensiveness for both focus groups can be found in Appendix J. The theme frequency (freq) and extensiveness (ext) will be identified for each theme discussed in the following section.

***Focus group findings.*** In broad terms, the concept of ICT connectivity in the focus groups was seen as the enabler for the transmission of information through ICTs (theme FCN1, freq = 21, ext = 7/10). This was similar to the finding in the qualitative phase (theme ICN1). Participant 20 specifically indicated that employees connect through a network, such as a cellular network or the Internet, to reach information or to be reached.

Focus group participants added that connectivity goes beyond the utilization of ICTs to retrieve information (theme FCN2, freq = 7, ext = 5/10). Participants agreed that connectivity explains the potential reachability and accessibility, or *exposure*, that employees have amongst each other, regardless of whether they are actually exchanging information through ICTs or not. For example:

*“I guess the other word is availability but connectivity is wider than that...the availability is more like people can contact you and you can contact people or you can search things. Connectivity is you get connected it doesn't matter if you are unavailable to others” (P19).*

Participants agreed that connectivity could be portrayed as a condition that exceeds the typical utilization measures of use. This was similar to the findings in

the qualitative phase (theme ICN2). This was also consistent with literature which argues that the notion of connectivity exceeds the traditional use measures of ICTs (Loges & Jung, 2001; Jung et al., 2001).

The main difference on ICT connectivity between the findings from this phase and the previous phase was that volume of exchanges and scope of ICTs did not seem to be a reflection of ICT connectivity. For example, two participants (P21 and P24) were equally connected in their views. However, this was not perceived from the volume of exchanges that they made, rather it was more because of the time they spent being connected and the ubiquity/availability of their ICTs. The findings from this phase focused more on portraying ICT connectivity as how 'exposed' or connected employees were through ICTs, regardless of particular details like the volume of exchanges made through ICTs, or the scope of ICTs an individual was connected through.

A new finding from the focus groups was the concept of the employees' job requirements for ICT connectivity (theme FCN3, freq = 10, ext = 6/10). The majority of participants agreed that the nature of the employee's role has influence on the level of ICT connectivity an individual has. For example:

*“For developers you have to be focused while you're developing, so it requires a lot more context switching so going to email and back into the same place where you know that frame of mind you know, it's different to the case of management” (P18).*

This notion was made clear and emphasized during focus group discussions. This was not previously found in the qualitative phase nor was it found in the literature on ICT connectivity.

When participants were asked to define the way they managed information flow through ICTs, they suggested having strategies in place or being *disciplined* with ICTs (theme FSD1, freq = 18, ext = 8/10). Strategies included tactics such as switching-off and disconnecting or setting times to check email. These strategies included manipulating individual availability (through ICTs) to others to deal

with incoming exchanges, to make careful decisions on how to respond to or initiate exchanges, filtering information through ICTs, prioritising tasks and exerting time management skills. Having such strategies in place was mentioned 18 times by eight of the focus group participants collectively, giving significance to the notion of individual control.

Another key difference between the findings from the focus groups and the findings from the qualitative phase was the way employees portrayed the notion of individual control. The qualitative phase highlighted the attentiveness and responsiveness of an individual through ICTs (themes ICR2, ICR3). The focus groups expanded this and revealed more on the underlying concept of these strategies – regulating the behaviours towards ICTs. When it came to labelling this phenomenon, all the participants in the second focus group confirmed that this notion of individual control is better explained as *self-discipline*.

Thus, during the model refinement phase, the notion of individual control was better perceived as ICT self-discipline, which reflected the employee's ability to regulate their behaviours towards ICTs. This concept of regulating behaviours also emerged during steps one and two of model refinement. The logic behind this notion and the support provided from the empirical findings in this phase encouraged the decision to re-name the concept of individual control as ICT self-discipline. This decision led to a post-hoc review of relevant literature on the notion of discipline. This will be discussed in the updated research model section of this chapter. The remainder of this thesis refers to individual control as ICT self-discipline.

The majority of participants from the two focus groups agreed that having such discipline in an environment of constant connectivity would pay off in the long run for better effect of ICTs on productivity (theme FSD2, freq = 12, ext = 8/10). For example:

*“Communication technologies are really really important in our lives and we need to continue to use them to help us, being connected means there's less down time and making decisions and getting information*



*and helps you to do what you need to do but at the same time we just need to make sure they [ICTs] don't overwhelm us and the employee has the best control of that mechanism" (P16).*

Thus, it seemed clear that ICT self-discipline could moderate the effect of ICT connectivity on individual work productivity.

During focus groups, productivity was perceived as the ability to accomplish tasks within a designated timeframe (theme FPD1, freq = 8, ext = 6/10), similar to the finding in the qualitative phase (theme IPD1).

Focus group participants repeatedly stated that ICT connectivity enhanced decision making due to the efficiency and effectiveness gained when retrieving information (theme FPD2, freq = 13, ext = 10/10). The main pitfall of ICT connectivity was the added amount of disruptions and information overload.

It was reassuring to see that the themes found in both focus groups converged. No new themes emerged in the second focus group, which prompted the end of data gathering in this phase.

The findings from the qualitative phase and the focus groups complimented each other. This indicated the validation and confirmation of findings and gave the researcher confidence to move on to the next round of model refinement.

### ***5.1.3 Model refinement step four – expert reviews***

The fourth and last round of model refinement involved translating the results from the focus groups into the research model. The updated research model was presented to a panel of scholars within the IS profession during the Australasian Conference on Information Systems Doctoral Consortium in early December, 2013. The feedback confirmed that the research model was sufficiently concise and the development approach was sound. The feedback also suggested that the research model reflected important workplace phenomena in a balanced and plausible manner. Further, it was suggested that the constructs and relationships were well described. This confirmation gave the researcher confidence that the

updated research model was ready for testing in the quantitative phase of this research (chapter six).

The following section presents the updated research model.

## **5.2 Updated Research Model after Focus Groups**

The purpose of this chapter was to modify the research model from the qualitative phase into a testable form. Clear and concise definitions of the research constructs were necessary to avoid confusion on what each does and does not do (MacKenzie, Podsakoff & Podsakoff, 2011; Weber, 2012). It was also important to achieve clarity on the construct boundaries so that the development of measures in the subsequent phase (chapter six) was as accurate as possible.

The model refinement steps described previously ensured that a thorough and iterative process took place to reach this updated, testable version of the research model.

The iterative process of review and analysis was useful in this phase as it provided the necessary rigour, accuracy and reliability which made the research model more credible than it was previously in chapters two and four (Johnson, 1997; Teddlie & Tashakkori, 2009; Venkatesh et al., 2013). Taking these model refinement steps was also considered a step toward providing the research model with face validity to assess to what extent the research model illustrated what it intended to (Hardesty & Bearden, 2004).

Collectively, the literature review, interview findings, feedback from IS scholars and findings from the focus groups assisted in finalising the research model to make it a model suitable for testing purposes (Figure 5-1). The updated research definitions are presented in Table 5-3.

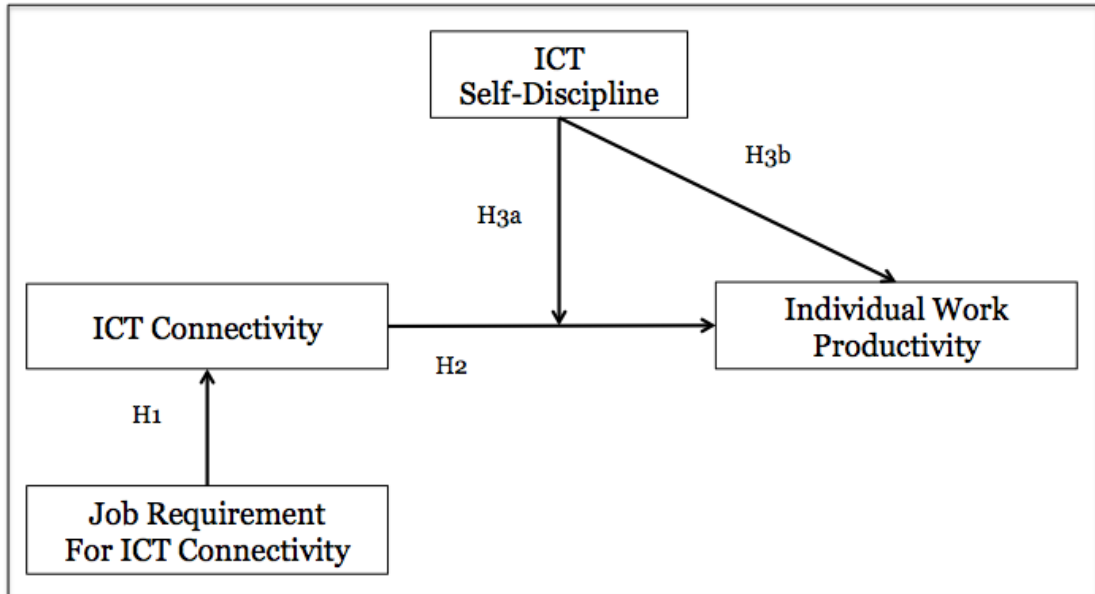


Figure 5-1. Updated Research Model – Post Model Refinement Phase

Table 5-3. Updated Research Definitions – Post Model Refinement Phase

Model component	Updated definition
Job requirement for ICT connectivity	The extent to which an individual requires the support of ICTs to perform his/her job.
ICT connectivity	The extent to which an individual is connected to ICTs.
Individual work productivity	The extent to which an individual perceives themselves to have accomplished the expected work during a typical work-day.
Individual control	The extent to which an individual can regulate his/her behaviours towards ICTs.
Hypothesis one (H1)	Job requirement for ICT connectivity will influence ICT connectivity.
Hypothesis two (H2)	ICT connectivity will influence individual work productivity.
Hypothesis three (H3a)	ICT self-discipline moderates the effect of ICT connectivity on individual work productivity.
Hypothesis three (H3b)	ICT self-discipline will influence individual work productivity.

Each research construct and hypothesis is explained next, with support from relevant literature and empirical data from interviews and focus groups. To follow, the research domain will be specified.

### 5.2.1 Job requirement for ICT connectivity

Job requirement for ICT connectivity was defined as *the extent to which an individual requires the support of ICTs to perform his/her job*. This notion emerged during the focus group discussions and led to investigating literature similar to this phenomenon.

One's needs or requirements are not always strictly personal but may be shaped by their culture or by various social surroundings such as work conditions (Rossi, 2002). In this research, the notion of job requirement for ICT connectivity was seen as a contextual factor outside of the individual's control.

The underlying concept of this construct stemmed from the dependence that users have on ICTs, as explained in the MSD theory (Ball-Rokeach & DeFleur, 1976). Understanding an employee's dependence on technology provides a better explanation on how important the technology is in an employee's life. Learning about the individuals' job requirement for ICT connectivity seemed meaningful to better explain the effects of ICT connectivity in this research.

Leung (2011) suggested that "need of ICTs" (a similar phenomenon to job requirement for ICT connectivity) is a sub-component of ICT connectivity. However, focus group findings suggested that ICT connectivity "*is very contextual, everybody has their own needs*" (P18). Thus, this research separated the requirement of ICTs from the notion of ICT connectivity as they were viewed as two separate entities – job requirement for ICT connectivity was contextual whereas ICT connectivity was based on the individual's choice. These entities would capture two different things and were seen as two independent constructs.

The Uses and Gratifications Theory (UGT) further supports the notion of job requirement for ICT connectivity. The theory posits that people's needs influence what media they would choose, how they will use it and what gratifications they will get out of it (Ruggiero, 2000). The *what* media and *how* media is used components of UGT are applicable to this research. Some employees (such as a help-desk worker or a project manager) cannot afford to completely disengage from ICTs as doing so disables them from fulfilling their job requirements. In contrast, others (such as a surgeon or an academic) may be able to fulfil their job with minimal amount of ICT connectivity and at times need zero connectivity during the day. For example, a recruitment agent stated: "*if I'm expecting a response from a couple of people, I will probably check my email every half hour or on the hour, versus on another day where perhaps I'm between assignments I'm checking my email every 2 hours or less and I can survive*" (P22). In contrast

an academic responded: “*with me I can leave it a day or two days with email, unless I know that students need to contact me*” (P21).

As a result, the job requirement for ICT connectivity for different roles will vary and heavily influence an employee’s level of ICT connectivity. The below studies in IS illustrate this view.

Zhu and He (2002) explain a similar phenomenon of perceived need of the Internet, which they refer to as an influencer of Internet use. So, those who perceive themselves to need to use the Internet to gather information for work for example are likely to use it. Similarly, Pica and Sorensen (2004) also suggested there is a relationship between work context and ICTs. They investigated the nature of police workers and found that some rely heavily on information accessed via ICTs, thus having a high need for those technologies. In another context, Barrett, Strayer and Shubart (2004) investigated the need for ICTs for healthcare professionals. They found that practitioners required ICTs to help in retrieving blood test results and patient medical information. Gebauer & Shaw (2004) also found that if an employee were required to handle emergency situations his/her ICT connectivity would increase. This evidence supports the importance of highlighting the requirement to connect to set the work context and better explain an individual’s ICT connectivity. Therefore, the following research hypothesis was proposed:

**H1:** *Job requirement for ICT connectivity will influence ICT connectivity.*

### **5.2.2 ICT connectivity**

The initial definition of ICT connectivity from chapter two was *to what extent to which an individual is connected to sources of information through ICTs*. The qualitative phase of this research updated the definition to a more precise explanation, which was *the ability to reach and be reached by sources of information through ICTs*. The findings from the model refinement phase suggested and confirmed a more high-level description of ICT connectivity that was beyond the availability and reachability of employees. As a result, to address

these different aspects of connectivity, ICT connectivity was defined as *the extent to which an individual is connected to ICTs*.

As presented in the initial literature review, the concept of ICT connectivity explained the potential incoming and outgoing reach an individual has through ICTs (Castells, 2011; Dery & MacCormick, 2012; Katz & Aakhus, 2002; Kolb, 2008; Kolb et al., 2012; Mazmanian, 2013; Mazmanian et al., 2006; Perlow & Porter, 2009; Renaud et al., 2006; Stephens, 2012; Towers et al., 2006).

During focus groups, the notion of ICT connectivity was portrayed in the following way: *“connectivity is wider...the availability is more like people can contact you and you can contact people or you can search things. Connectivity is you get connected it doesn’t matter if you are unavailable to others”* (P19). Thus, the updated definition from the model refinement phase took into account the potential reach an individual had through ICTs, including both the potential incoming and outgoing exchanges through ICTs. This is what Kolb (2008) referred to as “latent potentiality”. He explained that “connectivity ‘serves to connect’ (present tense) with options for the future.”

Discussions during the focus groups confirmed that the time spent being connected and the ubiquity of the ICTs collectively reflected an individual’s level of ICT connectivity. This was also supported by the findings from the qualitative phase. The ICTCI developed by Leung (2011) had also used the time being connected (intensity) as a component of ICT connectivity. The findings from the model refinement phase encouraged adopting the time spent being connected to ICTs and the ubiquity of ICTs to best reflect the notion of ICT connectivity in this research.

When asked about the consequences of ICT connectivity, participants emphasized increased work efficiency and effectiveness. For example:

*“It helps me cut down time, I’ve got more time to focus on the actual document...for my job I’m dependent on other people providing me*

*information. If I can get the information straight away then I can do things quickly” (P11).*

On the other hand, participants also emphasized the disruptions ICT connectivity caused. For example:

*“I’ve got plenty to do in a day and all it means is people want to get a hold of me. So what I’ve done is I turned all my instant messaging off so people can come and talk to me...so in terms of that it’s negative on my productivity” (P16).*

The combination of the two quotes above showed that ICT connectivity led to both positive and negative effects on individual work productivity.

Literature investigating the effect of ICTs in the workplace is consistent with the mixed effects of ICTs shared by participants in this research. For instance, high levels of connectivity can be useful when seeking information to assist decision-making or accomplishment of tasks (Davis, 2002; Venkatesh et al., 2010). However, other research suggests that while technology has its good consequences it can exceed its purpose and result to a negative effect on individual productivity. This is what Karr-Wisniewski and Lu (2010) call technology overload.

Technology overload is influenced by the law of diminishing returns (from economics), which posits that when there is an excessive amount of resource, inefficiency will start to take place. Similarly, Karr-Wisniewski and Lu (2010) suggest that overload of technology (including technology features, communication and information) will lead to lower individual productivity. Having excessive accessibility and reachability can also lead to information overload, stress and negatively affect an individual’s work productivity (Ayyagari et al., 2011; Hung et al., 2011). Excessive connectivity can also lead to interruptions that in turn can lead to a decline in productivity (Carr & Lu, 2007; Rennecker & Godwin, 2005).

Based on the empirical data from the interviews and focus groups, and the key themes from the literature review, the following research hypothesis was proposed:

**H2:** *ICT connectivity will influence individual work productivity.*

### **5.2.3 Individual work productivity**

Individual work productivity was defined as *the extent to which an individual perceives themselves to have accomplished the expected work during a typical work-day*. This is the dependent variable in this research, as it is a critical and common component of organisational success (Burton-Jones & Straub, 2006; Pitt et al., 2011; Rennecker & Godwin, 2003, 2005; Tarafdar et al., 2007). Both the qualitative phase findings and the focus group findings illustrated similar views on individual work productivity. The phenomenon is concisely defined by one of the research participants: *“you can do a lot of work but not be productive. Productive is how efficiently can you complete a desired task correctly and completely”* (P24).

It is important to note that others may not see an individual’s perception of their productivity as being productive in the workplace, or vice versa. For example:

*“If you are replying to an email there may not be much for you in there as far as productivity is concerned but for someone else [there is]. Or it can mean productivity for you but not productivity for the other person”* (P18).

This quote implied that certain behaviour can be counterproductive – while certain strategies make the user productive it can make others unproductive or vice versa.



#### 5.2.4 ICT self-discipline

ICT self-discipline was defined as *the extent to which an individual can regulate his/her behaviours towards ICTs*. The concept of self-discipline emerged during the focus group discussions and led to the review of literature on self-control and self-discipline (Table 5-4).

Table 5-4. Theories/Concepts Related to ICT Self-Discipline

Theory/concept	Key focus
Self-control (Freud, 1911, 1959)	The notion of delaying instant gratifications to reach larger alternative goals.
Self-Regulation Theory (Baumeister & Vohs, 2007)	The theory posits that individuals place effort in controlling what they think, say and do.
Self-Determination Theory (Deci & Ryan, 2000)	The theory is concerned with supporting intrinsic tendencies to behave in healthy ways.
General Theory of Crime (Gottfredson & Hirschi, 1990)	The theory suggests that criminals with lack of self-control are more likely to commit crime.

Self-control in psychology was recognized by Freud (1911, 1959) as the pleasure-principle and the reality-principle. The pleasure principle referred to the desire for immediate gratification, for instance teenagers buying a videogame. The reality principle is established in the process of growing up and realising the need to accept delaying gratification because of certain obstacles. From then, self-control came to refer to “an individual's decision or ability to delay immediate gratification of desires in order to reach larger alternative goals” (Baker, 2011, pg. 266). Individuals with high self-control are said to be better at regulating impulsive behaviours and therefore better at delaying gratifications (Baker, 2011; Tangney, Baumeister & Boone, 2004). Thus, this notion was a reflection of an individual's abilities to regulate behaviours – similar to the explanations made during the focus groups.

Such control is also evident in the Self-Regulation Theory (Baumeister & Vohs, 2007). The theory posits that individuals place effort in controlling what they think, say and do. Soror and Davis (2014) suggest that self-control is the conscious subset of self-regulation.

Similarly, the Self-Determination Theory (SDT) by Deci and Ryan (2000) is concerned with supporting intrinsic tendencies to behave in healthy ways. Van den Broeck, Vansteenkiste, De Witte, Soenens and Lens (2010) distinguish the

key difference between the concept of self-control in SDT and in organisational studies. They suggest that SDT is more concerned with the subjective experience hence it focuses on internal feelings as opposed to the behaviours themselves.

Self-control is also a very large component of the General Theory of Crime, which suggests that criminals with lack of self-control are more likely to commit crime (Gottfredson & Hirschi, 1990). Self-control is evident “...when there is an optimal fit between self and environment, and this fit can be substantially improved by altering the self to fit the world” (Tangney et al., 2004, pg. 272).

The notion of self-control has previously reflected an individual’s self-discipline in health studies, education and social life (Cook et al., 1998; Gottfredson & Hirschi, 1990; Wolfe & Johnson, 1995). The notion has been used in health studies, investigating alcohol (Cook, Young, Taylor & Bedford, 1998), in education, exploring the effect of personality on grade point average of university students (Wolfe & Johnson, 1995) and in social life, assessing individuals’ abilities to save money and not spend it (Romal & Kaplan, 1995). In all these studies, high self-control was associated with positive outcomes.

To synthesise, ICT self-discipline in this research was adopted from the concept of self-control, the work of Tangney et al. (2004) and the General Theory of Crime (Gottfredson & Hirschi, 1990). As discussed in earlier sections of this chapter, the notion’s name was changed from *control* to *discipline* to best reflect its description in this research.

In this research, control was viewed as a notion concerned with the power or guidance or authority an individual places in his/her life. Control can provide guidance for behaviours and can be seen as an artefact. It can imply two sides of a spectrum – a situation is under control, or it is not.

On the other hand, in this research, discipline was viewed as a notion concerned with the choices an individual made. Discipline was seen as the *doing* of the behaviours guided by control. Thus, discipline was portrayed as a behavioural notion.

Given that the notion in this research was concerned with regulating behaviours towards ICTs, it made sense to adopt a label that implied behavioural intentions. Additionally, the term *self-discipline* was considered as opposed to *individual-control* or *self-control* to avoid misconception with other control-related definitions that imply cognitive and emotional motivations which sit outside scope of this research (Deci & Ryan, 2002; Rotter, 1954). In support of these views, the insights shared during the focus groups confirmed that using the term *discipline* was a more appropriate way of reflecting the phenomenon. The acronym ‘ICT’ was placed before ‘self-discipline’ so that the context of the phenomenon was made clear.

Furthermore, Tangney et al. (2004) developed the self-control scale to capture an individual’s self-control. Their scale was comprised of five different components, one of which was discipline. The component of discipline sought the individual’s ability to regulate their behaviours with habits – similar to the definition of ICT self-discipline investigated in this research. Thus, the structure of the scale gave confidence to view discipline as one of the underlying concepts defining self-control.

As a result, it seemed more appropriate to name the notion ICT self-discipline to best reflect the notion described by this research and by the participants.

It is important to note that ICT self-discipline in this research focused on how disciplined employees were when using ICTs, regardless of whether the decisions were consciously or subconsciously made (Soror & Davis, 2014).

Discussions during interviews and focus groups exemplified the importance of ICT self-discipline in the context of ICT connectivity. For example: “*you see now [during interview] I’ve got the phone on silent. That’s the thing with ICT’s I’ve got control over it, I can choose when I want to look at my emails and that’s the good things about it*” (P1). The data also showed the influence of self-discipline in the context of ICTs, for example: “*the biggest problem with ICTs is the disruption, if you can ignore it then there’s no way you will have a negative effect*” (P5).

There are several strategies that individuals have in place to manage ICTs. Firstly, research shows that individuals' behaviours of technology use stem from obsessive and compulsive behaviours and addiction such as the need to continuously check or use ICTs, even when not needed (Mazmanian et al., 2006; Towers et al., 2006).

Secondly, studies on technology use suggest that individuals use filtering mechanisms, response mechanisms (whether or not to respond to incoming exchanges), and personal information management techniques that show their conscientious, or organised and well-disciplined personalities (Dabbish & Kraut, 2006; Malone et al., 1987; Mazmanian, 2013; Perlow, 2012; Shirky, 2008).

One's ability to regulate gratifications and impulsive behaviour shows self-discipline and demonstrates high self-control (Baker, 2011; Tangney et al., 2004). If individuals were able to regulate their impulsive behaviours and regulate gratifications in the context of ICT use, they should experience a more positive outcome. These behaviours are all a reflection of an individual's self-discipline with the use of ICTs, similar to Freud's notion of self-control (1911, 1959) and the General Theory of Crime (Gottfredson & Hirschi, 1990). Therefore, the following research hypothesis was proposed:

**H3a:** *ICT self-discipline moderates the effect of ICT connectivity on individual work productivity.*

Furthermore, generally high levels of self-control "would effectively predict positive outcomes across a variety of life domains" (Tangney et al. 2004, pg. 272). For instance, to predict positive outcomes, the notion of self-control has been used in health studies, investigating alcohol (Cook et al., 1998), in education, exploring the effect of personality on grade point average of university students (Wolfe & Johnson, 1995) and in social life, assessing individuals' abilities to save money and not spend it (Romal & Kaplan, 1995). High scores with self-control were related to higher grade point average, fewer reports of psychopathology, higher self-esteem, less binge eating and alcohol abuse, better relationships and interpersonal skills, secure attachment and more ideal emotional responses. All

these studies showed that individuals with high self-control had more effective outcomes. Therefore, the following research hypothesis was proposed:

**H3b:** *ICT self-discipline will influence individual work productivity.*

### **5.2.5 Research domain**

It is important to carefully identify the research domain to highlight in which situations the suggested research model holds (Hinkin, 1998).

First, the individuals assessed in this research were employees from New Zealand organisations who required the use of ICTs to perform their job. This research model would not be applicable to individuals that do not require the use of ICTs to perform their work. It may also not be applicable to cultures dissimilar to the New Zealand context.

Second, the context of this research was concerned with the use of ICTs at work. Using ICTs for non-work-related matters was not investigated and therefore was not reflected in the research model.

Third, based on the review of the literature on the notion of ICT connectivity, employees are always connected to ICTs. What changes is the employee's *level* of ICT connectivity. Therefore, this research acknowledges that ICT connectivity will always exist for an employee, but can vary.

Fourth, based on the review of the literature on the notion of ICT self-discipline, employees are always applying discipline during a typical work-day. What changes is how strict or lenient an employee is when managing information flow through ICTs. Therefore, this research acknowledges that ICT self-discipline will always exist for an employee.

Fifth, it is necessary to highlight the difference between ICT connectivity and ICT self-discipline and note that they seek two different notions. The notion of ICT connectivity indicates to what extent an individual is connected to ICTs. It explains the employee's condition. On the other hand, ICT self-discipline is

concerned with the behaviours an individual performs to manage ICTs. It reflects an employee's availability and not necessarily their connectivity. Thus, in this research, if an employee has a low level of ICT connectivity it does not imply that their ICT self-discipline will not exist. This research does not assign a correlation between the two notions.

The following section summarises the key points discussed in this chapter.

### **5.3 Chapter Summary**

The purpose of this chapter was to explain the steps taken to modify the research model from chapter four into a testable form. The chapter began by providing an overview of the steps involved in refining the research model. Then, the research model validation and confirmation steps were discussed. The final version of the research model was then presented in its testable form. The findings from this phase acted as a basis for the third phase of this study.

The following chapter explains the quantitative phase, which builds a survey instrument to test the updated research model developed in this chapter.

## **6 Quantitative Phase**

The purpose of this chapter is to explain the steps taken during the quantitative phase of this research. The chapter begins by introducing the data gathering method in this phase. The survey instrument development process is then explained. To follow, the survey instrument validation steps are discussed. The survey instrument design and pre-test results are explained before the survey instrument refinements are explained. Lastly, the survey instrument distribution and results are discussed before the key points of this chapter are highlighted in the chapter summary. The chapter outline is summarised below:

- 6.1 Data Gathering Method
- 6.2 Survey Instrument Development
- 6.3 Survey Instrument Validation
- 6.4 Survey Instrument Design and Pre-Test
- 6.5 Survey Instrument Refinement
- 6.6 Survey Instrument Distribution and Results
- 6.7 Chapter Summary

### **6.1 Data Gathering Method**

The purpose of the quantitative phase was to achieve the third research objective:

RO3: to investigate the influence of ICT self-discipline on the relationship between ICT connectivity and individual work productivity.

The nature of this research objective required assessing relationships amongst ICT connectivity, individual work productivity and ICT self-discipline. In order to be addressed, research objective RO3 required a data gathering method that allowed for quantifiable descriptions of the relationships being tested.

Surveys are a common data gathering method used in IS research studies that are concerned with validating research models (Gefen & Straub, 2005; Venkatesh et al., 2013).

The survey results provide quantitative descriptions from a representative sample of a population that describe the validity (or not) of hypothesized statements. These results can be generalized for the entire population being studied (Creswell, 2008).

To address research objective RO3, an online survey was developed and used to test and validate the proposed research model presented in chapter five (Gefen & Straub, 2005; Hinkin, 1998; Straub, 1989). Online surveys allow for speed and timeliness, the ability to obtain large samples, ease of data entry and analysis and they provide complete answers through software features such as notifying participants to provide answers for questions with a required response (Evans & Mathur, 2005). The speed, timeliness and ease of data entry and analysis of the online survey meant that the quantitative phase could be carried out within the project timeline. Further, the benefit of having access to large data samples and complete answers through an online survey meant that there would be added accuracy in the generalized findings.

The remaining sections of this chapter will explain the survey development, validation and refinement. The results of the online survey will be discussed later in this chapter.

## **6.2 Survey Instrument Development**

The purpose of this section is to first explain the instrument development process, then to present the initial pool of items for each construct and lastly to discuss the instrument design. Each of these are discussed in detail below.

### ***6.2.1 Instrument development process***

According to Hinkin (1998), one of the key steps necessary prior to developing survey instruments is to specify the research domain. Chapter five provided an explanation of the finalised research model constructs and established the research domain. The next step was to generate items to represent the research constructs within that domain (MacKenzie et al., 2011).



To assist in developing the items to reflect the research model, Moore and Benbasat's (1991) guide to item creation was used:

- 1) examine literature,
- 2) purify/create new items where necessary,
- 3) develop scales for items.

First, literature related to the research topic was examined to seek existing items that reflected the research model (Hinkin, 1998; Mitra et al., 2011; Moore & Benbasat, 1991; Pinsonneault & Kraemer, 1993). Careful consideration took place when potential items were reviewed. It was ensured that the items aligned well with the research constructs in the research model. As a result of the analysis of literature, the items were drawn from disciplines including Organisational Studies, Communications, IS and Psychology. Beginning with pre-existing items in this manner allows the researcher to work with pre-tested items, saving time and providing reliable items. This is considered as an efficient step in item development (Boudreau, Gefen & Straub, 2001).

A pool of items for each construct was put together based on their reliability. According to Churchill (1979), the Cronbach alpha coefficient needs to be assessed when evaluating the quality of an instrument. The Cronbach alpha coefficient is a statistical value that indicates the reliability (or internal consistency) of a set of items (more on this is discussed in upcoming sections). Thus, when developing the pool of items for the survey instrument in this research, it was ensured that the borrowed items had high Cronbach alpha coefficients.

Second, items were purified to suit the context of the study (Moore & Benbasat, 1991). In turn, some items that were used were re-worded where necessary. New items were also added to constructs that were not covered in the literature review (Moore & Benbasat, 1991). New items were added to ensure that the constructs were fully reflected. Items that were outside the scope of the research were not used.

Dillman, Smyth and Christian (2008) suggest guidelines for choosing and forming items in a survey instrument. For instance, items should:

- 1) apply to the respondent,
- 2) be technically accurate,
- 3) ask one thing,
- 4) use simple and familiar words,
- 5) use specific and concrete words to specify concepts clearly,
- 6) use as few words possible to pose the question,
- 7) use complete sentences with simple sentence structures.

Further, Hinkin (1998) suggests that items should be as short as possible and the language used should be familiar to target respondents. Additionally, to avoid confusion, researchers should avoid “double-barrelled” items that seek more than one issue. In some cases, reverse-coded items are used to reduce bias, however, they need to be clear and not add confusion (Dillman et al., 2008; Price & Mueller, 1986). All the items in this research were assessed according to these criteria.

There is no hard-and-fast rule about how many items to have in an instrument (Hinkin, 1998). However, it is suggested that keeping it short is an effective way of minimizing boredom and/or fatigue by participants, which can help avoid a low response rate. Bagozzi and Baumgartner (1994) suggest that it is sufficient to measure a construct with between three and eight items. Although keeping the number of measurement items short is beneficial, it is only on the basis that each construct is adequately sampled (Churchill, 1979). These suggestions were used as a benchmark when survey items were re-worded or created.

Third, scales were developed for each item in the survey instrument (Moore & Benbasat, 1991). Likert-type scales are the most frequently used in survey instruments (Hinkin, 1998). Particularly, 7-point scales are useful to ensure variance on a measure. Using a smaller scale (i.e. 5-point) runs the risk of introducing excessive bias in the survey results (Figure 6-1).

7-point Likert Scale						
1	2	3	4	5	6	7
Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
5-point Likert Scale						
1	2	3	4	5		
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree		

Figure 6-1. Likert Scales

For example, individuals performing frequent and common behaviour such as using ICTs would most likely choose the higher end of a short scale, hence there will be less accuracy and variety in the results. On the other hand, fewer categories in a scale can help reduce the cognitive load for the participant that is involved in providing a response. According to Dillman et al. (2008), a scale needs to be long enough to represent the entire continuum of possible answers but without so many options that may burden the respondents or that the difference between any two categories becomes so small that it is meaningless.

A 7-point Likert scale was used initially for all the items for the following reasons (Hinkin, 1998):

- 1) a 7-point scale would provide more accurate data since the construct behaviours are frequently performed,
- 2) generally, 7-point scales provide accurate benchmarks, which were necessary to obtain variance in the data,
- 3) the constructs in the conceptual research model were mostly new and required explicit measures,
- 4) all items used the same scale to remain consistent and minimise confusion for the participants.

The results from the qualitative phase and the model refinement phase indicated that the constructs being measured in this research were reflective and perceptual in nature. For instance, job requirement for ICT connectivity was portrayed as a concept defined by the variety of tasks employees accomplished each day (i.e. administrative, high-focus, managerial etc.).

ICT connectivity was not defined objectively by the number of calls or emails received by an individual, instead it was defined by the individual depending on his/her perception towards their daily encounter with ICTs. Individual work productivity was viewed as a perception of how much work was accomplished. Similarly, ICT self-discipline was also a perception reported by the individual him- or herself on the different strategies they adopted to manage their ICTs. Thus, all items selected to cover the constructs were perceptual and reflective in nature, meaning that any changes in the construct would cause change in the items themselves (Polites, Roberts & Thatcher, 2012).

In total, three rounds of proof reading occurred to ensure the items clearly reflected the respective construct definitions. Throughout the process of initial item development, senior IS scholars formally reviewed draft versions of the items. This took place to maximise comprehension and avoid measurement error of items (Dillman et al., 2008). This also achieved content validity to ensure the items represented the constructs being measured (Straub et al., 2004). Boudreau et al. (2001) suggest that a combination of methods (i.e. assessing the Cronbach alpha *and* expert review) can assist in item reliability.

The following section presents the construct items that went through the instrument development process mentioned above.

### **6.2.2 Initial items for research constructs**

This section explains the item development for job requirement for ICT connectivity, followed by ICT connectivity, individual work productivity and ICT self-discipline.

***Job requirement for ICT connectivity.*** In this research, job requirement for ICT connectivity was defined as *the extent to which an individual requires the support of ICTs to perform his/her job.*

The concept for 'need' or 'requirement' was investigated by Scornavacca (2010). In his study, eight items are used to reflect individuals' perceived need to connect to mobile IS to support his/her portfolio of tasks. Similarly, Leung (2011) sought

an individual's need to use ICTs for work at home, however, he developed one item using a simple closed ended (yes or no) question. Leung (2011) associated this item as a reflection of centrality of ICTs in an individual's life.

Zhu & He (2002) also investigated the perceived need of the Internet in China. They proposed six items to reflect whether media types satisfied users' needs. Although the items sought to explain whether media types allowed for satisfaction of needs post-ICT connectivity as opposed to pre-ICT connectivity, the authors still offered a highly useful set of items that can be used to seek the requirement to connect to ICTs in the work context. These items are presented in Table 6-1.

The sample population for this research included individuals that required the deployment of ICTs in their jobs. To distinguish differences amongst the sample and have variance, words like "highly" were used to separate those that only partially required ICT connectivity from those who required ICT connectivity consistently during their workday. Using words like "highly" reflected the most 'extreme' case and prevent respondents from selecting higher ratings, reducing bias in results.

Table 6-1. Job Requirement for ICT Connectivity Items from the Literature

Source	Item	Scale
Perceived need of mobile IS alpha = 0.95 (Scornavacca, 2010)	<i>My everyday work tasks require...</i>	7 point Likert-type  1 = Strongly disagree 7 = Strongly agree
	A high level of support by a Mobile Information System.	
	Me to rely on a Mobile Information System.	
	Me to frequently use a Mobile Information System.	
	Me to frequently need the support of a Mobile Information System.	
	I frequently need to send, receive, retrieve and consult information via a Mobile Information System in order to meet my work obligations.	
	I frequently have to use a Mobile Information System in order to meet my work obligations.	
	I cannot perform most of my work tasks without the support of a Mobile Information System.	
	I frequently need to have access to information via a Mobile Information Systems while on the go in order to meet my work obligations.	
Requirement to use ICTs alpha = 0.90 (Leung, 2011)	Does your job require you to use the following traditional media at home: reading a newspaper, watching TV, and watching TV news?	For each mode of communication: 0 = no 1 = yes
Perceived need for Internet alpha = 0.74 (Zhu & He, 2002)	<i>How much do you feel that the newspaper, radio, television, movie and other conventional media you use have satisfied your following needs...</i>	5 point Likert-type  1 = Completely dissatisfied 5 = Completely satisfied
	Learn domestic and international news events.	
	Get information for personal needs (e.g., shopping, traveling, investment, health, etc.).	
	Get information for work/study (e.g., finding a job, finding a school, improving work-/study-related knowledge and skills, etc.).	
	Get entertainment or personal hobbies (e.g., play games, listen to radio, sports news).	
	Express personal views and opinions on public affairs.	
	Enhance personal relations (e.g., meeting new friends, maintaining existing relationships).	

Items from Scornavacca (2010) were adapted where there was relevance to the context of this study. For instance, items about requiring ICTs were relevant, but items related to the “use” specifically (i.e. “my job requires me to frequently have to use ICTs”) did not seem useful. This is because job requirement for ICT connectivity sought to understand the support of ICTs in the individual’s job and not necessarily the use of ICTs. This was supported by the outcome of one of the items-review iterations, where experts removed “use” measures from job requirement for ICT connectivity. Items from Leung (2011) and Zhu and He (2002) were also adapted to emphasize the “need” and “requirement” component of this construct.

Further, items by Leung (2011) and Zhu and He (2002) were specific with which tasks the ICTs provided support for. This encouraged the inclusion of an item for this construct that was task specific. However, instead of breaking down the possible tasks an employee required ICT support for, the term “communicate” was used to cover the variety of tasks employees performed.

A total of eight items were used to represent job requirement for ICT connectivity. Each of those items used a 7-point Likert scale. The items that best reflected job requirement for ICT connectivity are summarised in Table 6-2.

Table 6-2. Initial Items for Job Requirement for ICT Connectivity

Code	Item	Adapted from
JR01	My job always requires the support of ICTs.	(Leung, 2011; Scornavacca, 2010)
JR02	My job always requires me to rely on ICTs.	(Scornavacca, 2010)
JR03	My job always requires me to communicate via ICTs.	(Scornavacca, 2010; Zhu & He, 2002)
JR04	I cannot perform my job without the support of ICTs.	(Scornavacca, 2010)
JR05	I can perform my job with minimal support from ICTs.	(Scornavacca, 2010)
JR06	I must have the support of ICTs to perform my job.	(Scornavacca, 2010)
JR07	It is critical that I use ICTs to perform my job.	(Leung, 2011; Scornavacca, 2010)
JR08	My job requires minimal support from ICTs.	(Scornavacca, 2010)

*Note.* Job requirement for ICT connectivity = the extent to which an individual requires the support of ICTs to perform his/her job.

**ICT connectivity.** ICT connectivity in this research was defined as *the extent to which an individual is connected to ICTs*. The literature review on this notion suggested that little previous research has measured the phenomenon of ICT connectivity. That may be the reason why it has been suggested by Kolb et al. (2012) that continued development of metrics within this field should be developed.

Findings from the qualitative phase and the model refinement phase suggested that ICT connectivity was comprised of two main components, including time spent connected and ubiquity of ICTs. Thus, to assist in developing items for this construct, this research assessed studies that investigated the concept of connectivity itself and studies on the way employees behaved with ICTs at work. Although this study was not particularly concerned with measuring ICT

connectivity through typical use measures, the literature on use measures still provided useful insights useful for framing the items to capture ICT connectivity.

In general, connectivity in Stephens' study (2012) was a sub-component of availability. On the other hand, Leung (2011) examined connectivity in terms of overall connectedness. Both of these studies were considered to assist in framing the items reflecting ICT connectivity in this research.

To capture the time spent being connected, Leung (2011) used the ICTCI to assess the frequency of times an individual used ICTs. Ou and Davison (2011) also investigated the use of instant messaging in organisations. They explained use as work-related contact to answer questions, share files and engage in work-related socialization.

By reviewing the ubiquity of ICTs at work, Stephens (2012) captured the effect of multiple conversations during organizational meetings. She examined the notion of being available in meetings, including an individual's reachability, connectivity and overall availability. These items successfully captured the extent to which individuals were available to others during meetings. The items reviewed for this ICT connectivity in this research are presented in Table 6-3.



Table 6-3. ICT Connectivity Items from the Literature

Source	Item	Scale
Availability (Stephens, 2012)	<i>How often do you use communication technologies during meetings to...</i>	7 point Likert-type  1 = Strongly disagree 7 = Strongly agree
	Allow me to remain available to others even when I am in a meeting.	
	Be reachable during a meeting.	
	Be connected to others during a meeting.	
	Be within reach if others need me during a meeting.	
Intensity and scope alpha = 0.78 (Leung, 2011)	How often do you use the following ICTs (e-mail, IM, chat rooms, blogs, web surfing, and on-line news) to do office work at home?	4 point scale 1 = never 2 = seldom 3 = sometimes 4 = often
	Besides e-mail, do you use IM, chat rooms, blogs, Web surfing, and on-line news to do office work at home?	For each activity 0 = no 1 = yes
Usage (Ou & Davison, 2011)	I often use IM tools to contact other people for my work.	7 point Likert-type  1 = Strongly disagree 7 = Strongly agree
	I regularly use IM tools to communicate with colleagues or customers in my daily work.	
	The frequency of usage of IM tools to do the following things in my daily work is...	
	Ask questions. Answer questions. Share files. Work-related socialisation.	

To capture the amount of time spent connected to ICTs, the intensity component of the ICTCI was used as a guide and a new item was developed focusing on being connected the entire day. This item purposely avoided quantifying the amount of time spent as its interpretation could confuse the respondent. For instance, it may be challenging for a participant to propose a percentage of the day that they are connected to ICTs.

To best reflect the construct of ICT connectivity, items specific on availability and reachability were not adopted. In the context of this research, such behaviours are reflected post ICT connectivity or they are a result of ICT connectivity. For instance “I use ICTs to be reachable during a meeting” is a result of an individual who is already connected. If that same individual were disconnected then he/she would not be reachable. In this research, ICT connectivity is what sets the potential to communicate through ICTs. Therefore, it seemed more appropriate to incorporate measures on the device ubiquity, scope of ICTs and the time being connected – these facilitate behaviours such as availability and reachability.

The concept of ubiquity as defined in the literature was used to assist in developing items that capture device ubiquity. Ubiquity is defined as a state of being everywhere at once (Siau, Sheng & Nah, 2003). Thus, a new item was developed deriving from the definition of ubiquity itself, ensuring the *everywhere* component of ICT connectivity was covered in this research, as suggested by the findings from the interviews and focus groups.

ICT connectivity was also given “overall” items to capture an overall view of the construct. This overall view of ICT connectivity was indicated by the findings from the qualitative phase and the model refinement phase. It was noted during these phases that employees compared their level of ICT connectivity to their colleagues in order to articulate their own level. Therefore, this approach of using comparison was considered when developing the items for this construct.

Words like “often” and “usually” were not used as they have the tendency to cause vagueness and lead to problems in answering (Tourangeau, 2000). Additionally, the word “communicate” was used to replace “work-related contact to answer questions, share files and engage in work-related socialization.” Making items simpler is encouraged during the phase of item development (Dillman et al., 2008).

There was a total of six items reflecting ICT connectivity. Each of those items had a 7-point Likert scale (this was justified previously on pg. 112 onwards). The initial pool of items for ICT connectivity is summarised in Table 6-4 below.

Table 6-4. Initial Items for ICT Connectivity

Code	Item	Adapted from
ICTC01	I spend my entire work-day connected through ICTs.	(Leung, 2011)
ICTC02	During a typical work-day all my communication through ICTs are work-related.	(Leung, 2011; Ou & Davison, 2011)
ICTC03	During a typical work-day I always have my ICTs with me everywhere I go.	(Siau et al., 2003; Stephens, 2012)
ICTC04	Compared to my work colleagues I rate myself to be very connected through ICTs.	Qualitative phase, model refinement phase
ICTC05	My work colleagues expect me to connect to many more ICTs.	Qualitative phase, model refinement phase
ICTC06	I perceive myself to have a high level of ICT connectivity in the workplace.	Qualitative phase, model refinement phase

Note. ICT connectivity = the extent to which an individual is connected to ICTs.

***Individual work productivity.*** Individual work productivity in this research was defined as *the extent to which an individual perceives themselves to have accomplished the expected work during a typical work-day*. As indicated in chapter two (section 2.2), individual work productivity is commonly investigated in IS research, yet it can be defined in varying manners, sometimes referred to as performance or productivity. Belanger, Collins & Cheney (2001) state "performance is often confused with productivity, but it is actually measured by more global variables such as the quality of outputs, job knowledge, leadership, or judgement" (pg.160). What this suggested was that to seek performance required a more rigorous attempt, whereas "productivity is the ratio between inputs and outputs" (Belanger et al., 2001, pg. 159). This research focused on individual work productivity and not performance.

Torkzadeh and Doll's items for productivity (1999) have been commonly used or adapted in IS research investigating the impact of technology on individuals (Tarafdar et al., 2007; Yun et al., 2012). Their 3-item scale seeks the perceived impact of IT on work (for employees). Particularly, it seeks the improvement of the input/output ratio after technology adoption.

Using a similar set of items, Tarafdar et al. (2007) use a four-item scale to measure individual productivity in the context of technostress. Again these items assessed the degree of improvement in work that technologies provided employees.

Adapting the items above, Yun et al. (2012) developed a four-item scale to capture enhanced productivity in the context of smartphones. Acceptable alpha figures for these measures were returned, which indicated a reliable set of items to borrow for this study. These items are presented in Table 6-5.

Table 6-5. Individual Work Productivity Items from the Literature

Source	Item	Scale
Productivity alpha = 0.79 (Yun et al., 2012)	The work use of a smartphone helps to improve the quality of my work.	5 point Likert-type  1 = Strongly disagree 5 = Strongly agree
	The work use of a smartphone helps to improve my productivity.	
	The work use of a smartphone helps me accomplish more work than would otherwise be possible.	
	The work use of a smartphone helps me to perform my job better.	
Productivity alpha = 0.90 (Torkzadeh & Doll, 1999)	This application saves me time.	5 point Likert-type  1 = Strongly disagree 5 = Strongly agree
	This application increases my productivity.	
	This application allows me to accomplish more work than would otherwise be possible.	
Productivity alpha = 0.92 (Tarafdar et al., 2007)	This technology helps to improve the quality of my work.	5 point Likert-type  1 = Strongly disagree 5 = Strongly agree
	This technology helps to improve my productivity.	
	This technology helps me to accomplish more work than otherwise would be possible.	
	This technology helps me to perform my job better.	

Because individual work productivity was the dependent variable in this research, it required solid grounding. To ensure this, Torkzadeh and Doll's (1999) items on productivity were used – not only were they reliable (alpha = 0.90) but they had been successfully used in previous research (Tarafdar et al., 2007; Yun et al., 2012). Although the items reflected task productivity, they assessed the phenomenon at the individual level, which made it suitable for this research.

A lot of work in IS tends to assess an improvement of individual productivity or performance (Karr-Wisniewski & Lu, 2010; Tarafdar et al., 2007; Torkzadeh & Doll, 1999). However, in these studies the authors compared the results of pre- and post-use of technology. For instance, Torkzadeh and Doll (1999) define productivity as the extent that an application improves the user's output per unit of time. They assess the impact of technology whilst asking participants to compare their previous experience at work with their existing technology driven work environment. This comparison allows for the researchers to capture the perceived "enhancement" in individual productivity induced by technology.

The key difference between such measures of productivity in literature and productivity in this research was, firstly, that this study did not seek productivity

induced by ICTs, it sought a general perception of work accomplishment. Secondly, this study did not seek the “enhancement” of work outputs, instead it asked for a perceived overview. This is important to note because some participants during the qualitative phase found it difficult to compare their experiences with ICTs to report whether their productivity had improved or not. For instance, some did not necessarily have enough work experience to assess the change in their productivity. In other cases participants had always used ICTs in the workplace and therefore did not have a large enough change in their work environment to be able to make a comparison. Thus, it seemed easier for participants to reflect on their recent productivity as opposed to thinking back to a particular time and comparing (Griffin, 2013).

Torkzadeh and Doll’s (1999) items were used by Tarafdar et al. (2007), which were then borrowed by Yun et al. (2012). However, these authors included quality and performance as a component of productivity. Items on the quality or performance were outside of the scope of this construct and therefore were not included in the items. This research viewed quality as a component of performance, which exceeded the notion of productivity (Belanger et al., 2001).

As a result, the initial pool of items on productivity from literature was re-worded to align with the context of this study. There was a total of five items reflecting individual work productivity. Each of those items had a 7-point Likert scale (this was justified previously on pg. 112 onwards). The items are summarised in Table 6-6 below.

Table 6-6. Initial Items for Individual Work Productivity

Code	Item	Adapted from
IP01	In a typical work-day I always accomplish the work I had expected to achieve.	(Tarafdar et al., 2007 Torkzadeh & Doll, 1999; Yun et al., 2012 )
IP02	In a typical work-day I always accomplish my work within the time allocated for it.	
IP03	In a typical work-day I am always productive.	
IP04	In a typical work-day I always accomplish more work than I had expected to achieve.	
IP05	In a typical work-day I do not accomplish the work I had expected to achieve.	

*Note.* Individual work productivity = the extent to which an individual perceives themselves to have accomplished the expected work during a typical work-day.

**ICT self-discipline.** ICT self-discipline in this research was defined as *the extent to which an individual can regulate his/her behaviours towards ICTs*. The concept of ICT self-discipline in this research was influenced by Tangney et al.'s work (2004) on self-control, which stems from the General Theory of Crime. Through assessing several existing self-control scales they developed a 36-item scale to explain an individual's self-control within the context of grade point average, adjustment (psychopathology, self-esteem), binge eating and alcohol abuse, relationships and interpersonal skills, attachment and emotional responses.

To further assess the self-control scale, additional statistical analysis was retrieved from the authors of the paper (Tangney et al., 2004). The scale comprised of five components to reflect self-control. The five components included discipline, deliberate/non-impulsive behaviours, habits, work ethic and reliability.

The 36-item scale (total self-control scale) was tested for internal consistency and reliability and yielded what the authors refer to as "good" results. The total self-control scale was also reduced to a 13-item measure (brief self-control scale) to assess self-control briefly without being specific to context. In two studies, the brief self-control scale correlated 0.93 and 0.92 with the total self-control scale. Thus, the brief self-control scale was seen to cover the same range of content as the total self-control scale.

When the brief self-control scale was tested in two studies, the reliability of the items received an alpha of 0.83 and 0.85 in studies one and two respectively. The brief self-control items are presented in

Table 6-7.

Table 6-7. ICT Self-discipline Items from the Literature

Item	Scale
I am good at resisting temptation.	5 point Likert-type 1 = Not at all 5 = Very much alpha = 0.83
I have a hard time breaking bad habits.	
I am lazy.	
I say inappropriate things.	
I do certain things that are bad for me, if they are fun.	
I refuse things that are bad for me.	
I wish I had more self-discipline.	
People would say that I have iron self-discipline.	
Pleasure and fun sometimes keep me from getting work done.	
I have trouble concentrating.	
I am able to work effectively toward long-term goals.	
Sometimes I can't stop myself from doing something even if I know it is wrong.	
I often act without thinking through all the alternatives.	

*Note.* Brief Self-Control Scale by Tangney et al. (2004).

The brief self-control scale was used for this research instead of the total self-control scale. This was because a shorter measurement instrument can increase the response rate of a survey on the basis it adequately samples the construct (Churchill, 1979; Hinkin, 1998). The brief self-control scale was proven to yield similar results to the total self-control scale, making it just as accurate. Further, the brief self-control scale had a sufficient alpha, which meant it was reliable.

Further, the focus of the items in the brief self-control scale aligned with the notion of ICT self-discipline in this research. The brief self-control scale was adopted in this research because it mainly comprised of items reflecting discipline and habits. There were two items in the brief self-control scale that reflected deliberate/non-impulsive behaviours and work ethic. Section 5.2.4 in chapter five explained that the literature on the use of ICTs and the findings from the focus groups collectively supported that discipline, impulsive behaviours and habits were related to how employees dealt with ICTs for work. Therefore, it seemed appropriate to adopt the brief self-control scale to capture the notion of ICT self-discipline in this research.

Because ICT self-discipline was a newly developed construct, the entire brief self-control scale by Tangney et al. (2004) was used as a guide and refined where necessary as a starting point. Starting with a large set of items meant that the items could comfortably be trimmed down if necessary during item validation.

Findings on ICT self-discipline from the qualitative phase and the model refinement phase were used to guide the translation of the brief self-control scale (original scale) into ICT self-discipline items. Words used in the original scale were changed if they caused confusion. It is generally recommended that ambiguous terms should be clarified, simplified and made more specific to the context (MacKenzie et al., 2011).

Three new items were developed to reflect ICT self-discipline in this research. The first item was to seek an individual's overall ICT self-discipline. The second item was to question the individual's assessment of alternative methods of communication as suggested by qualitative phase findings (e.g. *"If it's a matter from the colleague on the project [and] if it [email] is too long, longer than two paragraphs I think it needs to be verbally exchanged"* P8). The third item was added to reflect the original item 'I have trouble concentrating' to be more specific. Two items, "I am lazy" and "I say inappropriate things" were not borrowed from the brief self-control scale as they did not fit the context of study.

Although the original items use a 5-point scale, where 1 = not at all and 5 = very much, it seemed appropriate to use the 7-point agree-disagree scale to remain consistent with the remainder of the items in the survey. It also made better sense grammatically to use the 7-point agree-disagree scale when the items were proof-read. There was a total of 14 items reflecting ICT self-discipline in total. The potential pool of items is summarised in Table 6-8 below.



Table 6-8. Initial Items for ICT Self-Discipline

Code	Item	Component of self-control scale adapted from Tangney et al. (2004)
SD01	I am very good at ignoring exchanges through ICTs, even if I am tempted to check them.	Discipline
SD02	I have a very hard time breaking bad habits with ICTs.	Discipline
SD03	It is very hard to stop myself from doing things with my ICTs even if I know they are unnecessary.	Discipline
SD04	I always use my ICTs for fun even if they will have a bad impact on me.	Habits
SD05	I always do things with my ICTs for fun even if they keep me from getting work done.	Work ethic
SD06	I always think about alternative ways to communicate prior to using ICTs.	<i>Qualitative phase, model refinement phase</i>
SD07	I can always regulate my behaviours with ICTs.	<i>Qualitative phase, model refinement phase</i>
SD08	I am always able to refuse exchanges through ICTs that are not immediately relevant.	Habit
SD09	I wish I had more self-discipline when using my ICTs.	Discipline
SD10	People say that I have high self-discipline when using my ICTs.	Habit
SD11	Having the presence of my ICTs makes it difficult to concentrate.	Discipline
SD12	I find it very difficult to concentrate when purposely avoiding checking my ICTs.	Discipline
SD13	I am always able to stay focused and not let ICTs interrupt me.	Discipline
SD14	I always use ICTs without thinking through all the alternative ways to communicate.	Deliberate/non-impulsive behaviours

*Note.* ICT self-discipline = the extent to which an individual can regulate his/her behaviours towards ICTs. Italicised font = not covered in self-control scale.

**Demographic information.** Demographic information was also sought to set the respondents context and assist in explaining the results of the study. Gender, age, culture, organisation type, job type and work experience have all been shown an effect on individuals in the workplace (Leidner & Kayworth, 2006; Yun et al., 2012). Thus, these participant traits were sought at the end of the survey.

The finalised survey instrument consisted of 33 items reflecting the research constructs and seven items for demographic information. The following section discusses the steps taken to validate the survey instrument.

### 6.3 Survey Instrument Validation

Once survey items are generated they need to be evaluated for their content validity (MacKenzie et al., 2011). A summary of the validation steps undertaken during this phase can be found in Appendix E.

According to Straub et al. (2004), content validity seeks to explain to what extent items in an instrument represent the constructs being measured. Thus, it is necessary to ask:

- 1) is the individual item representative of an aspect of the content domain of the constructs?
- 2) are the items as a set collectively representative of the entire content domain of the construct?

(MacKenzie et al., 2011)

To answer these questions, card sorting was used to assist in validating the initial items previously developed. Card sorting is a procedure used to capture whether the items developed reflect the construct they intend to measure (Moore & Benbasat, 1991). The technique asks participants to group items based on what they are seeking and in some cases to provide definitions of what each 'group' is seeking to measure (Davis, 1989; Bracken & Fischel, 2006).

There are two types of card sorting techniques used, open and closed. Open card sorting invites the participants to group items depending on what the participant thinks the items are assessing. The participants must then develop the construct names and definitions for the items that they have grouped. Closed card sorting also invites the participants to group items depending on what the participant thinks the items are assessing. However, in closed card sorting the researcher provides each construct and its definition and asks the participants to match it to the appropriate group of items (Davis, 1989).

In this research there were three rounds of card sorting – pilot, open, and closed card sorting. In all card sorting events it was ensured that participants came from a range of roles to cater for external validity. External validity is a survey design

validation method that is concerned with the extent to which results of a survey can be generalized to other settings (Venkatesh et al., 2013). The following sections explain each of the card sorting steps.

### **6.3.1 Pilot card sorting**

The purpose of the pilot card sorting was to take note of any challenges encountered with the initial items developed. The participants were PhD candidates in Information Systems (IS). In this round of card sorting the participants were asked to:

- 1) read a set of instructions that will be provided for the participants in upcoming card sorting round,
- 2) put items into appropriate groups,
- 3) come up with construct definitions for each group,
- 4) provide feedback on the exercise structure, timing and wording of items.

Prior to commencing the card sorting exercise each item was printed out on a card separately and all cards were shuffled well. Empty cards were provided for the participants to come up with additional construct names if necessary. An instruction sheet indicating the exercise steps was written and proof-read by senior IS colleagues.

The pilot card sorting procedure took place individually with PhD candidates in IS. After the instructions were read by the participant, a trial exercise took place using items not related to the research (see Appendix K). This was to ensure each participant understood the nature of the exercise (Moore & Benbasat, 1991). The pilot card sorting took place once the participant successfully understood the instructions. The participant was then asked to provide feedback on the exercise structure, timing and wording of items.

Items placement analysis is a technique that assesses the overall correct hits of a card sorting exercise (Moore & Benbasat, 1991). It seeks whether the items were placed where they belonged originally. Items placement analysis was carried out

on the results of the pilot card sorting to get an indication of the expected outcomes for the upcoming card sorting exercises. The placement of each item was compared to the original item-construct placement developed in section 6.2.2 (see pg. 116 onwards). Table 6-9 provides a summary of the pilot card sorting items-placement.

Table 6-9. Pilot Card Sorting Items Placement

	ICTC	JR	IWP	SD	Total Hits	Correct Placement
ICTC (6)	25	1	1	2	29	86%
JR (8)	11	27	1	0	39	69%
IWP (5)	0	2	23	0	25	92%
SD (14)	6	0	1	57	64	89%
Overall Hits: 157		Correct Hits: 132		Overall Correct Placement: 84%		

Twenty-five of the ICT connectivity items were placed in the correct group/construct, forming a correct placement of 86%. One of the items was discarded by a participant and was not used in the items placement analysis. This explained why the total hits for ICT connectivity was 29 and not 30 (5 participants multiplied by 6 items).

Twenty-seven of the job requirement for ICT connectivity items were placed in the correct group/construct, forming a correct placement of 69%. One of the items was discarded by a participant and was not used in the items placement analysis. This explained why the total hits for job requirement for ICT connectivity was 39 and not 40 (5 participants multiplied by 8 items).

Twenty-three of the individual work productivity items were placed in the correct group/construct, forming a correct placement of 92%.

Lastly, 57 of the ICT self-discipline items were placed in the correct group/construct, forming a correct placement of 89%. Seven of the items were discarded by participants and were not used in the items placement analysis. This explained why the total hits for ICT self-discipline was 64 and not 70 (5 participants multiplied by 14 items).

Overall, the correct placement of items was 84%, which indicated reliable results (Moore & Benbasat, 1991). This gave confidence for the open and closed card sorting exercises to take place.

To further assess the pilot card sorting results, inter-rater agreement analysis took place. This technique identifies to what extent the participants (or raters) agreed amongst each other (Moore & Benbasat, 1991).

To calculate the inter-rater agreement, each rater (in this case, each card sorting participant) was compared against every other rater. The agreement of items placement was summed up then inserted into an online matrix tool to calculate the Cohen Kappa (<http://graphpad.com/quickcalcs/kappa1/>). The Cohen Kappa is a statistical measure that captures the strength of agreement between raters (Fleiss, Levin & Paik, 2003). A Cohen Kappa value of 0.5, 0.6, 0.7-0.99 and 1 means moderate, good, very good and perfect strength respectively.

The inter-rater agreement of the pilot card sorting is presented in Table 6-10.

Table 6-10. Pilot Card Sorting Inter-Rater Agreement

Raters	Cohen Kappa
1&2	0.685
1&3	0.757
1&4	0.556
1&5	0.773
2&3	0.772
2&4	0.300
2&5	0.781
3&4	0.653
3&5	0.863
4&5	0.607
Average Cohen Kappa	0.675

The average Cohen Kappa, or strength of agreement amongst raters, was 0.675. According to Moore and Benbasat (1991) this is considered a 'good' figure. The result indicated that participants agreed about the placement of items presented in the item-placement analysis. This indicated that there was agreement on the overlap of ICT connectivity and job requirement for ICT connectivity items. To address this, ICT connectivity and job requirement for ICT connectivity items were re-worded to distinguish a greater difference between them.

With regards to feedback on the structure and timing of the pilot card sorting exercise, participants suggested that more time should be given for each participant to perform the exercise. Follow-up interviews with the participants were also recommended so that the participant could make clarifications where necessary.

In terms of naming the research constructs, the job requirement for connectivity was referred to as technology requirement, support or reliance. ICT connectivity was referred to as connectivity or connectedness. ICT self-discipline was referred to as discipline, control or regulation. Individual work productivity was referred to as performance or productivity. Discussions with participants after the end of the pilot card sorting did not indicate the need to make changes to the construct names in the model as the participants saw them to be similar to the ones they had suggested.

In terms of the item wording, some items were restructured to make the point of interest noticeable. For instance, in job requirement for ICT connectivity, all items starting with “I” were changed to “my job” to ensure that the reader understood the focus was on the job as opposed to their own perception solely.

Item ICTCo2 (“During a typical work-day all my communication through ICTs are work-related”) was deleted as it fit better with ICT self-discipline. Item JRo6 (“I can perform my job with minimal support from ICTs”) was deleted as it was found to be repeating other items, which was found to be irritating.

Three new items were developed for ICT self-discipline to better describe the concept according to the discussions with card sorting participants: SD15 (“I always do things with my ICTs for fun even if they disrupt my work-day” reflecting disruption of ICTs), SD16 (“I always use ICTs for work-related matters” adapted from ICTCo2 to show ability to separate work from life) and SD17 (“While at work, I only use ICTs for work related matters” related to SD16 to see which worked best in upcoming card sorting rounds).

Changes were made accordingly and in total there were 34 items. The updated set of items was reviewed by two IS scholars before moving on to open card sorting.

### **6.3.2 Open card sorting**

An open card sorting exercise was conducted individually with five professionals that were potential members of the research sample (see Table 6-11). A variety of individuals (in terms of roles, gender and age) were approached to remain consistent with previous data gathering methods and to also cover a wide sample.

Table 6-11. Open Card Sorting Participants

Role	Age	Gender
Senior software developer	31	Male
Project Manager	23	Male
Lecturer	40+	Female
Security & Privacy Manager	40+	Male
Judge's Clerk	26	Female

The group consisted of a software developer, a project manager, a lecturer, a security and privacy manager and a judge's clerk. The differences in these roles meant that a range of perceptions were included during the open card sorting. This was to ensure the phenomena were simplistic enough to be understood over a wide range of industries. Overall, the open card sorting group of participants had a variety of characteristics.

Each participant was given an instruction sheet and the cards for sorting (see Appendix L). A trial exercise was performed to ensure each participant understood the exercise instructions provided. The trial exercise consisted of items irrelevant to the research topic. However, the exercise had the same instructions as the open card sorting. Once the exercise was completed, clarifications on the instructions were made where necessary. At this point the participant was ready to take part in the open card sorting.

Each participant was provided with empty cards for them to come up with construct names and definitions. There was no limit on how many constructs/groups they were to create. This ensured results were not biased. Each participant was given as much time as necessary to complete the exercise. After

each card sorting was complete a discussion with the participant took place to gain further insight on the decisions they had made. This clarified the open card sorting outcomes where necessary.

Items placement analysis took place after all the card sorting exercises were completed. The items placement results for the open card sorting are presented in Table 6-12.

Table 6-12. Open Card Sorting Items Placement

	ICTC	JR	IWP	SD	Total Hits	Correct Placement
ICTC (5)	21	1	0	2	22	95%
JR (7)	19	14	0	0	33	42%
IWP (5)	0	2	25	0	25	100%
SD (17)	6	0	1	79	81	98%
Overall Hits: 161	Correct Hits: 139		Overall Correct Placement: 86%			

Twenty-one of the ICT connectivity items were placed in the correct group/construct, forming a correct placement of 95%. Three of the items were discarded by participants and were not used in the items placement analysis. This explained why the total hits for ICT connectivity was 22 and not 25 (5 participants multiplied by 5 items).

Fourteen of the items for job requirement for ICT connectivity were placed in the correct group/construct, forming a low correct placement of 42%. There was high overlap with ICT connectivity, which received 58% with job requirement for ICT connectivity items. Two of the items were discarded by participants and were not used in the items placement analysis. This explained why the total hits for job requirement for ICT connectivity was 33 and not 35 (5 participants multiplied by 7 items).

Twenty-five of the individual work productivity items were placed in the correct group/construct, forming a correct placement of 100%.

Lastly, 79 of the ICT self-discipline items were placed in the correct group/construct, forming a correct placement of 98%. Four of the items were discarded by participants and were not used in the items placement analysis. This explained why the total hits for ICT self-discipline was 81 and not 85 (5 participants multiplied by 17 items).



Overall, the correct placement of items was 84%, which indicated reliable results (Moore & Benbasat, 1991).

To further assess the open card sorting results, inter-rater agreement analysis took place, following the same procedure explained from the pilot card sorting. This test seemed necessary particularly because there was high overlap of items between job requirement for ICT connectivity and ICT connectivity. The inter-rater agreement results of the open card sorting are presented in Table 6-13.

Table 6-13. Open Card Sorting Inter-Rater Agreement

Raters	Cohen Kappa
1&2	1.000
1&3	0.893
1&4	0.583
1&5	0.654
2&3	0.945
2&4	0.617
2&5	0.691
3&4	0.716
3&5	0.710
4&5	0.721
Average Cohen Kappa	0.753

The average Cohen Kappa, or strength of agreement amongst raters, was 0.753. According to Moore and Benbasat (1991) this is considered a ‘very good’ figure. The result indicated that participants agreed about the placement of items presented in the item-placement analysis. This indicated that the overlap of job requirement for ICT connectivity items in ICT connectivity was agreed upon.

During discussions, participants found that the items of ICT connectivity and job requirement for ICT connectivity overlapped highly due to the similarity of what they were seeking. To address this, ICT connectivity and job requirement for ICT connectivity items were re-worded to distinguish a difference between them. Discussions after the end of the each open card sorting exercise did not indicate the need to make changes to the construct names in the model as the participants saw them to be similar to the ones they had suggested.

In terms of naming the research constructs, the job requirement for connectivity was referred to as reliance on ICTs or required connectivity. In this case, the term

*reliance* seemed more emotive, whereas, the term *required* seemed less ambiguous. Further, the notion of ICT connectivity was referred to as connectivity or connectedness. The term connectivity was favoured by the research participants as to them connectedness implied an emotional meaning. ICT self-discipline was referred to as discipline or regulation. Individual work productivity was referred to as achievement or productivity.

The construct definitions provided by the participants also aligned with the definitions of the constructs provided by the research. Therefore, no changes needed to be made to the research construct names and their definitions.

Suggested changes included removing items that seemed repetitive and re-wording items to better suit the research population. For instance words like “minimal” seemed vague and words like “critical” seemed emotive. These words were replaced to strengthen the quality of the items. Items JR05 and JR07 were both deleted because they repeated JR01. Item SD06 was seen as an outlier and item SD17 appeared to confuse participants. Therefore, these two items were deleted.

Changes were made accordingly and in total there were 30 items. The updated set of items was reviewed by two IS scholars before moving on to the closed card sorting.

### **6.3.3 Closed card sorting**

A closed card sorting exercise was conducted individually with five professionals that were potential members of the research sample (see Table 6-14). A variety of individuals (in terms of roles, gender and age) were approached to remain consistent with previous data gathering methods and to also cover a wide population.

Table 6-14. Closed Card Sorting Participants

Role	Age	Gender
Lecturer	33	Male
Senior software developer	27	Male
Accountant	25	Female

Chef	50's	Female
Business Securities Specialist	30	Female

The group consisted of a lecturer, a software developer, an accountant, a chef and a business securities specialist. The differences in these roles meant that a range of perceptions were included during the closed card sorting. This was to ensure the phenomena were simplistic enough to be understood over a wide range of industries. Overall, the closed card sorting group of participants had a variety of characteristics.

Each participant was given an instruction sheet and the cards for sorting (see Appendix M). A trial exercise was performed to ensure the participant understood the exercise instructions provided. The trial exercise consisted of items irrelevant to the research topic. The exercise had the same instructions as the open card sorting. Once the exercise was completed, clarifications on the instructions were made where necessary. At this point the participant was ready to take part in the closed card sorting.

The participants were provided with a predetermined set of constructs to assign the items to. Each participant was given as much time necessary to complete the exercise. After each card sorting was complete a discussion with the participant took place to gain further insight on the decisions they had made. This clarified the outcomes of the closed card sorting exercise where necessary.

Items placement analysis took place after all the card sorting exercises were completed. The items placement results for the closed card sorting are presented in Table 6-15.

Table 6-15. Closed Card Sorting Items Placement

	ICTC	JR	IWP	SD	Total Hits	Correct Placement
ICTC (5)	25	0	0	0	25	100%
JR (5)	0	24	0	0	24	100%
IWP (5)	0	0	25	0	25	100%
SD (15)	0	0	0	74	74	100%
Overall Hits: 148	Correct Hits: 148			Overall Correct Placement: 100%		

The items were all correctly grouped into their corresponding groups/constructs, hence the 100% overall correct placement of items. This meant that the items clearly articulated their corresponding constructs. Two of the items were discarded by participants and were not used in the items placement analysis. This explained why the total hits for job requirement for ICT connectivity was 24 and not 25, and why the total hits for ICT self-discipline was 74 and not 75.

The inter-rater agreement during closed card sorting was also assessed (Table 6-16), following the same procedure explained from the open card sorting.

Table 6-16. Closed Card Sorting Inter-Rater Agreement

Raters	Cohen Kappa
1&2	1.000
1&3	1.000
1&4	1.000
1&5	1.000
2&3	1.000
2&4	1.000
2&5	1.000
3&4	1.000
3&5	1.000
4&5	1.000
Average Cohen Kappa	1.000

The average Cohen Kappa, or strength of agreement amongst raters, was 1.000. According to Moore and Benbasat (1991) this is considered a ‘perfect’ figure. The result indicated that participants agreed about the placement of items presented in the items placement analysis.

Discussions with participants at the end of each closed card sorting exercise indicated there was no need to delete, add or re-name any items. It was only noted by one participant (or rater) that items to do with “fun” and “attitude” may not necessarily be part of ICT self-discipline as they were concerned with personal motives. Thus, these items were flagged for further investigation during the survey refinement process.

The outcomes of the closed round of card sorting were successful and no changes were made to the items. The 30-item survey instrument was reviewed by three IS

scholars to confirm their reliability. The items were then put into the survey software, this is discussed next in the survey design and pre-test section.

#### **6.4 Survey Instrument Design and Pre-Test**

The survey instrument design is a critical component of survey instrument development. Researchers should aim to develop a survey that is easy and short to complete (Dillman et al., 2008; Evans & Mathur, 2005; Simsek & Veiga, 2000). This is because long surveys have previously been found to have a negative effect on survey response rates. That is, surveys that take longer time achieve slightly lower response rates. In addition, surveys that are complex and confusing encourage the respondent to lose interest and withdraw before completing the survey.

For this research an online survey was built using Qualtrics software ([www.qualtrics.com](http://www.qualtrics.com)). Guidelines on successful survey design were used from Dillman et al. (2008), each is discussed below.

First, the survey was kept short and concise with straight-forward wording. Each item was concisely worded to keep it as short as possible, without losing its intention. This was to ensure the survey was not perceived as too long.

Second, the order of survey items and sections was logical. In the introduction of the survey an information sheet was provided to explain the purpose of the research and the aim of the survey. A consent form then followed this. Items seeking employment status were also put in place to ensure that the participants met the criteria for the study. Then, less complex and important items were placed early on in the survey and then the rest followed. These items were also carefully chosen to ensure participant interest was attained. This was because participants are usually more likely to continue if the early sections are interesting.

Third, the items were grouped with their corresponding construct in a 'section' to avoid switching between contexts. Although intermixing items can create less bias and make a survey more reliable, a study by Goodhue and Loiacono (2002) on

this topic showed that the difference in reliability between placing items adjacent to each other and keeping them intermixed was small. To avoid bias, the items in each section were randomised for each participant (a feature enabled by the Qualtrics software used to develop the survey).

Fourth, the layout of the survey items was simply formatted (following graphic design suggestions) to avoid any clutter (Simsek & Veiga, 2000). The answer boxes used were kept simple, that is, complex graphic or interactive functions were not used to avoid slowing down the download of the survey on the respondent's browser. This technique would save time and reduce the likelihood of a negative experience. The items for the main research constructs had a *force response* functionality so that there were no missing data.

Lastly, the software used to build the survey allowed for the user to save and return to the survey at a later time. Participants had up to one week to respond after activating the link. This timeframe would give participants flexibility and would make the survey more appealing.

After the survey instrument was designed a survey pre-test took place as another step of content validation to ensure the survey was a proper representation of the phenomena (Straub, 1989). Five IS scholars individually evaluated the quality of the items of the online survey instrument (Straub et al., 2004). Feedback on the survey concerning wording, question order, visual design and navigation was obtained (Holland, Smith, Hasselback & Payne, 2010).

The main suggestions made by the IS scholars focused on the wording of items, such as removing emotive and ambiguous words, removing overly repetitive items and keeping items simple. It was also suggested to change the order of the survey items and to make the survey begin with something more appealing. Further, it was noted to make the language in general simpler and more suited for a non-academic audience. These minor changes were made accordingly.

Additionally, the item scale length was questioned frequently by IS scholars. It was suggested to shorten the scale and to consider using radio buttons as opposed

to using sliding bars. Before making changes to the survey design, another pre-test took place.

The second pre-test took place with a subsample of ten individuals from the population – in this case practitioners whom were potential research participants (Dillman et al., 2008). A variety of individuals were approached to capture insights from a wide skillset and to remain consistent with other data gathering phases of this research. Separately, individuals were asked to answer the survey items and provide feedback on the wording, length, logic and overall usability of the online survey. To address issues on the scale length mentioned in the previous pre-test, participants in the second pre-test were asked to comment on the scale size and also on their preferred method of inserting answers (i.e. using sliding bars or radio buttons – both were provided in this pre-test).

Overall, the practitioners found the survey to be of a good length, logical and easy to follow. The practitioners suggested making the introduction more concise and appealing to capture participant interest and increase responses. This change was made accordingly. Some reverse-coded items were questioned, thus were removed as they can lead to miscomprehension (Swain, Weathers & Niedrich, 2008). Some spelling mistakes were pointed out by the practitioners and they were corrected. The construct definitions were repeated on each page of the survey for clarification, as suggested by practitioners. Radio buttons were used for the scale because of the ease of use noted by both experts and practitioners.

When the scale length was questioned, it was noted in both pre-tests should keep the scale short and simple. Thus, the survey scale was changed from a 7-point Likert scale to a 5-point Likert scale. Some items reflected frequent or common actions such as taking ICTs everywhere or an individual's need for ICTs to perform his/her job. Usually a 7-point Likert scale is used for such items to capture accuracy (Hinkin, 1998). Instead, the scale was shortened and words such as “always” or “entire” were used to emphasize an “extreme” case of a particular item. This was discussed with the pre-test participants and was confirmed to be effective. Additionally, using a 5-point scale is deemed successful in research, as it has shown similar reliability results to a 7-point scale (Dillman et al., 2008; Lissitz & Green, 1975).

After the changes were made, the final survey consisted of 26 items (see Table 6-17). The survey was tested on mobile and online platforms to ensure the survey functioned appropriately. This included testing the survey on multiple mobile operating systems such as Android, iOS, Microsoft and multiple browsers such as Internet Explorer, Firefox, Chrome and Safari.

Table 6-17. Survey Items – Post Validation

Code	Item	Change(s) made
ICTC01	I am connected to ICTs the entire time.	Re-worded
ICTC02	I always have my ICTs with me everywhere I go.	Updated code
ICTC03	I rate myself to be very connected through ICTs, compared to my work colleagues.	Re-worded
ICTC04	I perceive myself to have a high level of ICT connectivity in the workplace.	Unchanged
ICTC05	My work colleagues are more connected than I am.	New
JR01	ICTs are extremely essential for my job.	Re-worded
JR02	My job heavily requires me to rely on ICTs.	Unchanged
JR03	My job can be performed with very little ICT support.	Updated code, re-worded
IP01	I accomplish the work I expected to.	Re-worded
IP02	I accomplish my work within the time allocated for it.	Unchanged
IP03	I am productive.	Re-worded
IP04	I accomplish more work than I had expected.	Re-worded
IP05	I do not accomplish the work I expected to achieve.	Unchanged
SD01	I am good at ignoring exchanges through ICTs, even if I am tempted to check them.	Re-worded
SD02	It is hard to stop using ICTs even if I know they are unnecessary.	Updated code
SD03	I always use my ICTs for fun even if they will have a negative impact on my work.	Updated code
SD04	I always use my ICTs for fun even if they keep me from getting work done.	Updated code
SD05	I can always control my behaviours towards the use of ICTs at work.	Updated code, re-worded
SD06	I am always able to refuse communications through ICTs that are not immediately relevant for my work.	Updated code, re-worded
SD07	I wish I had more self-discipline when using my ICTs.	Updated code
SD08	I have high self-discipline when using my ICTs, compared to my work colleagues.	Updated code, re-worded
SD09	I find it very difficult to ignore my ICTs when they are nearby.	Updated code, re-worded
SD10	I am always able to stay focused and do not let ICTs interrupt me.	Updated code
SD11	I use ICTs without thinking through all the consequences.	Updated code
SD12	While at work, I never use ICTs for personal matters.	New
SD13	While at work, I only use ICTs for work related matters.	New



The following section discusses the survey instrument refinement process.

## **6.5 Survey Instrument Refinement**

The purpose of the survey instrument refinement was to test the finalised survey items to seek how well they reflected the measured research constructs. The aim was to get the survey instrument as accurate as possible prior to distributing it to test the research model.

A pilot survey was conducted to assist in refining the survey instrument. Pilot surveys are normally carried out to test the overall instrument to ensure that there are no unanticipated difficulties (Alreck & Settle, 1995; Boudreau et al., 2001; Moore & Benbasat, 1991). One can refer to a pilot study as a “dress rehearsal” in theatre – highlighting the importance of pilot studies (Moser, 1958). A pilot test of the instrument ensures face validity, that is, to assess to what extent the instrument measures what it intends to measure (DeVellis, 2011; Hardesty & Bearden, 2004).

The following first explains the pilot survey sampling strategy undertaken to pilot the survey. The pilot survey results are then presented. These results were used for analysis to further refine the survey instrument. The refined survey instrument will then be presented.

### **6.5.1 Pilot survey sample**

A pilot survey sample is usually a subset of the intended, larger research survey participants (Field, 2005; Moore & Benbasat, 1991). Therefore pilot participants need to meet the eligibility requirements of the survey. Because this research investigated workers who use ICTs from a range of industries, a variety of individuals were expected to take part. This catered for external validity and also remained consistent with samples from previous data gathering methods in this research.

To be eligible for the pilot survey, participants needed to be employed (including contractors, full- and part-time employees and self-employed) and require the use of ICTs to perform their job. Participants were kept anonymous in this survey

to encourage survey participation (Podsakoff, MacKenzie, Lee & Podsakoff, 2003).

The size of a pilot sample depends on the analytical techniques that will be performed. This research intended on performing Exploratory Factor Analysis (EFA), which is a technique used to identify the relationships amongst variables in a model (Field, 2005). This type of test is to ensure the quality of the survey instrument and will be further discussed later in this chapter. In order to be able to achieve such analytical steps it was necessary that a large enough sample took part during the pilot study.

There are mixed views on what a sample size should be in order to perform EFA. In general, a large sample is necessary for EFA so that the statistical significance is higher. However, the suggested large sample size is a subjective factor. Some suggest a general rule of thumb for a sample size varying from 100-500 participants (Cattell, 1978; Comrey & Lee, 1992; Gorsuch, 1983; Hair, Anderson, Tatham & Black, 1995; Hatcher, 1994). Others suggest a subject-variable-ratio. This means that an 'x' amount of participants is necessary per item in the survey (number of participants: per item). Again, opinions vary with this rule. For instance, Hair et al. (1995) suggest 20 participants per item, or 20:1. Others suggest 10:1 (Nunnally, 1978), 5:1 (Bryant & Yarnold, 1995) and 2:1 (Kline, 1979). Costello and Osbourne (2005) reviewed 1700 journal papers in PsycINFO published over two years that used some form of EFA found that the majority of the subject-variable-ratio ranged between 2:1 – 5:1.

Velicer and Fava (1998) suggest a sample size of 50 to be the absolute minimum for factor analysis. Henson and Roberts (2006) carried out a review of 60 papers that conducted EFA and they found the minimum, successful sample size consisted of 42 participants. Barclay, Higgins and Thompson (1995) suggest that a sample size should be the larger of the following: *a) ten times the number of indicators in a scale with the largest number of formative indicators* or *b) ten times the largest number of structural paths directed at a particular construct*. Chin and Newsted (1999) suggest that a sample as small as 20 can provide

enough information about the appropriateness of indicators if using Partial-Least-Squares (further explained later in this chapter).

A ratio of two participants per item to five participants per item was used as a guide. Thus, a sample size of 52 – 130 was targeted to be valid for EFA to take place in this research. To reach this sample a combination of sampling techniques were used to reach as many potential participants possible (Teddlie & Yu, 2007). To meet the eligibility criteria of pilot survey participants the following sampling strategy was put in place.

The participant recruitment method commenced with convenience sampling. Professionals from the researcher's network of professionals were contacted. This included initiating contact with architects, designers, IT consultants, engineers, management professionals (post-experience Masters students), surgeons and nurses, lawyers, university staff and accountants. Further recruitment of professionals depended on the type of survey link distribution these professionals performed, such as through email or through their industry communities. This allowed for snowball sampling, meaning participants would pass the survey link to other potential participants. The survey link was also distributed via social media, which has been deemed a successful method of recruiting participants (Thomson & Ito, 2013). Purposive sampling also took place to ensure that the participants met the research criteria. The survey began with a question asking the participant's employment status. Those unemployed were not invited to take part in the survey and the survey was closed off.

Approval from the Victoria University of Wellington (School of Information Management) Human Ethics Committee was granted in March, 2014, to allow for the quantitative data gathering to happen (see Appendix N). The following section discusses the pilot survey results.

### **6.5.2 Pilot survey results**

The link to the pilot survey was made available to participants in March, 2014, and was left accessible for 6 weeks. Eighty participants accessed the survey, but only 61 of those were completed and useable, forming a response rate of 76%. The

sample size still met the suggested criteria of 2-5 participants per item, in this case a sample size between 52-130 participants (Costello & Osbourne, 2005).

The time it took to complete the survey mainly ranged from 6-14 minutes (the modal average being 8 minutes), which is a good timeframe for an online survey (Dillman et al., 2008). It is important to note that some participants may have left the survey open and completed it at a later time, which explains why it took some 4 hours to complete it. This may have created bias in results because the participant will have lost focus by the time they returned to the survey.

Demographic information on the pilot survey participants is presented in Table 6-18.

Table 6-18. Pilot Survey Demographic Information

Gender	Female	50%
	Male	50%
Industry	Agri-business	1.6%
	Business and finance	36.1%
	Healthcare	4.9%
	IT	24.6%
	Education	6.6%
	Other	26.2%
Employment Status	Part-time employee	16%
	Full-time employee	71%
	Self-employed	5%
	Contractor	8%
Age Group	20-29 years old	50%
	30-39 years old	12%
	40-49 years old	20%
	50-59 years old	18%

The pilot survey sample had an equal ratio of males and females. Seventy-one percent of participants were full-time employees, 16% were part-time employees, 8% were contractors and 5% were self-employed. Participants came from a wide range of industries including business and finance (36.1%), IT (24.6%), education (6.6%), healthcare (4.9%), agri-business (1.6%) and other practices (26.2%). Overall, the pilot survey sample had variance in demographic attributes.

The purpose of the pilot survey was to ensure the survey instrument accurately captured what it intended to so that results were reliable. Data from the pilot

study underwent factor analysis to assess the reliability of the measurement model. Factor analysis uses statistical methods to analyse interrelationships amongst variables and identify clusters of highly interrelated variables that reflect underlying themes (Straub, 1989). IBM SPSS Statistics software version 22 was used to analyse the data from the pilot survey. This software is often used in social science research, is accessible and has a user-friendly interface (Field, 2013; Wagner, 2011).

The following sections explain the items' reliability, normality and factor analysis of the pilot survey data accordingly.

***Pilot survey items' reliability.*** As part of measurement validity, reliability was tested for to ensure the items were consistent and accurate (Hinkin, 1998; Straub, 1989; Venkatesh et al., 2013). The Cronbach's alpha for each construct was measured to seek internal consistency – that is, to what extent does a group of items capture the same phenomenon. A reliability alpha of 0.7 is suggested but a score of 0.6 is also considered acceptable for exploratory research (Moore & Benbasat, 1991; Nunnally, 1978; Straub et al., 2004). Because this research was exploratory and developed new items, a Cronbach's alpha of 0.6 was set as the benchmark. Additionally, the Cronbach's alpha if item deleted was assessed to further indicate the potential relevance of each item.

In addition to the Cronbach's alpha, the inter-item correlation and the item-total correlations were assessed. The inter-item correlation seeks how consistent the correlation amongst items is by finding the average of comparisons amongst pairs of items. The score for this needed to be over 0.3. The item-total correlation assesses how the overall items correlate. The score for this needed to be over 0.3 (Field, 2013).

The pilot survey reliability results for each item is summarised in Table 6-19.

Table 6-19. Pilot Survey Item Reliability

Construct	Cronbach's alpha	Item	Cronbach's alpha if item deleted	Item-total correlation
Job requirement for ICT connectivity	0.729			
		JR01	0.524	0.674
		JR02	0.508	0.654
		JR03*	0.863	0.375
ICT connectivity	0.676			
		ICTCo1	0.640	0.412
		ICTCo2	0.529	0.608
		ICTCo3*	0.707	0.275
		ICTCo4	0.529	0.693
		ICTCo5*	0.687	0.290
Individual work productivity	0.725			
		IP01	0.592	0.717
		IP02	0.662	0.523
		IP03	0.631	0.613
		IP04	0.702	0.423
		IP05*	0.781	0.231
ICT self-discipline	0.824			
		SD01	0.807	0.525
		SD02*	0.801	0.607
		SD03*	0.817	0.407
		SD04*	0.811	0.485
		SD05	0.818	0.377
		SD06	0.821	0.350
		SD07*	0.810	0.492
		SD08	0.817	0.394
		SD09*	0.798	0.639
		SD10	0.800	0.618
		SD11*	0.817	0.408
		SD12	0.819	0.372
		SD13	0.821	0.356

Note. \* = reverse-coded item

The Cronbach's alpha for job requirement for ICT connectivity (0.729), ICT connectivity (0.676), individual work productivity (0.725) and ICT self-discipline (0.824) all exceeded the minimum threshold of 0.6. This meant the items for each construct captured what they needed to.

The 'Cronbach's alpha if item deleted' was also assessed for each item. If that value for a particular item was greater than the item's corresponding construct Cronbach's alpha then the item was flagged for further analysis during the survey instrument refinement. Items JR03, ICTCo3, ICTCo5 and IP05 all had 'Cronbach's alpha if item deleted' larger than their corresponding construct Cronbach's alpha. Coincidentally, these four items were all reverse-coded and

may have caused confusion for participants. These items were flagged and re-considered during the survey instrument refinement, discussed later in this chapter.

The inter-item correlation was within the threshold of  $>0.3$  for all items but ICTCo3, ICTCo5, IPO5 and SD01-SD13. Items ICTCo3, ICTCo5 and IPO5 were reverse-coded items and may have caused confusion for the participants, therefore may not have correlated well with their corresponding items. It was not surprising that all the items for ICT self-discipline did not inter-correlate well (i.e. the majority were lower than 0.3) as the construct items were newly developed. These items were all flagged and addressed during the survey instrument refinement, discussed later in this chapter.

The item-total correlation was above the threshold of 0.3 for all items apart from ICTCo3, ICTCo5 and IPO5, which happened to be reverse-coded items. These items were initially developed to reduce bias and ensure accuracy, however, in some cases reverse-coded items can cause confusion for participants and lead to misleading results (Dillman et al., 2008). These items were flagged and re-considered during the survey instrument refinement, discussed later in this chapter.

***Pilot survey dataset normality.*** The normality of the dataset explains how far the dataset sits from zero and it seeks the distribution of the data. Normality tests include skewness (measure of symmetry) and kurtosis (cluster in the tails or peakedness). These tests ensure the data can be used for parametric analysis such as regression and correlation. The skewness and kurtosis scores should be within -2 and +2 range (Field, 2013). It is important to note that these tests are sensitive to sample size. So, in addition to these test scores one should review the distribution graphically using histograms to see the normality and make a qualitative judgement where necessary (Field, 2013).

The normality for each item was within the range apart from the kurtosis for ICTCo1 (3.911), ICTCo4 (2.058), JR03 (2.583) and IPO5 (2.397). Possible reasons for this are explained below.

Item ICTCo1 was extremely out of the suggested normality range, however, this may have been caused by the nature of the question itself “I am connected to ICTs the entire time.” The nature of this question is frequent and it is not surprising that the majority of the respondents gave this a 4-5 on the Likert scale.

Similarly, item ICTCo4 “I perceive myself to have a high level of ICT connectivity in the workplace” is commonly perceived by employees. For instance, during interviews and focus groups participants always perceived themselves to be highly connected in general. Therefore, it made sense that the majority of participants selected high scores for this item.

Items JR03 and IPO5 were both reverse-coded and may have caused confusion for respondents (Dillman et al., 2008). This explained why the kurtosis values of these items were out of range.

All items mentioned above were flagged for further review during the survey instrument refinement.

***Pilot survey factor analysis.*** To ensure the pilot survey dataset was eligible for factor analysis two tests needed to take place – the Keiser-Meyer-Olkin (KMO) test and the Bartlett’s Sphericity. These tests seek the strength of the relationship among variables. A dataset is useable on the basis it exceeds a score of 0.5 for the KMO and a significance  $<0.05$  for the Bartlett’s test (Field, 2013). The KMO figure for the pilot survey dataset was 0.506 and the Bartlett’s significance figure was 0.000. Both figures were within the threshold, which meant the pilot survey dataset suitable for exploratory factor analysis.

Exploratory factor analysis (EFA) is a statistical technique used to trim down the set of variables into a smaller set. The factor extraction method used in this research was Principal Component Analysis (PCA). This extraction method was used because it is concerned with finding patterns to reduce the factors of the dataset with minimal loss of information (Field, 2013).



After the factors were extracted, rotations were used to better explain the extracted factors (McDonald, 1985; Vogt, 1993). There are two types of rotations that can be performed, orthogonal and oblique. Orthogonal (varimax) rotations are where the factor axes are rotated to line up with the items better (the goal is to associate each variable to one factor). Orthogonal rotations simplify the relationships among the variables (items) and make them more meaningful for interpretation (Bryant & Yarnold, 1995). A less artificial rotation is direct oblique (direct oblimin) rotation. This type of rotation takes into consideration inter-relationships amongst factors created.

When an oblique rotation was run on the pilot survey dataset, the correlation matrix figures did not exceed 0.32, which meant there was no correlation amongst factors. This meant this type of rotation was unsuited for this type of research (Tabachnick & Fidell, 2007). Thus, orthogonal (varimax) rotation was used during the pilot survey factor analysis in this research.

It is common for research on organisational factors to use varimax rotation during factor analysis (Hedayatnia & Eshghi, 2011; Luo, 2005; Rao & Sharma, 2010; Stephan & Uhlaner, 2010). It implies that all factors (constructs) are independent, that is, they can have causal effects but not necessarily correlate. Varimax rotations give a clearer separation between the factors extracted (Hair, Anderson, Tatham & Black, 1992).

The threshold for factor loadings in EFA can vary. While some suggest 0.6 should be the threshold (Field, 2013), others suggest 0.4 is sufficient (Stevens, 1992). Hair, Anderson, Tatham and Black (1998) specify thresholds depending on the sample size obtained. Comrey and Lee (1992) suggest the following factor loading values:

- 0.32 – Poor
- 0.45 – Fair
- 0.55 – Good
- 0.63 – Very good
- 0.71 – Excellent

Because the items in this research are relatively new, it made sense to use a slightly lower threshold of  $>0.5$  to be fair (between fair and good). Assessing factor loadings tests for convergent validity, that is, to what extent the items measured the same notion (Straub et al., 2004; Venkatesh et al., 2013).

The cross-loading of each item was also assessed, which included reviewing the scores of each item in other components/factors and ensuring they were  $<0.4$ . If the cross-loading value was higher than the factor loading of that particular item, then there was overlap between components/factors.

In some cases, if the cross-loading is higher than the threshold of 0.4 then it is useful to assess the difference between loadings. If the difference between a factor loading and the highest cross-loading of that item is  $<0.2$  then the item should be questioned (Huber, Herrmann, Frederik, Vogel & Vollhardt, 2007). This cross-loading assessment tested for discriminant validity, that is, to what extent an item did not correlate with another item from outside its construct.

Testing for the factor loadings and item cross-loadings is necessary for overall construct validation, or measurement validity. This technique determines how well the items reflect the constructs proposed in the conceptual research model (Straub, 1989; Straub et al., 2004; Venkatesh et al., 2013).

Because this research was exploratory, the number of factors (or constructs) was not pre-defined. Instead, a component extraction (through SPSS) was used to identify the number of factors that score an eigenvalue of greater than 1 (Field, 2013). This way, the statistics indicated how many different groups (or constructs) existed within the dataset. The factor loadings and cross-loadings are presented in Table 6-20 below (showing loadings  $>0.5$ ). Each item is put in the suggested group (labelled component) generated during the factor analysis procedure.

Table 6-20. Factor and Cross-Loadings of Pilot Survey

Item	Component								
	1	2	3	4	5	6	7	8	9
ICTCo1		0.513			0.432				
ICTCo2		0.817							
ICTCo3		0.436			-0.407				
ICTCo4		0.843							
ICTCo5*								-0.577	
JRo1					0.895				
JRo2					0.885				
JRo3*									
SDo1	0.773								
SDo2*	0.801								
SDo3*			0.798						
SDo4*			0.792						
SDo5		0.525							0.505
SDo6	0.580	0.470							
SDo7*						0.538			
SDo8									0.808
SDo9*	0.718								
SDo10	0.726								
SDo11*						0.763			
SDo12							0.809		
SDo13							0.873		
IPo1				0.752					
IPo2				0.578					
IPo3				0.829					
IPo4				0.802					
IPo5*								0.821	

Note. Orthogonal (varimax) rotation was used, eigenvalue > 1. \* = reverse-coded item.

The items for ICT connectivity were well clustered and within the threshold for factor analysis figures (>0.5). Items ICTCo1 and ICTCo3 cross-loaded highly in job requirement for ICT connectivity. This overlap also occurred during the card sorting exercise. The connection between these two items and job requirement for ICT connectivity is that they were both concerned with the work context. Both of these items were flagged for re-wording to better suit their corresponding construct. As for ICTCo5, the reverse-coding may not have captured the exact opposite of what the other items are sought – this is one of the key challenges of reverse-coded items (Dillman et al., 2008). Therefore, item ICTCo5 was flagged for re-wording.

The first two items of job requirement for ICT connectivity loaded well, however item JRo3 (a reverse-coded item) did not meet the factor loading threshold of >0.5. This item was flagged for re-wording.

As for ICT self-discipline, items SDo1 and SDo2 both sought "compulsion", for instance whether one can ignore ICTs or whether one is addicted to ICTs. When

compared against the original brief self-control scale by Tangney et al. (2004), similar items were grouped in a factor called “deliberate/non-compulsive”. Thus, it made sense to view this as a sub-group of ICT self-discipline.

Items SDO3 and SDO4 were both concerned with “fun” and “attitude” so it was clear why they were clustered together. Coincidentally, the card sorting exercise indicated that both items SDO3 and SDO4 did not relate to the context of the study. These items were flagged for further investigation in the survey refinement phase.

The factor analysis grouped item SDO5 with the ICT connectivity construct. This may have been because SDO5 sought the behaviours of using ICTs *at work*, which overlapped with connectivity at work. Item SDO5 also cross-loaded with SDO8, which was concerned with high discipline when using ICTs *at work*. This item was also a reflection of controlling behaviours in a work context.

It made sense that SDO6 was grouped with SDO1, SDO2, SDO9 and SD10 because they all sought the ability to ignore ICTs, reflecting compulsion. Item SDO6 also cross-loaded with SDO5, which may have been because it was concerned with *controlling* behaviours – similar to what SDO6 was concerned with. Items SDO7 and SD11 were grouped together as they both assessed for lack of discipline in using ICTs.

Items SD12 and SD13 were grouped together as they sought the work/personal boundaries of individuals. This phenomenon of work and personal boundaries focuses on the context as opposed to the ICT use itself, which is what ICT self-discipline in this research was concerned with. Therefore, these items were flagged for re-consideration during the survey instrument refinement.

All individual work productivity items were well clustered, which made sense as this is a well-established construct in IS literature. Individual work productivity was the dependent variable in this research, so it was reassuring to have reliable results. The only concern was with item IPO5, which cross-loaded highly with

ICTCo5. The only similarity was that they were both reverse-coded items. IPo5 was flagged for reconsideration during the survey refinement process.

The following section presents the refined survey instrument.

### ***6.5.3 Refined survey instrument***

The reliability scores, factor loadings and general survey observations from the pilot survey assisted in refining the survey instrument to make it more accurate and reliable. Items were either kept, re-worded, deleted or added. These refinements are explained below.

In total, seven items were kept and remained unchanged (ICTCo1, ICTCo2, ICTCo4, SDo2, SDo6, SDo9, SD10), ten items were re-worded (JR01, JR02, JR03, IPo1, IPo2, IPo3, IPo4, IPo5, SDo1, SDo8), nine items were deleted (ICTCo3, ICTCo5, SDo3, SDo4, SDo5, SDo7, SD11, SD12, SD13) and four items were added (ICTCo6, ICTCo7, JR04, JR05). With these changes in place, the final survey consisted of 21 items (Table 6-21). Each construct had at least 3 items, which is considered a sufficient amount to reflect a construct (Bagozzi & Baumgartner, 1994). All items started with 'in a typical work-day' to emphasize the research context.

Table 6-21. Refined Survey Instrument – Post Pilot Survey

Code	Item	Change
ICTCo1	I am connected to ICTs the entire time.	Unchanged
ICTCo2	I always have my ICTs with me everywhere I go.	Unchanged
ICTCo4	I perceive myself to have a high level of ICT connectivity.	Unchanged, code updated
ICTCo6	I spend all of my day connected through ICTs.	New
ICTCo7*	I am often disconnected at work.	New
JRo1	It is essential to be connected to ICTs to perform my job.	Re-worded
JRo2	My job heavily requires me to be connected to ICTs.	Re-worded
JRo3	My job cannot be performed if I am disconnected from ICTs.	Re-worded
JRo4	My job requires me to be connected to ICTs the entire time.	New
JRo5	My job requires me to be constantly connected to ICTs.	New
IPo1	I always accomplish the work that I expected to.	Re-worded
IPo2	I always accomplish my work within the time allocated for it.	Re-worded
IPo3	I am always productive.	Re-worded
IPo4	I always accomplish more work than I had expected.	Re-worded
IPo5*	I hardly ever get my work done on time.	Re-worded
SDo1	I am good at ignoring incoming communication through ICTs, even if I am tempted to check them.	Re-worded
SDo2*	It is hard to stop myself from using ICTs even if I know they are unnecessary.	Unchanged
SDo6	I am always able to refuse communications through ICTs that are not immediately relevant for my work.	Unchanged
SDo8	I am highly disciplined when using my ICTs.	Re-worded
SDo9*	I find it very difficult to ignore my ICTs when they are nearby.	Unchanged
SDo10	I am always able to stay focused and do not let ICTs interrupt me.	Unchanged

Note. \* = reverse-coded item.

There were ten re-worded items in total. Both JRo1 and JRo3 cross-loaded with ICT connectivity, so re-wording them was necessary to differentiate between the items. Item JRo1, “ICTs are extremely essential for my job” was changed to “It is essential to be connected to ICTs to perform my job”. This was because the item was found to be extreme and it was recommended during the items review to use the word ‘essential’ instead. Also, using the word “connected” meant the item was more aligned with the construct focus on the requirement for ICT connectivity.

Item JRo3, “My job can be performed with very little ICT support” was changed to “My job cannot be performed if I am disconnected from ICTs”. The item was worded in a more direct manner, focusing on connectivity as opposed to just support. This was also re-worded to better align with the remaining items. It is recommended that constructs have at least 3-8 items measuring them (Bagozzi & Baumgartner, 1994). Therefore, two new items were added to job requirement for ICT connectivity, JRo4 and JRo5 to ensure there were sufficient items capturing the construct.

Further, item JR02 “My job heavily requires me to rely on ICTs” was changed to “My job heavily requires me to be connected to ICTs”. This was necessary to emphasize the need to be connected, to remain consistent with the construct definition.

The items for individual work productivity (IP01, IP02, IP03, IP04 and IP05) were all re-worded. During the pilot survey, the answers for individual work productivity had very little variance and most participants seemed to say they were productive. For instance the average score for a participant’s productivity was 19/25. To get more variance in the dataset and a wider spread, the items needed to reflect more extreme cases. Therefore the items were re-worded to include “always” in them.

Item SDO1 “I am good at ignoring exchanges through ICTs, even if I am tempted to check them” was re-worded to “I am good at ignoring incoming communication through ICTs, even if I am tempted to check them”. Changing the word exchanges to incoming communication seemed necessary for the item to be simpler and to make sense grammatically.

Item SDO8 “I have high self-discipline when using my ICTs, compared to my work colleagues” was changed to “I am highly disciplined when using my ICTs”. Firstly, there seemed to be lack of accuracy when asking respondents to compare themselves to colleagues because a) the respondent will have to make the judgement on behalf of the colleagues (Dillman et al., 2008) and b) different workplaces will have different working styles. The item was re-worded to change the focus to the individual him- or herself. Secondly, during the factor analysis the item loaded into a separate factor, whereas the original item from the self-control instrument by Tangney et al. (2004) loaded in the same group as the original items for SDO1, SDO2, SDO6, SDO9 and SD10 after factor analysis (varimax rotation). Thus, SDO8 was re-worded with the aim to align it better with the remaining items for ICT self-discipline.

There were nine items deleted in total. ICTCO3 had low reliability and it cross-loaded highly with another component during factor analysis. The reliability of

ICT connectivity was expected to increase if item ICTCo3 was deleted. Similarly, ICTCo5 had low reliability and would increase the construct reliability if it were deleted. Item ICTCo5 also loaded as a separate factor to ICT connectivity. Thus, these two items were deleted and replaced with two new items ICTCo6 and ICTCo7 to gain a more reliable set of items reflecting ICT connectivity. Item ICTCo7 was a reverse-coded item to capture any bias in results.

Items SDo3 and SDo4 were both concerned with using ICTs for fun which was more concerned with enjoyment as opposed to controlling behaviours with ICTs. In support of this, the items loaded as a separate component during factor analysis. Items SDo3 and SDo4 seemed outside the context of this research and were deleted.

During factor analysis item SDo5 cross-loaded with ICT connectivity. Initially this item was developed to reflect a general view of ICT self-discipline, which was already captured through other items such as SDo8. So, SDo5 was deleted as repetition can irritate respondents and lower a survey response rate (Dillman et al., 2008). Similarly, SDo7 was repeating SDo8 and it also did not capture the opposite polarity of SDo8 as a reverse-item should (DeVellis, 2011). Wishing for more discipline seemed weak as a reverse-code and did not necessarily imply lack of discipline, therefore SDo7 was deleted.

Item SD 11 “I use ICTs without thinking through all the consequences” reflected having lack of discipline. The item came with confusion on whether this action is deliberate or not, thus it had double meaning. Double-barrelled items are not encouraged in survey research as they can cause confusion therefore this item was deleted (DeVellis, 2011; Dillman et al., 2008).

Lastly, items SD12 and 13 loaded into their own component during factor analysis as they sought a work/life separation. These items were concerned with the *crossing boundaries* of work life and personal life. This was outside the context of the study and the items were deleted.



The separate components that were extracted for ICT self-discipline items during the pilot survey were understandable. The brief self-control scale by Tangney et al. (2004) was assessed by Maloney, Grawitch and Barber (2012). The authors conducted further factorial analysis and found that the scale was loading into two separate (but related) components, one concerned with restraints and the other concerned with impulsivity. The authors suggested further investigation on the brief-self-control scale.

To ensure the refined survey was statistically sound, a component factor analysis was run without specifying factor size to see the distribution of the items. The results are presented in Table 6-22. Note that the new items were not included in this test, as they had no data.

Table 6-22. Factor and Cross-Loadings for Final Survey Instrument

Item	Component			
	1	2	3	4
SD09*	0.806			
SD02*	0.791			
SD01	0.787			
SD10	0.702			
SD08	0.552			
IP01		0.831		
IP03		0.815		
IP04		0.701		
IP02		0.687		
IP05*		0.393	-0.389	
JR02			0.901	
JR01			0.830	
JR03*			0.437	
ICTCo4				0.838
ICTCo2				0.829
ICTCo1			0.421	0.602
SD06	0.451			0.500

Note. Orthogonal (varimax) rotation was used, eigenvalue > 1.

\*= reverse-coded item. The test was run on the pilot survey data before the online survey was distributed.

Overall, all of the items grouped correctly with their corresponding construct. The factor loadings exceeded the threshold of >0.5. Additionally, the amount of components generated reflected the number of constructs in the conceptual research model.

As indicated previously, items SD08, IP05 and JR03 were re-worded, thus it was expected that their factor loadings for the final survey would be enhanced. The

new items for ICT connectivity were expected to address the high cross-loading of item ICTCO1 (which did not exceed the 0.2 difference between the item factor loading and the cross-loading). Item SDO6 was grouped with ICT connectivity but it also cross-loaded with ICT self-discipline. To address this, some ICT connectivity and ICT self-discipline items were re-worded and new items were also added with the aim to further differentiate between constructs.

It is common in survey research to consider non-response bias. This sort of bias is concerned with the answers of respondents being different from potential answers of those who did not respond (Hair, Hult, Ringle & Sarstedt, 2014). This is to ensure that the responses can be generalised to the research population. To avoid the occurrence of this issue, the survey design was carefully thought out so that each individual accessing the survey would take part and avoid non-response. Additionally, email invitations were sent to participants with a research information sheet as well as reminders to take part (Dillman & Bowker, 2001).

Another technique used to address non-response bias is to compare the differences between early and late responders. Some researchers argue that late responders are similar to non-respondents, thus they are used as a proxy (Field, 2013). The pilot survey link was distributed to the sample population at different times, which meant the survey link was accessible for shorter periods for some members. The software used (Qualtrics) prevented the ability to differentiate between early and late responders in this case, thus this technique could not be used.

Assessing for common methods bias is another necessary task in quantitative research (Podsakoff et al., 2003). Common methods bias is concerned with the measurement technique that is used to capture answers to the items, or as Bagozzi, Yi and Phillips (1991, pg. 426) define it, it is the “variance that is attributable to the measurement method rather than to the construct of interest”. To reduce this bias, thorough analysis and review of survey items was conducted and answers were kept anonymous (Podsakoff et al., 2003). Thorough review of items was expected to reduce any errors in capturing the data. Making responses

anonymous encourages the researcher to be less restricted with the honesty of their response.

A Harman Single Factor test was also run to seek the variance of the dataset. This test is often used when not all the sources of method bias can be identified. All the variables were loaded into a single factor and extracted with no rotation (Harman, 1960; Podsakoff et al., 2003). The variance for the factor was 18.91%, below the maximum of 50%. This indicated that common method bias was not a problem in the dataset from the pilot survey.

Advice from Conway and Lance (2010) was also used as a checkpoint to improve the above test result of common methods bias. Conway and Lance (2010) suggest four reasonable expectations from research to address common methods bias.

First, it is expected that the researcher provides an argument for why self-reports are appropriate. This was addressed in section 6.2.1 of this chapter (see pg. 112 onwards).

Second, it is expected from a researcher to conduct construct validity so that it ensures a reliable measurement method. This was addressed during the pilot survey data analysis in section 6.5.2 (see pg. 147 onwards) of this chapter.

Third, lack of overlap is expected amongst items for different constructs. The survey items were carefully re-worded during the survey instrument refinement after the pilot survey took place (see section 6.5.3 on pg. 157 onwards). This was particularly considered for items cross-loading amongst ICT connectivity, job requirement for ICT connectivity and ICT self-discipline.

Fourth, there needs to be proactive assessments on the part of the author. Common method bias sources suggested by Podsakoff et al. (2003) were assessed. This included acknowledging item enhancement (re-wording during the survey instrument refinement), intermixing of items, scale length, common scale formats, and protecting respondent anonymity during the survey design (see section 6.4 on pg. 141 onwards).

As a result, the pilot survey results assisted in the refinement of the survey instrument developed in this research. The analytical steps and results from the pilot survey phase gave confidence to move on to the next step of distributing the final survey instrument to test the research model presented in chapter five. The survey design for the final online survey followed the same design guidelines for the pilot survey. The final online survey screenshots can be found in Appendix O. The following section discusses the distribution of the final research survey and the survey results.

## **6.6 Survey Instrument Distribution and Results**

The purpose of the online survey was to test and validate the proposed theoretical model presented in chapter five and to answer the research questions presented in chapter one. Structural Equation Modelling (SEM) is a statistical technique used to identify possible causal relationships between constructs and moderating relationships (Leedy & Ormrod, 2013). Thus, it seemed appropriate to adopt these statistical approaches in this research to answer the research questions.

Data from the online study underwent SEM to assess: (a) the measurement model to define constructs and (b) the structural model to test the relationships amongst these constructs (Gefen et al., 2000; Hinkin, 1998; Straub et al., 2004).

There are two key approaches to SEM, covariance-based and variance-based. Covariance-based SEM (CB-SEM) focuses on minimizing the differences between the estimated covariance and the observed covariance (Hair, Black, Babin & Anderson, 2010). It estimates a vector of parameters so that the sample's covariance matrix is as close as possible to the predicted covariance matrix (Reinartz et al., 2009). This technique is useful for testing well-established theories, it requires normal distribution of data and it can handle large sample sizes (Chin & Newsted, 1999; Hair, Ringle & Sarstedt, 2011). Software used for CB-SEM includes AMOS and LISREL.

On the other hand, variance-based SEM, also known as Partial Least Squares (PLS-SEM), is a technique concerned with minimizing the unexplained variances of the dependent variable(s) and maximizing the explained variance of the independent variables (Haenlein & Kaplan, 2004; Hair et al., 2011). This iterative

method seeks convergence and puts variables into 'blocks' that are close to the structural model (Reinartz, Haenlein & Henseler, 2009). This technique is suited for non-normal datasets, models that are not yet established, predictive hypotheses and/or research that has little available theory (Chin, Marcolin & Newsted, 2003; Chin & Newsted, 1999; Hwang, Malhotra, Kim, Tomiuk & Hong, 2010). The software used for PLS-SEM includes smartPLS and R.

When deciding which type of SEM to use the researcher should carefully consider the nature of the research and align it with the capabilities of the SEM choices (Ringle, Sarstedt & Straub, 2012). Hair et al. (2011) provide rules of thumb for selecting CB-SEM or PLS-SEM. These were used to assist the comparison of the research characteristics with the CB-SEM and PLS-SEM capabilities.

The characteristics of this research were:

- a) the measurement model was new and not yet established,
- b) the research model was predictive in nature, forecasting what was likely to happen amongst variables,
- c) the research topic was exploratory,
- d) the data distribution (later discussed in this section) was non-normal for some cases,
- e) the research model sought relationships among latent variables.

According to Chin and Newsted (1999), Hair et al. (2011), Hulland, Ryan and Rayner (2010) and Ringle et al. (2012) the above research characteristics aligned best with the PLS-SEM capabilities.

Additionally, a study by Afthanorhan (2013) compared CB-SEM and PLS-SEM results on a dataset within an organisational context. The results indicated that PLS-SEM was more valid and reliable than CB-SEM. The factor loadings and the average variance extracted (discussed later in this chapter) from the PLS-SEM were better than the CB-SEM results. These suggestions gave confidence that PLS-SEM was appropriate to use in this research. The software used was smartPLS version 3.0, as it had a user-friendly interface to make analysis simpler and more accurate.

A weakness in PLS-SEM is that it generally requires strong, or high-valued, paths amongst variables if the dataset was small. Additionally, PLS-SEM can lead to the issue of multi-collinearity, which can skew the statistical analysis if not handled well. These weaknesses are addressed in the online survey results section.

The following sections first explain the sampling strategy undertaken to distribute the online survey. To follow, the survey results will be presented, assessing the measurement and structural model to answer the research questions.

### ***6.6.1 Online survey sample***

The sample for the online survey consisted of professionals from a range of industries who required the use of ICTs to perform their job. This ensured diversity of job roles to make results as generalizable as possible. This was also to remain consistent with the samples from the previous data gathering methods in this research.

To be eligible for the online survey, participants need to be employed (including contractors, full- and part-time employees and self-employed). Participants were kept anonymous in this survey to encourage survey participation (Podsakoff et al., 2003).

The aim of survey research was to have as large a sample as possible (Leedy & Ormrod, 2013; Osborne & Costello, 2004). The sampling strategy used for the online survey was consistent with the strategy used for the pilot survey. The sampling strategy commenced with convenience sampling (inviting the researchers network to distribute the online survey link), snowball sampling (for those initially invited to distribute the link to other colleagues) and purposive sampling (participant eligibility criteria met through the survey introduction). The survey link was distributed via professional social media accounts (LinkedIn, Twitter and Facebook), a professional online blog (Geekzone.co.nz), newsletters and work email.

The following section presents the survey results.

### **6.6.2 Online survey results**

The link to the online survey was made available to participants in June 2014 and was left accessible for 8 weeks. In total, 594 participants accessed the survey, but only 541 of those responded, forming a response rate of 91%. Once the participant activated the survey link it was available for one week. After one week the data was captured by the online software used (Qualtrics).

Responses were removed from the dataset if not all the items were answered. Additionally, any responses that took less than 5 minutes were reviewed and assessed on whether answers seemed flawed. Of the 541 submitted responses, only 443 were useable.

Overall, the sample size exceeded the suggested criteria of 20 participants per item (Hair et al., 1995) and it met the PLS-SEM rule of the sample size having to be “ten times the largest number of structural paths directed at a particular latent construct in the structural model” (Hair et al., 2011, pg. 144). This meant that the survey sample was sufficient in size for quantitative analysis.

The time it took to complete the online survey mainly ranged from 2 minutes to four hours, the majority being 5-7 minutes, which is a good timeframe for an online survey (Dillman et al., 2008).

Demographic information of the online survey participants are presented in Table 6-23.

Table 6-23. Online Survey Demographic Information

Gender	Female	35%
	Male	65%
Employment	Part-time	12%
	Full-time	73%
	Self-employed	8%
	Contractor	7%
Age Group	20-29	31%
	30-39	29%
	40-49	19%
	50-59	16%
	60+	5%
Organisation type	Public	16%
	Private	35%
	Small	13%
	Multi-national	12%
	Other	24%
Industry	IT	43%
	Education	16%
	Business	7%
	Architecture & Design	1%
	Engineering	1%
	Hospitality	1%
	Customer Support	2%
	Agribusiness	1%
	Executives	2%
	Finance	4%
	HR/Recruitment	1%
	Lawyers	2%
	Media	1%
	Retail	2%
	Admin	2%
	Consulting	4%
	Science and Research	2%
	Social Work	1%
Other	7%	

The online survey participants came from at least 18 different work industries. The majority of the sample came from either IT (43%) or education (16%). The remaining industries had a range of 1-7% of the online survey sample. Furthermore, employees came from either the private sector (35%), public sector (16%), small organisations (13%), multi-national organisations (12%) or other work environments (24%) such as not for profit, medium sized organisations or family owned businesses. It is important to note that although participants were New Zealand employees, they may have been seconded to overseas projects at the time the survey was conducted. Therefore the workplace environment would have been outside of New Zealand.



It is common in survey research to consider non-response bias. This sort of bias is concerned with the answers of respondents being different from potential answers of those who did not respond (Hair et al., 2013). This is to ensure that the responses can be generalised to the research population. To avoid the occurrence of this issue, the survey design was carefully thought out so that each individual accessing the survey would take part. Additionally, email invitations were sent to participants with a research information sheet as well as reminders to take part (Dillman & Bowker, 2001).

Another technique used is to compare the differences between early and late responders. It is suggested that late responders are similar to non-respondents, thus they are used as a proxy (Field, 2013). The online survey link was distributed to the sample population at different times, which meant the survey link was accessible for shorter periods for some members. The software used (Qualtrics) prevented the ability to differentiate between early and late responders in this case, thus this technique could not be used.

Assessing for common methods bias is another necessary task in quantitative research (Podsakoff et al., 2003). Common methods bias is concerned with the measurement technique that is used to capture answers to the items, or as Bagozzi et al. (1991, pg. 426) define it, it is the “variance that is attributable to the measurement method rather than to the construct of interest”. To reduce this bias, the answers were kept anonymous (Podsakoff et al., 2003). Making responses anonymous encourages the researcher to be less restricted with the honesty of their response.

Additionally, a Harman Single Factor test was run to seek the variance of the dataset. This test is often used when not all the sources of method bias can be identified. All the variables were loaded into a single factor and extracted with no rotation (Harman, 1960; Podsakoff et al, 2003). The variance for the factor was 24.17%, below the maximum of 50%. This indicated that common method bias was not a problem in the dataset from the online survey.

The following sections explain the statistical analytical techniques conducted for the online survey. First, Exploratory Factor Analysis (EFA) tests are presented, then the Confirmatory Factor Analysis (CFA) measurement model tests and lastly the CFA structural model tests.

**EFA: online survey indicator reliability.** The IBM SPSS software was used to assess the reliability of the survey instrument and seek its consistency and accuracy. The thresholds for the statistical tests were Cronbach's alpha (>0.6), inter-item correlation (>0.3), item-total correlation (>0.3), Cronbach's alpha if item deleted (>construct Cronbach's alpha). The results for each item is summarised in Table 6-24.

Table 6-24. Online Survey Item Reliability

Construct	Cronbach's Alpha	Item	Cronbach's Alpha if Item Deleted	Item-Total Correlation
Job Requirement for ICT Connectivity	0.895			
		JR01	0.868	0.772
		JR02	0.872	0.744
		JR03	0.880	0.705
		JR04	0.876	0.736
		JR05	0.863	0.778
ICT Connectivity	0.799			
		ICTCo1	0.712	0.720
		ICTCo2	0.764	0.573
		ICTCo4	0.740	0.673
		ICTCo6	0.721	0.701
		ICTCo7*	0.844	0.293
Individual Work Productivity	0.790			
		IP01	0.731	0.629
		IP02	0.722	0.652
		IP03	0.745	0.586
		IP04	0.758	0.544
		IP05*	0.791	0.434
ICT Self-Discipline	0.815			
		SD01	0.775	0.629
		SD02*	0.795	0.544
		SD06	0.792	0.553
		SD08	0.801	0.508
		SD09*	0.785	0.585
		SD10	0.770	0.658

Note. \* = reverse-coded item. Italicised figures = outside threshold.

All items were within the thresholds identified above apart from items ICTCo7 and IPO5. Both items were reverse-coded, therefore they may have caused confusion for the participants and led to such results.

The Cronbach's alpha if item deleted for ICTCo7 was higher than the Cronbach's alpha for ICT connectivity by 0.053. This meant that the reliability of the construct would strengthen if ICTCo7 was excluded from the analysis. Strengthening the construct reliability is necessary particularly for newly developed constructs.

The inter-item correlation of items all exceeded the 0.3 threshold apart from ICTo7. The item loaded values of 0.158, 0.198 and 0.283 with ICTCo2, ICTCo4 and ICTCo6 respectively. This explained why the item-total correlation for ICTCo7 was less than the threshold of 0.3 by 0.007. This meant that the item did not fit well with the rest of the items in the group.

Item ICTCo7 "I am often disconnected at work" did not reflect the research domain specified in chapter five. That is, employees are always connected on the basis that they require the use of ICTs to perform their job. Instead, it is their level of connectivity that changes from low to high. Thus, it made sense for ICTCo7 to not fit with the remaining ICT connectivity items.

For the reasons above, item ICTCo7 was dropped and was not assessed in the upcoming analytical steps.

The Cronbach's alpha if item deleted for IPO5 was higher than the Cronbach's alpha for individual work productivity by 0.001. Usually, a difference in values would encourage an item to be dropped. However, because the difference was very minor and because all other statistical thresholds (for Cronbach's alpha, inter-item correlations and item-total correlation) were met by IPO5 it was decided to keep this item for upcoming analysis.

***EFA: online survey dataset normality.*** The skewness and kurtosis for the dataset was assessed to seek the distribution of the dataset. The scores needed to

be within -2 and +2 range. All scores were within the range apart from items: IPO5 (kurtosis 2.162), ICTCo6 (kurtosis 2.177), ICTCo4 (skewness -2.036, kurtosis 5.476) and ICTCo2 (kurtosis 2.141). These items sought very common behaviours in the workplace therefore it made sense as to why there was little distribution amongst them. Additionally, the Kolmogorov-Smirnov and Shapiro-Wilk tests were run, as they are specific for distribution in large datasets. The results indicated that the dataset was not normally distributed. However, PLS-SEM caters for non-normal distribution, therefore, this did not prevent further analysis to take place.

***EFA: online survey factor analysis.*** To ensure the online survey dataset was eligible for factor analysis two tests took place, the Keiser-Meyer-Olkin (KMO) test and the Bartlett's Sphericity. The dataset for the online survey met the threshold for KMO (0.840) and the Bartlett's test (0.000). This meant that the dataset was suitable for EFA.

Orthogonal, varimax, rotation was used during factor analysis for the online survey to give a clearer separation of the factors (Hair et al., 1992). This form of extraction grouped variables into components and showed how they correlated with other variables (note that the table does not show any factor loading  $<0.5$  and any cross-loading  $<0.4$ ). The results are presented in Table 6-25.

All of the items were within the threshold and exceeded a loading of 0.6, apart from IPO5. Field (2013) suggests that 0.6 should be the threshold for factor loadings, while Stevens (1992) suggests that 0.4 is a sufficient threshold. Further, Comrey and Lee (1992) suggest that 0.55 is a good cut off value for factor loadings. Because this research was exploratory, the items in this research were relatively new. Furthermore, because the value of 0.580 was within the previously mentioned thresholds (Comrey & Lee, 1992; Stevens, 1992), it was decided to keep IPO5.

Table 6-25. EFA Factor and Cross-Loadings of Online Survey

Item	Component			
	1	2	3	4
JR01	0.867			
JR03	0.841			
JR02	0.817			
JR05	0.802			
JR04	0.773			
SD01		0.769		
SD10		0.757		
SD09*		0.743		
SD06		0.695		
SD02*		0.686		
SD08		0.621		
IP02			0.804	
IP01			0.797	
IP04			0.714	
IP03			0.713	
IP05*			0.580	
ICTCo4				0.838
ICTCo2				0.803
ICTCo1				0.790
ICTCo6				0.754

Note. Orthogonal (varimax) rotation was used, eigenvalue > 1,  
 \* = reverse-coded item.

The cross-loadings of all items were less than 0.4, which meant items related to their corresponding constructs appropriately. In total, four components were generated during factor analysis, accurately reflecting the four constructs in the research model.

To address the issue of multi-collinearity (a potential weakness of PLS), latent variable scores were taken from smartPLS and inserted into IBM SPSS to run a linear regression and retrieve the variance inflation factor (VIF). This test checks for any collinearity amongst variables to indicate whether any variables should be merged into one or completely removed. Each variable was tested as the dependent variable (explaining the 'NA' values in the table). The results are presented in Table 6-26 below.

Table 6-26. Multi-Collinearity Testing

Variable	VIF	VIF	VIF	VIF
ICT connectivity	1.279	NA	1.019	1.272
ICT self-discipline	1.009	1.107	1.110	NA
Job requirement for ICT connectivity	1.237	1.029	NA	1.289
Individual work productivity	NA	1.122	1.105	1.018

All the VIF values were less than 5, meaning there was no issue of multicollinearity in the dataset (Hair et al., 2011).

**CFA: measurement model – indicator reliability.** During the EFA only one item was dropped (ICTCo7), leaving the survey with 20 items in total. Confirmatory Factor Analysis (CFA) was conducted on the finalised set of items to formally assess the significance of the final set of variables and to test the relationships amongst them. SmartPLS software version 3.0 was used to assess the measurement model.

Indicator reliability was tested for to seek the degree the items within a construct correlated. Similar to EFA, the factor loadings in CFA needed to be >0.6 and cross-loadings needed to be <0.4. Or, if the difference between the factor loading and cross-loading is >0.2 then the item should still be accepted (Nunnally & Bernstein, 1994; Huber et al., 2007). The results are presented in Table 6-27 below (note that the table does not show any factor loading <0.5 and any cross-loading <0.4).

Table 6-27. CFA Factor and Cross-Loadings of Online Survey

	ICT Connectivity	ICT Self-Discipline	Job Requirement for ICT Connectivity	Individual Work Productivity
ICTCo1	0.872		<i>0.456</i>	
ICTCo2	0.723			
ICTCo4	0.819			
ICTCo6	0.881		<i>0.505</i>	
IPo1				0.746
IPo2				0.779
IPo3				0.813
IPo4				0.729
IPo5*				0.587
JRo1			0.844	
JRo2	<i>0.422</i>		0.844	
JRo3			0.788	
JRo4	<i>0.457</i>		0.852	
JRo5	<i>0.469</i>		0.877	
SDo1		0.722		
SDo2*		0.638		
SDo6		0.702		
SDo8		0.757		
SDo9*		0.614		
SDo10		0.827		

Note. Italicised figures = outside threshold. \* = reverse-coded item.

All items loaded into their appropriate construct and exceeded the 0.6 threshold. Five items cross-loaded highly with other constructs, ICTCo1, ICTCo6, JRo2, JRo4 and JRo5. The nature of these items was closely related, therefore it was not surprising to see an overlap amongst them – this was previously seen during card sorting and the pilot survey. However, the difference between every item’s factor loading and its cross-loading was  $>0.2$ , therefore the items were still accepted (Nunnally & Bernstein, 1994; Huber et al., 2007). The final set remained with 20 items.

**CFA: measurement model – construct reliability, convergent validity.** Next, construct reliability was tested for to seek the degree to which each construct measured what it was supposed to. Convergent validity was tested for to retrieve the degree to which the measurements of a construct converged. Like in EFA, the Cronbach’s alpha was calculated and needed to be  $>0.7$ . The Composite Reliability (CR) was also calculated to measure to what degree a set of items proposed to measure the same thing produced similar results. This assessment captures the internal consistency of a construct (Venkatesh et al., 2013). Like the Cronbach’s alpha, the CR needed to be  $>0.7$ .

A study comparing pairs of Cronbach’s alpha coefficients and CR showed that there was minimal and insignificant difference between the two (a difference of 0.02), nevertheless, both values were calculated in this research to give more accuracy (Peterson & Kim, 2013).

Additionally, the Average Variance Extracted (AVE) was tested for to measure the amount of variance captured from the construct indicators relative to the variance from measurement error. The AVE needed to be  $>0.5$  to ensure convergent reliability of a construct. The results are presented in Table 6-28 below.

Table 6-28. Online Survey Convergent Validity

Construct	AVE	CR	Cronbach’s Alpha
ICT Connectivity	0.684	0.896	0.849
ICT Self-Discipline	0.509	0.860	0.816
Job Requirement for ICT Connectivity	0.708	0.924	0.898
Individual Work Productivity	0.540	0.853	0.788

All items exceeded the threshold values for the convergent validity tests, which meant that the variables for each construct converged and measured the same concept.

**CFA: measurement model – construct reliability, discriminant validity.** Another form of construct reliability is discriminant validity, which seeks the degree to which the measurements of a construct are different to others. “Discriminant validity is assessed by comparing the shared variance (squared correlation) between each pair of constructs against the average of the AVEs for these two constructs” (Bove, Pervan, Beatty & Shiu, 2009, pg. 702).

The Fornell and Larcker test is a technique that takes the square root of the AVE’s of the variables to see whether the constructs inter-correlate with other constructs (Fornell & Larcker, 1981). According to Farrell (2009), this technique is the best method to apply. Thus, the Fornell and Larcker test was conducted to see whether each construct discriminated itself from other constructs.

The test requirement was that “for any two constructs, A and B, the AVE for A and the AVE for B both need to be larger than the shared variance (i.e., square of the correlation) between A and B. That is, both AVE estimates have to be greater than the shared variance estimate” (Farrell & Rudd, 2009, pg.5). In other words, the scores should be high when measuring the construct against itself and low when measuring against other constructs. This will show that a construct discriminates itself from other constructs, and will achieve discriminant validity. The results are presented in Table 6-29 below (square root of AVE shown in diagonal).

Table 6-29. Online Survey Discriminant Validity

	ICT Connectivity	ICT Self-Discipline	Job Requirement for ICT Connectivity	Individual Work Productivity
ICT Connectivity	<b>0.827</b>			
ICT Self-Discipline	-0.080	<b>0.713</b>		
Job Requirement for ICT Connectivity	0.488	-0.033	<b>0.841</b>	
Individual Work Productivity	0.063	0.333	0.140	<b>0.735</b>



All items cross-loaded according to the requirements explained previously, which meant that each construct measured its own entity.

This test marked the end of the measurement model analysis. Collectively, the results showed that the survey instrument was reliable and accurate. The research model was ready for structural model assessment. The final survey instrument contributed by this research is presented in Table 6-30.

Table 6-30. Final Survey Instrument Items

ICT connectivity Alpha = 0.849	ICTCo1	I am connected to ICTs the entire time.
	ICTCo2	I always have my ICTs with me everywhere I go.
	ICTCo4	I perceive myself to have a high level of ICT connectivity.
	ICTCo6	I spend all of my day connected through ICTs.
Job requirement for ICT connectivity Alpha = 0.898	JR01	It is essential to be connected to ICTs to perform my job.
	JR02	My job heavily requires me to be connected to ICTs.
	JR03	My job cannot be performed if I am disconnected from ICTs.
	JR04	My job requires me to be connected to ICTs the entire time.
	JR05	My job requires me to be constantly connected to ICTs.
Individual work productivity Alpha = 0.788	IP01	I always accomplish the work that I expected to.
	IP02	I always accomplish my work within the time allocated for it.
	IP03	I am always productive.
	IP04	I always accomplish more work than I had expected.
	IP05*	I hardly ever get my work done on time.
ICT self-discipline Alpha = 0.816	SD01	I am good at ignoring incoming communication through ICTs, even if I am tempted to check them.
	SD02*	It is hard to stop myself from using ICTs even if I know they are unnecessary.
	SD06	I am always able to refuse communications through ICTs that are not immediately relevant for my work.
	SD08	I am highly disciplined when using my ICTs.
	SD09*	I find it very difficult to ignore my ICTs when they are nearby.
	SD10	I am always able to stay focused and do not let ICTs interrupt me.
<i>Note.</i> * = reverse-coded item.		

**CFA: structural model – variance of constructs.** Assessing the structural model allows for the research hypotheses to be tested. Before the hypothesis testing is carried out it is necessary to assess the variance of constructs.

The variance of the endogenous (or dependent) variables is a statistical measure of how close the data are to the fitted regression line. This is called the  $R^2$ . The  $R^2$  determines how much of the constructs variance is explained by the model. Values of 0.67, 0.33, and 0.19 are viewed as substantial, moderate, and weak, respectively (Chin, 1998).

The model in this research had two endogenous variables (i.e. two constructs that have direct effects towards them), ICT connectivity and individual work productivity. The  $R^2$  for ICT connectivity was 0.2387, which meant 24% of variance was explained by job requirement for ICT connectivity. The  $R^2$  for individual work productivity was 0.1196 (without the moderating variable), which meant 12% was explained by ICT connectivity. The  $R^2$  for individual work productivity increased to 0.1330 when ICT self-discipline was inserted into the research model during PLS analysis. This meant 13% was explained by ICT connectivity and ICT self-discipline (more on this effect size is explained later in this chapter).

Chin (1998) suggests that if a dependent variable has one or two direct inner paths, then a medium  $R^2$  should be acceptable. However, the variances for both endogenous constructs in the research model were considered to be weak (Hair et al., 2011). An explanation for this is that there may be other factors explaining these endogenous variables.

In general, human behaviours are hard to predict (Nairne, 2006). ICT connectivity may be explained by factors such as social axioms, user satisfaction and addiction, which all have shown to influence human behaviour (Bond, Leung, Au, Tong & Chemonges-Nielson, 2004; Liao, Chen & Yen, 2007; Turel et al., 2011).

Further, individual work productivity has been explained by many variables such as stress, age, personality types and human resource practices (Ayyagari, et al., 2011; Liao & Chuang, 2004; Tarafdar, et al., 2007).

The weak  $R^2$  for ICT connectivity and individual work productivity did not necessarily mean the results were insignificant, rather it meant that the constructs were likely to be explained by other factors. Thus, the structural model was still assessed to test whether the relationships were statistically significant.

**CFA: structural model – hypothesis testing.** The next step of structural model testing was to formally assess the relationships between constructs. The hypothesis testing was presented by the path coefficients. The algebraic sign, magnitude and significance of the path coefficients need to be assessed to check the direction of the effect (positive or negative), its strength and confidence levels respectively (Urbach & Ahlemann, 2010). The path coefficients determine the algebraic sign and magnitude of the effect between latent variables. The path coefficient significance is determined by the T statistic (t-stat), which is created in a bootstrapping procedure. Bootstrapping is a resampling technique that randomly generates samples from the dataset at hand, usually forming 5000 samples to produce effective results (Hair et al., 2013). Bootstrapping tests to see whether the same result is retrieved each time the sample is re-run. The t-stat generated by the bootstrapping procedure is translated into significance levels to see how many times out of 100 the same result is generated (Efron & Tibshirani, 1993).

There are expected thresholds for the magnitude and significance of the effects between variables. For the magnitude of the path coefficients, values  $<0.2$ ,  $0.2-0.5$ ,  $>0.5$  are considered weak, moderate and strong respectively (Cohen, 1988). In IS research the t-stat generated for the significance is expected to be  $>1.96$  to retrieve a significance at the 0.05 level (Urbach & Ahlemann, 2010), or to be  $>1.65$  to retrieve a significance at the 0.1 level (Hair et al., 2011). Other disciplines related to the context of this study such as Managerial and Organisational Studies also show hypotheses supported with significance at the 0.1 level (Chu, Ritter & Hawamdeh, 2010; Nejati, 2013). Therefore, this research accepted hypotheses with significance at or above the 0.1 level (a t-stat equal to or above 1.65).

One of the weaknesses of PLS-SEM is that is that it requires strong, or high-valued, paths amongst variables if the dataset is small in size. Because the online

survey sample size was large and sufficient (443 responses), this was not seen as an issue in this research.

To answer the first research question – to what extent does ICT connectivity affect individual work productivity – the research model was run in smartPLS version 3.0 (using a two-tailed test) and the following results were retrieved (Table 6-31 and Figure 6-2).

Table 6-31. Online Survey Path Coefficients

Hypothesis	Path Coefficient	T-Stat	Result
H1. Job requirement for ICT connectivity has an effect on ICT connectivity.	0.489	10.246***	Supported
H2. ICT connectivity has an effect on individual work productivity.	0.091	1.854*	Supported
H3b. ICT self-discipline has an effect on individual work productivity.	0.341	8.968***	Supported

\* $p < 0.1$ . \*\*\* $p < 0.001$

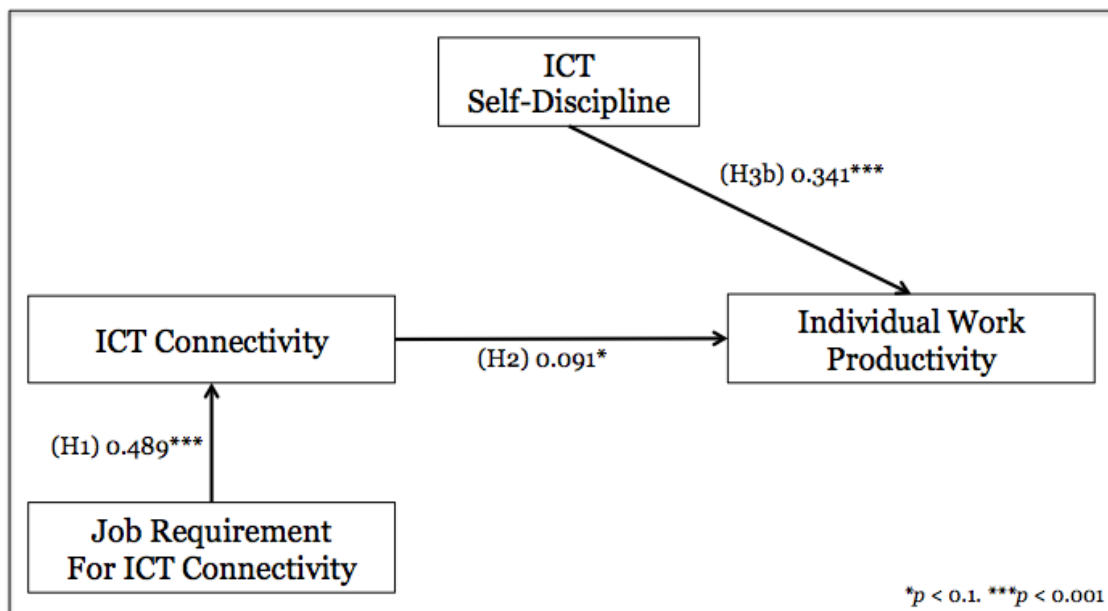


Figure 6-2. Hypotheses Testing – Without Moderation

The first hypothesis (H1) had a positive and medium-strong effect (0.489), and was significant at the 0.001 level. This meant that job requirement for ICT

connectivity had an effect on ICT connectivity, so the more requirement there was, the more connectivity an individual would have. Therefore, H1 was supported.

The second hypothesis (H2) had a positive but weak effect (0.091), and was significant at the 0.1 level. This meant that when ICT connectivity increased, individual work productivity was expected to increase. Because the effect was weak, H2 was supported and answered RQ1.

The third hypothesis (H3b) had a positive and medium effect (0.341), and was significant at the 0.001 level. This meant that ICT self-discipline had an effect on ICT connectivity, so the stricter an individual was with their ICT discipline, the more productive they would be. Therefore, H3b was supported.

A test for moderation was conducted to answer the second research question RQ2 – how does ICT self-discipline influence the effect of ICT connectivity on individual work productivity? Such tests seek what effect variable Z (the moderator) has on the relationship between X (exogenous variable) and Y (endogenous variable).

The type of moderation test that takes place depends on the sample size investigated. According to Henseler & Chin (2010), if the sample size is medium-large then the product indicator approach should be used. This approach multiplies each indicator in the moderating variable by each indicator in the exogenous variable. It is important to mean-centre the indicator values so that the effects are interpreted in a clearer manner (Hair et al., 2013). The product indicator approach was used as it suited the sample size in this research. The moderation test was conducted in smartPLS version 3.0. The results are summarised in Table 6-32 and Figure 6-3.

Table 6-32. Online Survey Moderation Effect

Hypothesis	Path Coefficient	T-Stat	Result
H1. Job requirement for ICT connectivity has an effect on ICT connectivity.	0.489	10.287***	Supported
H2. ICT connectivity has an effect on individual work productivity.	0.087	1.818*	Supported
H3a. ICT self-discipline influences the effect of ICT connectivity on individual work productivity.	0.119	0.628	Not supported (grey in model)
H3b. ICT self-discipline has an effect on individual work productivity.	0.328	8.230***	Supported

\* $p < 0.1$ . \*\*\* $p < 0.001$

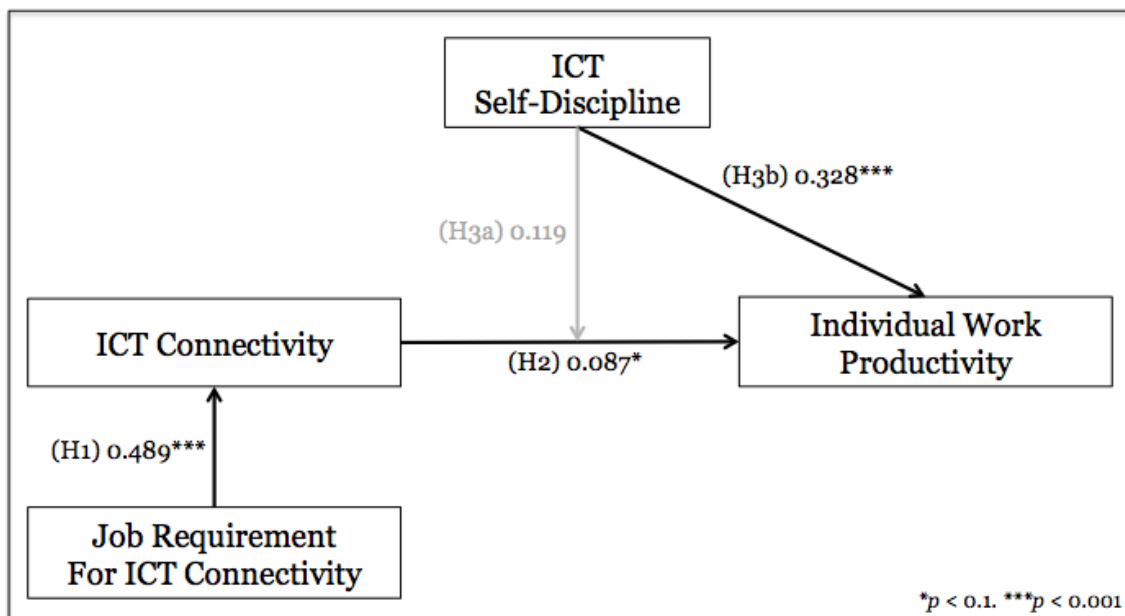


Figure 6-3. Hypotheses Testing – With Moderation

Hypothesis H1 had a positive and medium-strong effect (0.489), and was significant at the 0.001 level. This implied that job requirement for ICT connectivity had an effect on ICT connectivity, so the more requirement there was, the more connectivity an individual would have. Therefore, H1 was supported.

Hypothesis H2 had a positive but weak effect (0.087), and was significant at the 0.1 level. This meant that when ICT connectivity increased, individual work productivity was expected to increase. Because the effect was weak, H2 was supported and answered RQ1.

Hypothesis H3b had a positive and medium effect (0.328), and was significant at the 0.001 level. This implied that ICT self-discipline had an effect on ICT connectivity, so the stricter an individual was with their ICT discipline, the more productive they would be. Therefore, H3b was supported.

The path coefficient for H3a indicated that ICT self-discipline has a positive but weak influence on the effect of ICT connectivity on individual work productivity (0.119). This meant that with ICT self-discipline, the effect of ICT connectivity on individual work productivity could enhance. This answered the second research question. The t-stat for the moderation was not significant enough to reject the null hypothesis (ICT self-discipline does not influence the effect of ICT connectivity on individual work productivity), thus H3a was not supported.

However, just because a null hypothesis is not rejected it does not mean one should ignore an effect in a model as a whole. It just means that the regression weights are not significant enough to say that the null hypothesis is not true (Field, 2013).

The path coefficient magnitude of H3a still suggested that the moderator had influence on the effect from ICT connectivity to individual work productivity. To illustrate these findings, Figure 6-4 below shows a graphical representation of the moderating effect of ICT self-discipline. The graph shows the effect of 'high' and 'low' levels of ICT self-discipline on the relationship between ICT connectivity and individual work productivity. To identify the low and high values of the moderator, the indicator values above the mean are grouped as high values, and indicator values below the mean are grouped as low values (Henseler & Fassott, 2010).

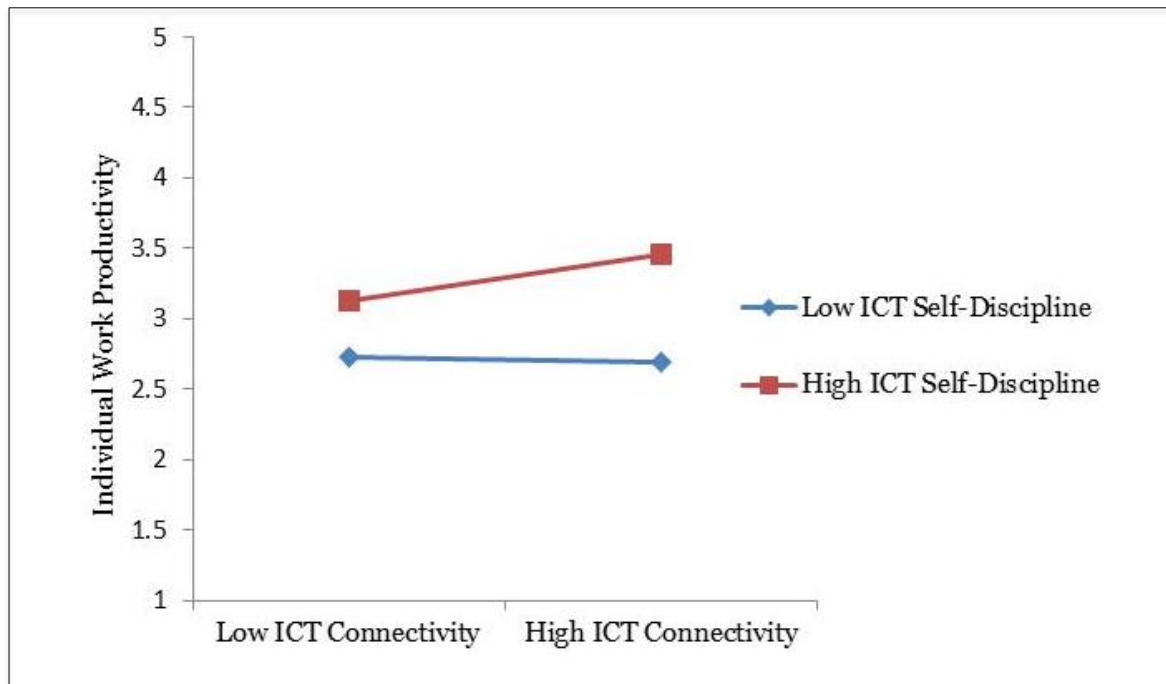


Figure 6-4. Moderating Effect in Entire Dataset

Further statistical analysis needed to take place to better explain the moderating effect of ICT self-discipline (H3a).

Impact Performance Matrix Analysis (IPMA) is a technique conducted in quantitative research to further explain the relationships amongst variables and remove any ambiguity in findings (Ahmad & Afthanorhan, 2014; Hair et al., 2013; Hock, Ringle & Sarstedt, 2010). The IPMA allows the researcher to identify ‘areas’ for improvement that should be addressed by management or marketing strategies (Hock et al., 2010). Given that this research was concerned with variables related to the workplace, it seemed appropriate to conduct the IPMA. The IPMA could assist in explaining areas for improvement in upcoming research or in management practices.

The IPMA compares the latent variable performance values (performance) to the total effect (impact) a variable has on the dependent variable. Thus, the goal was to identify variables with high impact but low performance on individual work productivity – these would be the ‘areas’ for improvement.



An IPMA was conducted in smartPLS version 3.0. The results are presented in Table 6-33 below and a graphical representation is illustrated in Figure 6-5.

Table 6-33. IPMA on Individual Work Productivity

Variable	Performance	Impact
ICT connectivity	82.826	0.081
ICT self-discipline	50.867	0.303
Job requirement for ICT connectivity	76.112	0.035

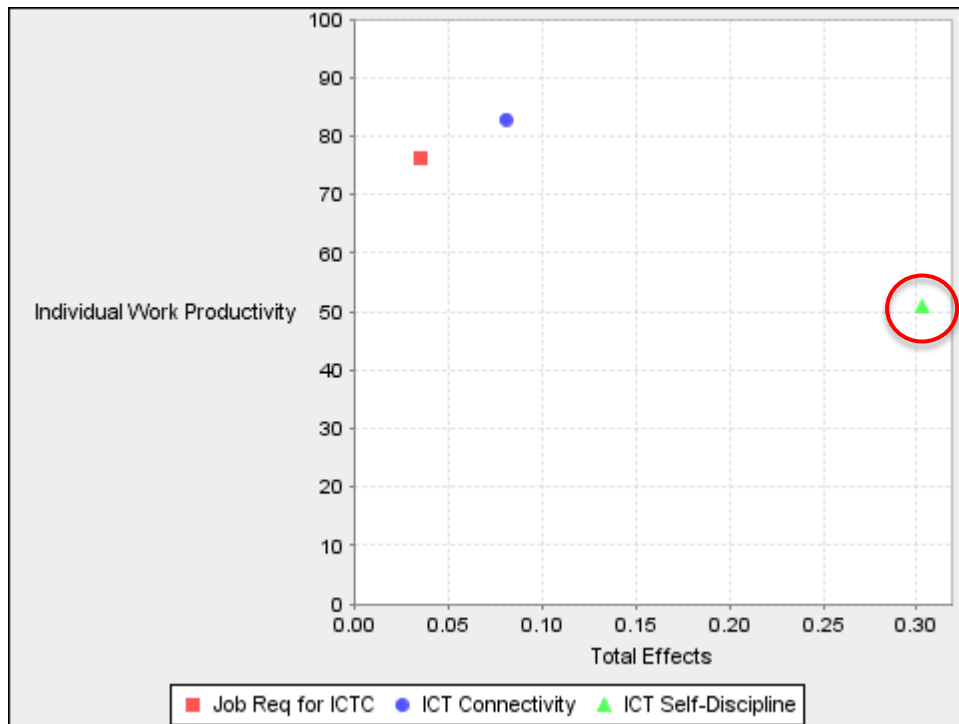


Figure 6-5. Performance vs. Impact on Individual Work Productivity

The results indicated that ICT self-discipline required further assessment. The results from the IPMA indicated that ICT self-discipline had the highest impact on individual work productivity (0.303) but the second to lowest performance (50.867). This meant that ICT self-discipline needed to be enhanced in order to retrieve higher performance values on individual work productivity. Thus, although H3a was not supported statistically, the results from the IPMA gave confidence that the notion of ICT self-discipline was important for an individual's work productivity in the connected workplace.

To further support the above finding, the effect size of ICT self-discipline on individual work productivity was calculated. The effect size is a test that is usually

conducted to seek the magnitude of the effects amongst constructs (Cohen, 1988). The effect size, presented by the  $f^2$ , helps assess the overall contribution of the research model. The effect size is determined by removing the exogenous variables from the research model and re-calculating the  $R^2$  each time to seek their impact (Henseler & Fassott, 2010).

In simpler terms, the following formula can be used to retrieve the effect size:

$$f^2 = \frac{(R^2 \text{ model with construct} - R^2 \text{ model without construct})}{(1 - R^2 \text{ model with construct})}$$

The effect sizes of 0.02, 0.15 and 0.35 are considered small, medium and strong respectively (Chin et al., 2003).

Initially, all the constructs were removed individually and the change in the  $R^2$  was calculated. The only construct with a large enough effect size to be indicated was ICT self-discipline, which had a medium sized effect (0.122) on individual work productivity. This was in line with the results from the IPMA, which highlighted the relevance of ICT self-discipline in this context.

To assess the size of the moderating effect of ICT self-discipline (H3a), the proportion of the variance explained (or the  $R^2$ ) of the model without the moderating effect and of the model including the moderating effect was compared (Henseler & Fassott, 2010).

The  $R^2$  for individual work productivity increased to 0.133 (previously 0.1196) when ICT self-discipline was inserted as a moderator in the research model during PLS analysis. Although the effect size of 0.01 was considered weak according to Chin et al. (2003), the change in the  $R^2$  indicated that the moderator placed an effect on the research model. The low performance of ICT self-discipline indicated during the IPMA may have been the reason behind this weak effect of the moderator.

Other tests, such as predictive relevance (predictive validity of a model) and global goodness of fit (overall prediction of a model), can be used to further explain the prediction strength of a model (Chin, 1998; Henseler, Ringle & Sinkovics, 2009). The predictive relevance ( $q^2$ ) can be calculated through a blindfolding procedure in software such as smartPLS version 3.0. This test follows a similar equation to the effect size (and follows the same thresholds), but it uses the construct changes in the  $Q^2$  value which is generated through blindfolding (Hair et al., 2013). This value is represented by the cross-validated redundancy generated by the blindfolding procedure. To calculate the predictive relevance of the model, the following formula was used:

$$q^2 = \frac{(Q^2 \text{ model with construct} - Q^2 \text{ model without construct})}{(1 - Q^2 \text{ model with construct})}$$

The  $Q^2$  for ICT connectivity increased from 0.06 to 0.15 when job requirement for ICT connectivity was inserted in the model. The predictive relevance of job requirement for ICT connectivity on ICT connectivity was medium (0.1059). The  $Q^2$  for individual work productivity increased from 0.001 to 0.059 when the ICT self-discipline was inserted in the model. However, the predictive relevance of ICT self-discipline on individual work productivity was small (0.0616).

To assess the overall value of the research model, the global goodness of fit was calculated through the following formula:

$$\text{Global goodness of fit} = \sqrt{\text{Communality} * R^2}$$

The global goodness of fit is calculated by taking square root of the average construct communality multiplied by the average variance ( $R^2$ ). It gives an indication of the overall prediction of a model. The average construct communality was 0.363085 and the average  $R^2$  was 0.186. The global goodness of fit of the model was therefore 0.259873. This meant that the model had a medium level of overall prediction (Henseler et al., 2009), which was reassuring given the low predictive relevance of ICT self-discipline on individual work productivity.

It is important to note that the predictive relevance and global goodness of fit tests are commonly used for complex research models, that is, models with 10 or more constructs and 50 or more items (Akter, D’Ambra & Ray, 2011; Chin, 2010). The model in this research was relatively small (less than 50 items), therefore this may have prevented the tests from yielding strong results. Additionally, the global goodness of fit test is mainly used during CB-SEM (Hair et al., 2011). This study used PLS-SEM, therefore this may have prevented the test from yielding strong results.

Although the tests of predictive relevance and global goodness of fit were not necessarily suited for the nature of the model in this research, they were still conducted to seek support for results when including ICT self-discipline in the model. The outcomes of these tests supported the IPMA results indicated earlier and further confirmed the relevance of ICT self-discipline in the research model.

**CFA: structural model – further analysis of H3a.** Further analysis on the moderating effect of ICT self-discipline was conducted to better understand why H3a was not supported when tested for the entire dataset. This was necessary so that the research could provide a more useful answer for RQ2.

As previously shown in the online survey demographics, the dataset comprised of at least 18 different industries. The two top industries were IT and education. Given the differences in the nature of their roles it was decided to run structural model analysis on each of the industries separately. Additionally, multi-national organisations and small organisations were assessed independently given their differences in structure. Thus, in total there were four groups that were assessed and compared. Other sample sub-groups were not assessed due to having an insufficient sample size for PLS analysis. The results are presented in Table 6-34.

Table 6-34. Group Specific Analysis of H3a

		Industry		Organisation Type	
		IT	Education	Small	Multi-national
H3a	Path	-0.265	0.620	-0.848	0.726
	T-stat	1.007	2.972**	1.132	0.954

\*\* $p < 0.01$ .

The results for H3a indicated differences in moderation amongst industries and organisation types. ICT self-discipline (H3a) had a negative moderating effect on employees from the IT industry and from small organisations. On the other hand, ICT self-discipline acted as a positive moderator within the education industry and in multi-national organisations. The moderating effect of ICT self-discipline was only significant in the education industry, with significance at the 0.01 level.

Although the moderating effect was not supported in three of the four groups, the magnitude and algebraic sign of the path coefficient of H3a provided useful insights to answer research question RQ2.

The purpose of assessing the moderating effect of ICT self-discipline within the different industries and organisation types was to further explain the lack of significance of H3a when tested against the entire online survey sample. The differences amongst these groups suggested that perhaps different work settings such as industries and organisation structures would retrieve different results for the moderating relationship observed in this research.

It is important to note that the sample sizes of the five groups assessed varied. The sample sizes were 187 (IT sector), 73 (education sector), 56 (small organisations), 51 (multi-national organisations) and 443 (entire dataset). Generally, larger samples give more effective results (Field, 2013).

To confirm the significance of the differences amongst the two industry types and the two organisation types, regardless of the sample size, multi-group analysis took place.

Multi-group analysis is a technique used in quantitative research to compare and contrast the bootstrapping results of path coefficients amongst pre-set groups in a sample (Hair et al., 2014). In PLS-SEM, there is a particular multi-group analysis approach followed (Henseler, 2012):

1. the data is divided into subsamples,
2. the PLS path model is estimated for each subsample,

3. each subsample becomes subject to a separate bootstrap analysis,
4. the observed distribution of the bootstrap outcomes are evaluated (through confidence intervals).

This multi-group analysis approach took place to assess the significance in the differences of the moderating effect of ICT self-discipline amongst the two industries and the two organisation types. Finding a significance for the differences would contribute further explanation on why H3a was not supported by the entire online survey sample.

In multi-group analysis, there are two ways to test for significance in differences of a moderating effect amongst groups. First, the parametric test seeks the p-value for group differences in the effects within a model. If the p-value generated is less than 0.05, then there is a significant difference in the strength. This test was not used in this research because it required groups to have similar sample sizes (Sarstedt, Henseler & Ringle, 2011). The sample sizes of the groups being observed were not closely aligned (187, 73, 56 and 51).

The second approach to testing for significance in differences of a moderating effect amongst groups is the confidence intervals bias corrected test. This test generates bias-corrected confidence intervals for each group being assessed. The method begins by computing PLS path modelling for each group. Bias-corrected confidence intervals are then generated to specify the low and high confidence intervals of each group, for each path coefficient being assessed.

If the path coefficient value of one group falls within the confidence intervals (low-high) of the other group, then there is a significant difference between the path coefficients from the groups (Sarstedt et al., 2011). This method is a useful approach for PLS-based multi-group analysis as it performs group comparisons that do not rely on distributional assumptions. Therefore, the confidence intervals bias corrected test was conducted to analyse the four groups in this research.

The IT industry group and education industry group were compared and the small organisations group and multi-national organisations group were compared. Other groups in the entire online survey sample were not compared because they did not meet the minimum group size requirement of 25 for group analysis (Sarstedt et al., 2011). The multi-group analysis test was run on smartPLS version 3.0, using bias-corrected confidence intervals and bootstrap analysis using 5000 samples (Sarstedt et al., 2011). The results are presented in Table 6-35.

Table 6-35. Comparison of H3a Confidence Intervals (CI) amongst Groups

Multi-National Organisations			Small Organisations		
Path Coefficient	CI Low	CI High	Path Coefficient	CI Low	CI High
0.726	-0.295	1.495	-0.848	-2.160	0.338
IT Industry			Education Industry		
Path Coefficient	CI Low	CI High	Path Coefficient	CI Low	CI High
-0.265	-0.570	0.402	0.620	-0.057	0.920

The results indicated that the path coefficient of H3a in the multi-national organisations group (0.726) did not fall within the range of confidence intervals in the small organisations group (-2.160 – 0.388). This meant that there was a significant difference between the moderating effect of ICT self-discipline for employees from multi-national and for employees from small organisations. This confirmed that ICT self-discipline would be a positive moderator on the effect of ICT connectivity on individual work productivity for employees working in multi-national organisations and a negative moderator in small organisations.

Similarly, the path coefficient of H3a in the IT industry group (-0.265) did not fall within the range of confidence intervals in the education industry group (-0.057 – 0.920). This meant that there was a significant difference between the moderating effect of ICT self-discipline for employees from the IT industry and for employees from the education industry. This confirmed that ICT self-discipline would be a negative moderator on the effect of ICT connectivity on individual work productivity for employees working in the IT industry and a positive moderator for employees working in the education industry.

The purpose of the multi-group analysis was to confirm the differences of the effect of H3a amongst the two industries and the two organisation types. This was

to better explain why H3a was not supported from a generalised view (through using the entire dataset). The multi-group analysis indicated differences amongst industry types and organisation structures. These differences further explained the answer to research question RQ2. The results are discussed in chapter seven.

***Validating quantitative findings.*** In quantitative research, statistical conclusion validity is necessary so that the interpretation of the statistical inferences are reliable (Venkatesh et al., 2013). To address statistical conclusion validity, the quantitative results of the online survey in this research were cross-checked with senior IS colleagues in three rounds.

The survey results were first presented to a panel of five IS scholars. The second round of review involved presenting a conclusion of the survey results to a panel of IS experts during the 25th Australasian Conference on Information Systems. The third round of review involved presenting the results to the Victoria University of Wellington (School of Information Management) Research Degrees Committee.

Discussions indicated that the notion of ICT self-discipline was well received, which gave confidence that the interpretation of findings was logical. The discussions on ICT self-discipline triggered conducting additional statistical analysis to further explain H3a. This was performed and led to the findings from the Importance Performance Matrix Analysis (IPMA) and multi-group analysis.

Furthermore, it was suggested that perhaps job requirement for ICT connectivity was a moderator of the relationship between ICT connectivity and individual work productivity. That is, the effect of ICT connectivity on individual work productivity would change as the job requirement for ICT connectivity increased or decreased. Logically, this would imply there was 'fit' between the employee's level of ICT connectivity and the employee's job requirement for ICT connectivity. Thus, this would reflect the employee's discipline in this context.

Although this suggestion was contrary to the empirical findings in this research, it was still decided to test the influence of job requirement for ICT connectivity on



the relationship between ICT connectivity and individual work productivity in case it provided further explanation for the research model. Different variations of the model were assessed to test the suggested moderating effect (Table 6-36).

Table 6-36. Job Requirement for ICT Connectivity as a Moderator

Variation of model	Path size of moderator	Significance (t-stat)
ICTC > IWP JR > IWP JR * ICTC > IWP	0.147	0.943
JR > ICTC ICTC > IWP JR > IWP JR * ICTC > IWP	0.149	0.915
JR > ICTC ICTC > IWP SD > IWP JR > IWP JR * ICTC > IWP	0.103	0.758
ICTC > IWP SD > IWP SD * ICTC > IWP JR > IWP JR * ICTC > IWP	0.141	1.193
JR > ICTC ICTC > IWP SD > IWP SD * ICTC > IWP JR > IWP JR * ICTC > IWP	0.141	1.167

Note. JR = job requirement for ICT connectivity, ICTC = ICT connectivity, IWP = individual work productivity, SD = ICT self-discipline.

The quantitative analysis indicated that the suggested moderating effect was statistically non-significant when tested in the different model variations. Thus, the suggested moderating effect was not supported.

There were three key reasons for why the notion of job requirement for ICT connectivity was assessed in the context of ICT connectivity in the first place. First, it was necessary to better explain ICT connectivity, which was a key component in this research. Thus, it made sense to include any of its antecedents that emerged in the empirical data of this research.

Second, prior studies on ICT connectivity had merged a similar notion to job requirement for ICT connectivity with the concept of ICT connectivity, however the findings in this research indicated the need for their separation. This seemed

like a relevant contribution to the literature on ICT connectivity and encouraged the idea of including job requirement for ICT connectivity in the research model.

Third, the relationship of H1 was indicated by the literature on ICTs and by the qualitative data of this research. The relationship was also supported by the quantitative data in this research. Thus, because of these reasons it was decided to include the notion of job requirement for ICT connectivity and its effect on ICT connectivity in the scope of this research.

On the other hand, there were three key reasons for why job requirement for ICT connectivity was not assessed as a moderator in this research. First, the moderating effect of job requirement for ICT connectivity on the relationship between ICT connectivity and individual work productivity was not signalled or supported by the reviewed literature on ICTs, the qualitative data and the quantitative data in this research.

Second, the idea of ‘fit’ between an employee’s job and their connectivity would have been captured through the notion of ICT self-discipline in the model. Particularly by the question of *I am always able to refuse communications through ICTs that are not immediately relevant for my work*. In this research, this ICT discipline provided the basis for the behaviours such as matching the job requirement for ICT connectivity with the ICT connectivity (pg. 105). Thus, it seemed redundant to assess the job requirement for ICT connectivity as a moderator.

Third, this research was interested in investigating the moderating effect of ICT self-discipline on the relationship between ICT connectivity and individual work productivity. Thus, the idea of job requirement for ICT connectivity as a moderator exceeded the scope of this research.

As a result, the moderating effect of job requirement for ICT connectivity on the relationship between ICT connectivity and individual work productivity was not further investigated in this research. Instead, the suggested relationship was

considered as a potential avenue for further investigation after the completion of this research.

The reviews of the quantitative data ensured that the statistical interpretations were sound. The reviews also ensured the reliability of the meta-inferences developed in the research. That is, to check how well the qualitative and quantitative findings were integrated (Venkatesh et al., 2013). Further, the discussions during reviews also ensured the corroboration of results to achieve inferential validity so that the research results were accurate and reliable (Venkatesh et al., 2013).

The following section summarises the key points discussed in this chapter.

### **6.7 Chapter Summary**

The purpose of this chapter was to explain the steps undertaken during the quantitative phase of this research. The chapter began by explaining the data gathering method used in this phase to address the research objective RO3. To follow, the survey instrument development process was presented, which consolidated key themes from the review of literature and from the previous data gathering phases. The survey instrument validation was discussed, which explained the open and closed card sorting exercises that took place in this phase. The survey instrument design and pre-test procedures were then explained. To follow, the pilot survey results were discussed and the refined survey instrument was presented. Lastly, the online survey data were analysed through factorial analysis and PLS-SEM and the results were presented and validated.

The following chapter consolidates and discusses the key findings from the three phases of this research and answers the research questions RQ1 and RQ2.



## **7 Discussion and Conclusion**

The purpose of this chapter is to consolidate the findings from the three phases of data gathering to address the research questions. The chapter begins by addressing RQ1, then, it addresses RQ2. The research contributions are then discussed prior to an outline of the research limitations. The research is then summarised in the conclusion. The chapter outline is summarised below:

7.1 Addressing Research Question One

7.2 Addressing Research Question Two

7.3 Research Contributions

7.4 Research Limitations

7.5 Research Conclusion

### **7.1 Addressing Research Question One**

The purpose of this section is to address the first research question:

RQ1: to what extent does ICT connectivity affect individual work productivity?

This section discusses how each of the data gathering phases (the qualitative phase, research model refinement phase and the quantitative phase) contributed to answering RQ1.

Having multiple data collection methods can help researchers make better and more accurate inferences. The integration of findings from the data gathering phases allows the researcher to create meta-inferences, which are considered essential components of mixed methods research (Tashakkori & Teddlie, 2008; Venkatesh et al., 2013).

#### ***7.1.1 Contributions from the qualitative phase***

The purpose of the qualitative phase was to further explore the research phenomena to be able to accurately capture the effect of ICT connectivity on individual work productivity.

During interviews, ICT connectivity was portrayed by the participants as the ability to reach and to be reached by sources of information through ICTs. Similarly, literature explained ICT connectivity as the potential incoming and outgoing reach an individual has through ICTs (Castells, 2011; Dery & MacCormick, 2012; Katz & Aakhus, 2002; Kolb, 2008; Kolb et al., 2012; Mazmanian, 2013; Mazmanian et al., 2006; Perlow & Porter, 2009; Renaud et al., 2006; Stephens, 2012; Towers et al., 2006).

The key difference between the findings from the qualitative phase and the findings from literature was the way ICT connectivity was assessed. The findings from this phase expand the traditional set of factors explaining ICT connectivity and suggest a more accurate measurement approach. Little existing research had measured the phenomenon of ICT connectivity, hence why Kolb et al. (2012) suggested that the development of metrics for this notion was necessary. Initially, interview findings suggested that ICT connectivity was potentially reflected by the time spent being connected, the scope of ICTs an individual was connected through, the volume of exchanges made through ICTs and the ubiquity of ICTs. Organisational and IS research has previously examined these components separately but not in a consolidated form (Leung, 2011; Ou & Davison, 2011; Stephens, 2012).

Interview findings echoed the importance of effectiveness and efficiency in the notion of individual work productivity. Individual work productivity is a well-established phenomenon in literature that is often concerned with the efficiency and effectiveness of employees (Burton-Jones & Volkoff, n.d; Igbaria & Tan, 1997; Karr- Wisniewski & Lu, 2010; Locke, 2005; Ramirez & Nembhard, 2004; Tarafdar et al., 2007; Torkzadeh & Doll, 1999; Vuolle et al., 2008). Interviews indicated that the sense of being productive was achieved after the accomplishment of tasks which was generally assisted by typical techniques such as to-do lists, project management and other industry-specific tools (Leshed & Sengers, 2011).

A new perspective of productivity is contributed by this research. Work quality was not captured through individual work productivity in this research as it was perceived by interviewees as a factor that was related to but outside the notion of

individual work productivity in this research. This contrasted to the work of other researchers who incorporate quality into employee productivity (Tarafdar et al., 2007; Yun et al., 2012). Narrowing the focus to efficiency and effectiveness made the measurement of individual work productivity more accurate.

Findings from the qualitative phase explicitly indicated there were mixed views on the effect of ICT connectivity on individual productivity. There were positive perspectives with regards to ICTs. For instance, ICTs were seen as a vehicle of seamless communication and reach of information, which increased efficiency. However, ICTs were also seen as a way for employees to ‘hide’ and delay communication with managers, which in turn affected individual work productivity. These views were consistent with findings from literature (Ayyagari et al., 2011; Davis, 2002; Hung et al., 2011; Rennecker & Godwin, 2005; Venkatesh et al., 2010; Karr-Wisniewski & Lu, 2010).

Discussions during interviews helped further clarify and confirm the concepts of ICT connectivity and individual work productivity. They explicitly showed that there is both a positive and negative effect between ICT connectivity and individual work productivity. The findings from the qualitative phase confirmed the themes that emerged in the literature review and helped address the first research question RQ1.

### ***7.1.2 Contributions from the model refinement phase***

The purpose of the research model refinement phase was to build on the findings from the qualitative phase and help address the first research question RQ1. The key focus was to define the research constructs and relationships accurately to make them ready for the quantitative phase.

In general, focus group discussions provided an answer to RQ1 that was similar to the qualitative phase results, that is – ICT connectivity has both positive and negative effects on individual work productivity.

Focus group participants also added that employees can be counter-productive. For instance, an individual can be productive during a meeting but that same

individual can lose productivity during disruptions in workflow caused through ICTs. Thus, the consequences of ICTs balance each other out and can simply result in small effect. This is consistent with the views of Mazmanian et al. (2006) who suggest that employees have to mitigate the negative consequences of ICTs with the positive experiences.

Views on the meanings of ICT connectivity and individual work productivity in the model refinement phase were similar to the qualitative phase results. The key difference was the perception of ICT connectivity. The qualitative phase provided a specific definition with precise use measures to reflect the concept of ICT connectivity. However, the model refinement phase was more focused on portraying ICT connectivity as how 'exposed' or connected employees thought they were through ICTs, regardless of particular details like the volume of exchanges made through ICTs. Thus, ICT connectivity was defined as the extent to which an individual is connected to ICTs. This phase also confirmed that the time employees spent being connected to ICTs and the ubiquity or availability of ICT best reflected ICT connectivity.

Another key contribution from the focus groups was the introduction of a new construct in the research model, job requirement for ICT connectivity. Discussions highlighted the need for job requirement for ICT connectivity to better explain an individual's ICT connectivity at work. This concept was consistent with the Media Systems Dependency Theory (MSDT) which highlights that the more an individual depends on media to meet their needs, the more important the media will be (Ball-Rokeach & DeFleur, 1976).

In this research, job requirement for ICT connectivity was viewed as an independent characteristic of ICT-connected workplace environments. Previous research had investigated a similar phenomenon – the need for mobile IS, the need for Internet use and the requirement to use ICTs (Leung, 2011; Scornavacca, 2010; Zhu & He, 2002). In particular, Leung (2011) views the requirement to use ICTs as a sub-component of ICT connectedness. However, discussions during focus groups made it clear that the requirement for ICT connectivity was a



separate phenomenon that influenced ICT connectivity as opposed to being a component that defined it.

The findings from the model refinement phase helped define ICT connectivity as the extent to which an individual is connected to ICTs, and individual work productivity as the extent to which an individual perceives him- or herself to have accomplished the expected work during a typical work-day. This phase introduced job requirement for ICT connectivity, which was defined as the extent to which an individual requires the support of ICTs to perform his/her job. This phase expanded the answer to RQ1 by adding that job requirement for ICT connectivity influenced an employee's ICT connectivity. Mapping a more precise flow of effects provided additional insights for research question RQ1.

### ***7.1.3 Contributions from the quantitative phase***

The purpose of this phase was to develop a survey instrument that would test the research model to answer RQ1. Findings from the two previous phases and the key themes from the literature from IS, Communications and Organisational Studies were used as a basis to develop the items for the survey instrument.

Five items were developed in this phase to reflect the concept of job requirement for ICT connectivity:

JR01: It is essential to be connected to ICTs to perform my job.

JR02: My job heavily requires me to be connected to ICTs.

JR03: My job cannot be performed if I am disconnected from ICTs.

JR04: My job requires me to be connected to ICTs the entire time.

JR05: My job requires me to be constantly connected to ICTs.

Collectively, these items formed a reliable reflection of job requirement for ICT connectivity (AVE 0.708, CR 0.924, Cronbach's alpha 0.898).

Although previous research suggested job requirement for ICT connectivity as a component that defined ICT connectivity (Leung, 2011), discussions during the focus groups emphasized that the requirement for ICT connectivity was a

separate phenomenon that determined ICT connectivity. Findings from the quantitative phase supported this differentiation. First, the component extraction during the factor analysis of items showed that job requirement for ICT connectivity was grouped as a separate component to ICT connectivity. Second, the discriminant validity of items between ICT connectivity and job requirement for ICT connectivity was large and did not signal any form of correlation.

The job requirement for ICT connectivity explained 24% of the variance in ICT connectivity, which meant it explained a small-moderate amount of the variance. To further support this, the hypothesis testing showed a medium-strong effect (0.489) from job requirement for ICT connectivity to ICT connectivity. The effect was significant (10.246,  $p < 0.001$ ) and H1 was supported. This meant that the construct had an effect on the research model.

Four items were developed in this phase to reflect the concept ICT connectivity:

ICTCo1: I am connected to ICTs the entire time

ICTCo2: I always have my ICTs with me everywhere I go

ICTCo4: I perceive myself to have a high level of ICT connectivity

ICTCo6: I spend all of my day connected through ICTs

Collectively, these items formed a reliable reflection for ICT connectivity (AVE 0.684, CR 0.896, Cronbach's alpha 0.849).

Five items were developed in this phase to reflect individual work productivity:

IPo1: I always accomplish the work that I expected to.

IPo2: I always accomplish my work within the time allocated for it.

IPo3: I am always productive.

IPo4: I always accomplish more work than I had expected.

IPo5: I hardly ever get my work done on time.

Collectively, these items formed a reliable reflection for individual work productivity (AVE 0.540, CR 0.853, Cronbach's alpha 0.788).

To answer RQ1, H2 was tested and the results showed that there was a positive effect (0.087) between ICT connectivity and individual work productivity. The effect was significant (1.854,  $p < 0.1$ ) and H2 was supported (due to its weak effect).

The observed effect between ICT connectivity and individual work productivity was classified 'weak' in IS research standards (Cohen, 1988). This weak effect could be because of the collective positive *and* negative consequences of ICTs that were mentioned in the literature review, interviews and focus groups. But even so, from a holistic perspective, the positive consequences can be seen as outweighing the negative consequences and resulting in an overall positive outcome. This meant that ICTs had a large positive influence on individual work productivity to begin with. This insight sheds positive light on the effect of ICT connectivity on individual work productivity, whereas previous studies have painted a negative picture of this effect (Ayyagari et al., 2011; Hung et al., 2011; Tarafdar et al., 2007).

The following section answers RQ2.

## **7.2 Addressing Research Question Two**

The purpose of this section is to address the second research question:

RQ2: how does ICT self-discipline influence the effect of ICT connectivity on individual work productivity?

This section discusses how each of the data gathering phases (the qualitative phase, research model refinement phase and the quantitative phase) contributed to answering RQ2.

### **7.2.1 Contributions from the qualitative phase**

The purpose of the qualitative phase was to further explore the concept of ICT self-discipline within the context of ICT connectivity.

Interview participants portrayed ICT self-discipline as a way of managing communication through ICTs. Strategies were shared on how to manage

behaviours towards ICTs. For instance, employees managed the notifications of messages coming through ICTs and delayed communication so that they were 'passively' connected. Employees were cautious of common workplace behaviours such as the attentiveness and responsiveness towards information exchange through ICTs (Dabbish & Kraut, 2006; Malone et al., 1987; Mazmanian et al., 2006; Shirky, 2008).

The findings in this phase confirmed the importance of ICT self-discipline in the context of ICT connectivity. For instance: "*the biggest problem with ICTs is the disruption, if you can ignore it then there's no way you will have a negative effect*" (P5). It was repeatedly stated in interviews that it is a matter of how the communication tool is managed to determine the consequences of ICT connectivity on individual work productivity.

Participants explained that managing information flow through ICTs was mainly to control their workload, which would result in improved performance. Similarly, literature on individual control repetitively showed that incorporating a notion reflecting such behaviours into theoretical models might better explain the effects of ICT connectivity on individual work productivity than previous models have (Derks & Bakker, 2010; Leung, 2011; Mazmanian et al., 2006; Wajcman et al., 2010).

The qualitative phase also highlighted that there were different policies amongst organisations which could influence the way employees managed ICTs. Some employees came from organisations that had strict regulations to adhere to for security purposes and others came from a more liberal work environment. Similarly, it has been indicated in previous literature that different work contexts can influence employee behaviours (Anandarajan, et al., 2000; Markus, 1983; Orlikowski, 2008; Ou & Davison, 2011; Rossi, 2002).

Overall, this phase confirmed the relevance of ICT self-discipline in the workplace. It concluded that ICT connectivity could lead to a positive effect on individual work productivity when implementing workplace strategies to manage ICTs. These strategies included knowing how and when to be connected to ICTs.

### ***7.2.2 Contributions from the model refinement phase***

The purpose of the model refinement phase was to confirm the findings from the interviews and to further clarify the notion of ICT self-discipline.

The key contribution of this phase was expanding the researcher's understanding of the underlying concept of ICT self-discipline. Discussions through expert reviews and focus groups during this phase assisted in explaining the notion of ICT self-discipline and highlighted its key attributes. There were mixed views on whether this concept was considered a form of control or a form of discipline. Although previous research viewed this phenomenon as a form of control (Derks & Bakker, 2010; Leung, 2011; Mazmanian et al., 2006; Wajcman et al., 2010), this research considered both views until it reached a plausible explanation of the phenomenon.

The focus group discussions allowed for further elicitation of factors related to ICT self-discipline. The participants confirmed that ICT self-discipline was a more meaningful way of explaining the phenomenon as opposed to individual control (the label used for this notion in the literature). This finding changed the focus of the notion from management strategies (found in the qualitative phase) to employee behaviours. Behaviours of discipline discussed in this phase reflected Freud's notion of self-control (1911, 1959) and the General Theory of Crime (Gottfredson & Hirschi, 1990). These theories posit that individuals who are able to regulate their impulsive behaviours and regulate gratifications should experience more positive outcomes. Work on self-discipline is widely explored and shows positive impact on individuals overall (Cook et al., 1998; Gottfredson & Hirschi, 1990; Romal & Kaplan, 1995; Tangney et al., 2004; Wolfe & Johnson, 1995).

During the model refinement phase ICT self-discipline was defined as the extent to which an individual can regulate his/her behaviours towards ICTs. No previous research viewed this phenomenon from a discipline perspective. Looking at this notion through a different lens meant new insights are brought into IS and Psychology literature on the notion of individual control.

Another key finding from this phase was that ICT self-discipline was likely to differ amongst different industries. For instance a participant from the education industry highlighted their ability to disconnect at their leisure. On the other hand, a participant from the recruitment industry stated that they could not afford to disconnect as frequently. These differences in industries and workplace environments are likely to influence employee behaviours (Anandarajan, et al., 2000; Markus, 1983; Orlikowski, 2008; Ou & Davison, 2011; Rossi, 2002), however, they were not identified in previous research as necessary employee attributes in the context of ICT self-discipline.

Participants in this phase agreed that having strict discipline could enhance the effect of their ICT connectivity on individual work productivity. Behaviours included ‘switching-off’ or ‘setting times to check email.’ These strategies included manipulating individual availability (through ICTs) to others to deal with incoming exchanges, to make careful decisions on how to respond to or initiate exchanges, filtering information through ICTs, prioritising tasks and exerting time management skills. These views are consistent with Rose’s findings (2013) on controlling incoming communication through ICTs – “[there were] a range of ways in which employees interacted with ICTs, in this case to exert control over who they had contact with and the mode via which they did so” (Rose, 2013, pg. 14). The findings from this phase were also consistent with recent work identifying the need to manage ICT connectivity at work to be productive (Cecez-Kecmanovic et al., 2014).

Overall, the findings from the model refinement phase contributed a modified and concise definition of ICT self-discipline and confirmed the importance of this phenomenon in the workplace. Both the qualitative phase and the model refinement phase provided sufficient detail on the notion of ICT self-discipline.

### ***7.2.3 Contributions from the quantitative phase***

The purpose of this phase was to answer RQ2. The findings from the previous phases and the key themes from the literature on Psychology formed the basis for the development of six items to reflect ICT self-discipline:

SDo1: I am good at ignoring incoming communication through ICTs, even if I am tempted to check them.

SDo2: It is hard to stop myself from using ICTs even if I know they are unnecessary.

SDo6: I am always able to refuse communications through ICTs that are not immediately relevant for my work.

SDo8: I am highly disciplined when using my ICTs.

SDo9: I find it very difficult to ignore my ICTs when they are nearby.

SD10: I am always able to stay focused and do not let ICTs interrupt me.

Collectively, these items formed a reliable reflection for ICT self-discipline (AVE 0.509, CR 0.860, Cronbach's alpha 0.816).

To answer RQ2, H3a was tested and results showed that there was a positive moderating influence (0.119) from ICT self-discipline to the effect between ICT connectivity and individual work productivity. The significance of this relationship was too minimal to support the hypothesis ( $t = 0.628$ ), therefore, from a holistic view H3a was rejected.

As identified during the focus groups, ICT self-discipline may be exerted differently amongst work contexts. This led to testing hypothesis H3a in different settings.

Hypothesis H3a yielded different results when it was tested in sub-samples of the research population. In the sample of employees only from the education industry, ICT self-discipline placed a positive and medium-strong influence (0.620) on the effect of ICT connectivity on individual work productivity. The result was also significant ( $t = 2.972$ ,  $p < 0.01$ ), therefore, within the education industry H3a was supported.

Employees from the education industry sample included lecturers, librarians, teachers, trainers and research assistants. The job descriptions of these roles were investigated via a New Zealand government owned website which provided definitions of common industry roles ([www.careers.govt.nz](http://www.careers.govt.nz)). When these

descriptions were assessed, it turned out that the nature of these roles had low-medium interdependence. This meant that employees required little input from others to perform their job (Gebauer, Shaw & Gribbins, 2010). Particularly, this included employees with independent jobs (such as teaching) that could be performed without the interaction with others, and pooled jobs (such as researching) that required two or more people to interact to perform the job (Hackathorn & Keen, 1981).

Thus, having a somewhat independent nature of work is expected to give employees the freedom to ignore communication through ICTs from time to time to avoid interruptions without the risk of missing out on relevant information, hence improving productivity. This explained why ICT self-discipline was a positive moderator on the effect between ICT connectivity and individual work productivity.

On the other hand, in the sample of employees from the IT industry, ICT self-discipline placed a negative influence (-0.265) on the effect of ICT connectivity on individual work productivity. The influence was not significant therefore H3a was not supported in this context, however, the results provided meaningful insight.

The roles in the IT industry sample included software developers, project managers, business analysts, software testers and consultants. These jobs were defined via [www.careers.govt.nz](http://www.careers.govt.nz). The nature of these roles had medium-high interdependence, which meant employees required input from others in order to perform their jobs. To be exact, this included employees with pooled jobs (such as software testing) that required two or more people to interact to perform the job, and sequential jobs (such as project managers) where employees can only perform their jobs with a sequence of inputs coming from other sources of information (Hackathorn & Keen, 1981).

To illustrate the discussion above, a project manager may not be able to impose strict ICT self-discipline as that might lead to a loss of critical information necessary for the job. ICT self-discipline may enhance an employee's productivity at one point in time but it may also increase the backlog of emails, which in the



long run could result in a negative effect on productivity. This explained why ICT self-discipline was a negative moderator on the effect between ICT connectivity and individual work productivity.

There were similar contrasting differences between the results of H3a when assessed for employees from large multi-national organisations and for employees from small organisations. Employees from a multi-national organisation faced a positive and medium-strong influence (0.726) from ICT self-discipline on the relationship between ICT connectivity and individual work productivity. Contrastingly, employees from small organisations faced a negative influence (-0.848) from ICT self-discipline on the relationship between ICT connectivity and individual work productivity.

The contrasting results mentioned above are likely to be due to the nature of the organisation the employees worked in. Multi-national organisations (which were also classified large in size in the dataset) are seen to have formal structures, whereas small organisations are seen to have informal ones (Chen & Hambrick, 1995; Russo & Perrini, 2010).

Having a process-driven and strictly regulated environment in a large multi-national organisation makes it suitable for employees to up-take strict ICT self-discipline, hence the positive moderation of H3a. On the other hand, small organisations are seen to have a more flexible work environment which would seem less inviting for strict ICT self-discipline. This explained the negative moderation of H3a.

Additionally, large organisations are likely to have more resources (Jesus et al., 2010; McAdam & Reid, 2001) and face more communication through ICT connectivity compared to small organisations. This implied that ICT self-discipline would assist in filtering out the 'good' and the 'bad' connectivity in such inter-connected work environments, explaining the positive moderation of H3a for multi-national organisations.

Participants in the qualitative phase highlighted the importance of assessing different factors that may be beyond the individual's control, including organisational factors (theme ICR4). The findings from the quantitative phase confirmed this contribution, as explained above.

Although the results of ICT self-discipline in large multi-national and small organisations were insignificant to support H3a, they still provided useful suggestions on the differences in the role of ICT self-discipline in these work contexts.

When H3b was tested, results showed that there is a direct, medium-strong effect (0.328) of ICT self-discipline on individual work productivity. The effect was significant ( $t = 8.230$ ,  $p < 0.001$ ) and H3b was supported. This indicated that the direct effect from ICT self-discipline to individual work productivity is much more significant than the effect on the relationship between ICT connectivity and individual work productivity. This is consistent with findings from the literature on discipline which shows that discipline yields positive impact on individuals in general (Cook et al., 1998; Gottfredson & Hirschi, 1990; Romal & Kaplan, 1995; Tangney et al., 2004; Wolfe & Johnson, 1995).

To answer RQ2, in general there is minimal (and statistically insignificant) influence of ICT self-discipline on the effect between ICT connectivity and individual work productivity. However, ICT self-discipline has a relatively larger and statistically significant direct influence on individual work productivity.

The effect of ICT self-discipline as a moderator is subject to the work context (job type and organisation type) an employee is in. This finding was not previously indicated in the literature on individual control. Contributing specific work factors to assess will help employees tailor ICT self-discipline to their needs so they obtain the best from ICT connectivity and receive added productivity at work.

In chapter two, the literature review underlined that external factors beyond an individual's control, such as work conditions, can influence the way employees managed ICTs (Anandarajan, et al., 2000; Loges & Jung, 2001; Markus, 1983;

Orlikowski, 2008; Ou & Davison, 2011; Rossi, 2002). Thus, it made sense that an employee's job and organisational structure can influence their level of ICT self-discipline.

Overall, the findings from the quantitative phase indicated the importance of ICT self-discipline, particularly by the IPMA and the effect size test. ICT self-discipline is a positive and significant moderator of the relationship between ICT connectivity and individual work productivity in job types that have low-medium interdependence (such as jobs in the education industry).

Further, ICT self-discipline can be seen (but yet to be tested) as a positive moderator in organisations with low flexibility and that have strict regulations in place (such as multi-national or large organisations). On the other hand, ICT self-discipline can be seen (but yet to be tested) as a negative moderator of the relationship between ICT connectivity and individual work productivity in work industries that have high interdependence (such as the IT industry) and in organisations with high flexibility (such as small organisations).

The following section highlights the research contributions.

### **7.3 Research Contributions**

This section presents the contributions of this research. Contributions towards IS theory, literature, future research and practice are discussed accordingly.

#### ***7.3.1 Contributions to IS theory***

This research contributes a model towards future theory. The model is new to the IS discipline and provides a different perspective towards productive ICT connectivity (Figure 7-1). This validated model provides the foundations for future theoretical developments related to the research phenomena.

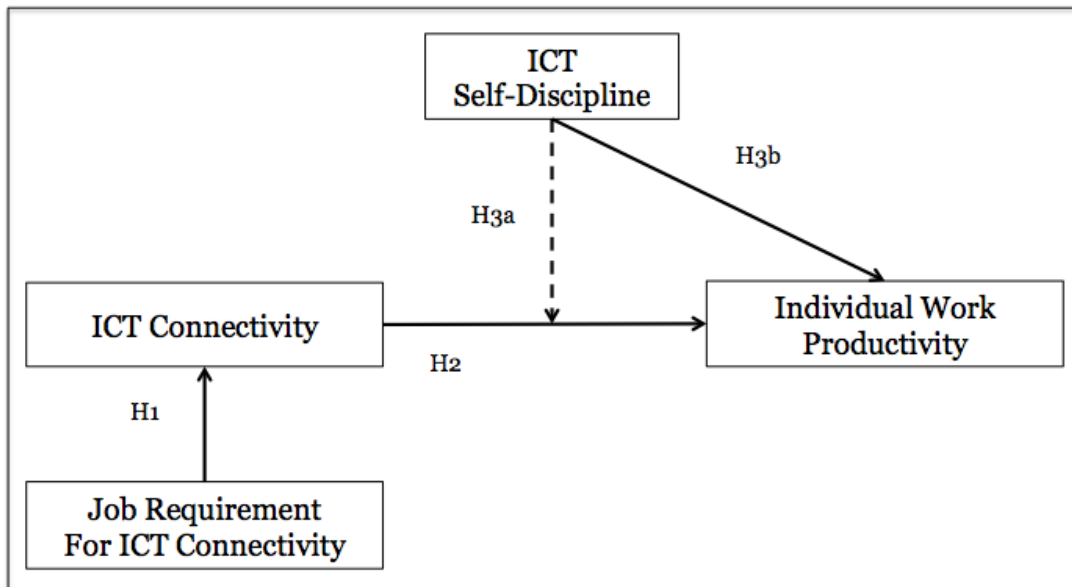


Figure 7-1. Model of Productive ICT Connectivity

This research began with an initial need to examine the effect of ICT connectivity on individual productivity, with the influence of ICT self-discipline. As a result, a model was developed through a post-positivist approach. The model had assistance from existing theories on human behaviours including Media Systems Dependency Theory (Ball-Rokeach & DeFleur, 1976), Uses and Gratifications Theory (Ruggiero, 2000) and the General Theory of Crime (Gottfredson & Hirschi, 1990).

According to Crotty (1998), “post-positivism has the effect of turning laws of physics into relative statements and to some degree into subjective perceptions” (pg. 29). The research phenomena were viewed as objective social entities that were captured through subjective perceptions and tested. As a result, the research model posited four statements.

First, the job requirement for ICT connectivity determines the level of ICT connectivity an individual has (H1). For instance, a project manager may require high levels of ICT connectivity to perform his/her job. The importance of this construct is explained by the fact that it defines the necessary level of connectivity an employee should have. Assessing this characteristic can unfold the reasoning behind an employee’s performance.

Second, ICT connectivity has a positive influence on individual work productivity (H2). This means that as ICT connectivity increases, individual work productivity is expected to increase (but in small increments). This particular relationship diminishes the negative associations of ICTs in the workplace and it indicates that ICT connectivity in general has a positive effect on employees.

Third, strict levels of ICT self-discipline can enhance the relationship between ICT connectivity and individual work productivity in job types with low interdependence (H3a). This means that the more ICT self-discipline an employee (such as a lecturer, teacher and a researcher) applies at work, the better the outcome of their ICT connectivity will be on their productivity. The importance of this construct is explained by the fact that it provides a way of diminishing the negative outcomes of ICTs and enhancing the effect of ICT connectivity on productivity.

Fourth, ICT self-discipline has a positive influence on individual work productivity (H3b). This means that employees that have some form of ICT self-discipline with their behaviours towards ICTs at work are expected to perform better. This effect suggests that in general ICT-disciplined employees should expect better work outcomes, therefore they should invest in applying strategic work behaviours for their own benefit.

There are several reasons for how the model in this research differs from existing theories. Traditional theories from the IS and Communications disciplines have investigated the impacts of ICTs, however, they have not addressed the concept of ICT connectivity in particular. Theories relevant for this research included the Media Richness Theory (Daft & Lengel, 1986 - matching mode of communication with equivocality of message), Task-Technology Fit (Goodhue, 1995 - matching task with technology capabilities) and Media Synchronicity Theory (Dennis et al., 2008 - matching the required synchronicity of the communication process with the medium's synchronicity capabilities).

First, the theories above tend to be concerned with the effectiveness of the technology and what the technology allows the user to do. Instead, the model in this research is concerned with the effectiveness of the individual's behaviours by managing the communication through the technologies they connect through.

Second, the theories mentioned previously are medium specific as they focus on the impact of the technology itself. The model in this research focuses on the condition of being connected as opposed to the technology being used. This covers more than just the medium, it covers the intangible functionalities gained through technology.

Third, the theories mentioned previously are concerned with the alignment or fit of the communication medium for the task at hand. The model in this research is concerned with the employee's ability to regulate such behaviours. So, the previous theories assess these behaviours individually, while the model in this research provides a consolidated representation of the underlying concept behind these behaviours through the notion of ICT self-discipline. Thus, the model developed in this research can be seen as the foundation that explains these behaviours of aligning tasks to the right technology.

Following Gregor's (2006) taxonomy of theories in IS, this research contributes a model consistent with a Type IV theory, that is, the model explains and predicts the relationships amongst ICT connectivity, individual work productivity and ICT self-discipline. Potentially, the model from this research could be developed into a Type IV theory and be further validated.

According to Gregor (2006), Type IV theories are common in IS research. Thus, it was reassuring that this research could contribute a model with similar traits to theories common to the IS discipline. The model in this research is also meaningful for the IS discipline because it contributes a phenomenon (ICT self-discipline) that can enhance the impact of IS (or ICTs) in organisations.

### ***7.3.2 Contributions to the literature***

Chapter one drew attention to this topic by highlighting the gap in literature and the ongoing concern in the media about the effect of ICTs in the workplace. This research addressed these gaps by contributing emerging phenomena, new measurement scales and insights on the workplace. Each is explained accordingly.

***Emerging phenomena.*** This research contributes three emerging phenomena including job requirement for ICT connectivity, ICT connectivity and ICT self-discipline. These phenomena are contributed to the literature on IS, Organisational Studies, Communications and Psychology.

First, this research further developed the notion of job requirement for ICT connectivity, which has previously been seen as a sub-component of ICT connectedness (Leung, 2011). This research indicated the need to separate this construct and defined it as the extent to which an individual requires the support of ICTs to perform his/her job.

Second, ICT connectivity in this research was defined as the extent to which an individual is connected to ICTs. Previously, Leung (2011) developed a similar concept (ICT connectedness), which was a multi-level and contextual approach to assessing the relationship between individuals and ICTs. His work focused on the use of ICTs in general. However, ICT connectivity in this research was portrayed as a construct that goes beyond the ICT measures of use and frequency of use (Burton Jones & Straub, 2006).

Further, findings from this research suggest that ICT connectivity can be viewed as an affordance, or, something that the user can gain through ICTs (Goh, Gao & Agarwal, 2011). ICT connectivity in this research took into consideration the ubiquity of ICTs and the time spent being connected to ICTs. As evidenced during interviews and focus groups, ICT connectivity facilitates employee availability and reachability. This is also consistent with views in the literature on the contrast between use and connectivity. For instance, Jung et al. (2001) emphasize that use is a conception of computer-based technologies as tools that individuals use to gratify their needs, while connectivity reflects a multi-level and contextual way of envisioning the relationship between individuals and technology. Parallel to this view, Kolb's explanation of connectivity does not incorporate typical use measures (2008):

*“...the mechanisms, processes, systems and relationships that link individuals and collectives (e.g. groups, organizations, cultures, societies) by facilitating material, informational and/or social*

*exchange. It includes geo-physical (e.g. space, time and location), technological (e.g. information technologies and their applications) as well as social interactions and artefacts.”*

Both the research constructs ICT connectivity and job requirement for ICT connectivity are contributed to literature on IS, Communications and Organisational Studies, as they concern the use of IS for communication in the workplace. In particular, viewing the notion of ICT connectivity as an affordance responds to recent calls for research on societal challenges of ICTs (Majchrzak et al., 2014).

Third, in this research, ICT self-discipline extended the literature on individual control. The notion was further developed from Psychology literature concerned with self-control. ICT self-discipline was defined as the extent to which an individual can regulate his/her behaviours towards ICTs. Previously, neither IS or Psychology literature had fully investigated this phenomenon. The contribution of this phenomenon expands the literature on Psychology, IS and Organisational Studies (human resources).

Further, the notion of ICT self-discipline in this research contributes insight towards ‘restricting connectivity and protecting oneself’ and can help limit connectivity at work in order to be more productive. Cecez-Kecmanovic et al. (2014) conceptualise four modes of connectivity that professionals encounter in the workplace. Connectivity that is enabling and inevitable is referred to as ‘connected as a form of life’. Connectivity that is disturbing and inevitable puts professionals in a mode referred to as ‘burnt by connectivity’. Connectivity that is enabling and controllable is referred to as ‘restricting connectivity and protecting oneself’. Connectivity that is disturbing and controllable puts professionals in a mode that makes them ‘struggling with connectivity’. Findings from this research support and expand these views.

**Measurement scale.** A reliable measurement scale was developed for each of the four constructs assessed in this research to capture the effect of ICT connectivity on individual work productivity with the influence of ICT self-discipline. This measurement instrument can be used in the industry and in



research within IS, Communications, Organisational Studies and Psychology.

The measurement scale developed in this research allowed for the effect of ICT connectivity on individual work productivity to be tested and confirmed through a *quantitative* method. This expands the selected existing quantitative metrics related to the investigated research phenomena (Ayyagari et al., 2011; Davis, 2002; Hung et al., 2011; Rennecker & Godwin, 2005; Venkatesh et al., 2010; Karr-Wisniewski & Lu, 2010).

***New insights.*** The answers from the two research questions RQ1 and RQ2 provided new insights on the topics investigated in this research.

First, the job requirement for ICT connectivity was previously assessed as a single item explaining connectedness (Leung, 2011). However, this research assessed it as a separate construct and provided a more explicit measure for it. Such findings can be used in future research on the adoption of technology.

Second, ICT connectivity can be seen as a new type of ICT (or technology) affordance. This expands the current 'affordance types' contributed by Sebastian and Bui (2012), namely communication, decision support, accountability and compliance.

Third, the topic of ICT self-discipline was previously touched on in literature, only to indicate its potential value in the context of ICT connectivity (Derks & Bakker, 2010; Kolb et al., 2012; Leung, 2011; Wajcman et al., 2010). This study expanded these findings by providing both qualitative and quantitative data on the emerging phenomenon. The findings highlighted the importance of ICT self-discipline and they provided a basis for future research on this topic (discussed next).

### ***7.3.3 Opportunities for future research***

Another key contribution from this research is the number of opportunities generated for future development on the phenomena investigated. At this stage, the contributed research model has an abstract view of reality. It serves as a starting point and gives indications for future developments. As a result, avenues for future research are provided for four areas including job requirement for ICT

connectivity, ICT connectivity, ICT self-discipline and the development/assessment of new research constructs. Each is explained accordingly.

***Future research for job requirement for ICT connectivity.*** One of the main findings in this research was that the effect of ICT self-discipline will vary for different job types. Although job requirement for ICT connectivity indicates a general view of the connectivity required, future research can break this down to the task-level. This is because generally a job is comprised of a set of business tasks that vary in nature (Gebauer et al., 2010; Gory & Morton, 1989; Hackathorn & Keen, 1981). Underpinning each kind of task and assigning the ‘appropriate’ level of ICT connectivity to it might yield more accurate results. Further, researchers can incorporate measures of job characteristics and the skills required to achieve those (Kim & Longest, 2014). That way, the notion of job-connectivity fit can be determined with accuracy.

Moreover, a future construct might use guidance from the TTF theory (Goodhue, 1995) and develop the task-connectivity fit construct to provide a more concise explanation between the job requirement for ICT connectivity and ICT connectivity. The multi-group analysis during the quantitative phase indicated the need to further assess employee’s jobs in order to best explain the effect of ICT self-discipline. That added analysis showed that there were varying task types employees were expected to perform. Thus, to get a more complete picture, future research could focus on the task types an employee performs instead of a high-level view of their job type.

***Future research for ICT connectivity.*** The quantitative findings in this research showed that although there was a positive effect from ICT connectivity on individual work productivity, the effect was minimal, or weak. There are certain factors that may have diminished the strength of this result.

First, being *connected* (viewed as a form of reachability in this research) may also mean connected to a community or friends (Kobler et al., 2010) or connected via mobile or wireless network availability (Gebauer et al., 2010). There are also different types of connectivity that an employee encounters through ICTs (Kolb et

al., 2008). Thus, the perceived understanding of the term connected may have been seen as too ambiguous. This issue was addressed during the item development via rigorous reviews by IS academics and practitioners, however, their views may have been limited to experience.

Further, Cecez-Kecmanovic et al. (2014) suggest that “constant connectivity is a more complex phenomenon than currently described in the literature” (pg. 7). Thus, future research could be more explicit in defining the concept of being connected to add further clarity in hopes that the assessment will measure the same interpretation of connectivity each time. This may allow future research to capture a more accurate relationship between ICT connectivity and individual work productivity.

Second, building on the idea of different connectivity types, the mixed effects of ICT connectivity evidenced in this research bring both ‘good’ and ‘bad’ connectivity for employees. Future developments could distinguish between the two and test the impact of ICT self-discipline on both types of ICT connectivity.

Future research should also distinguish between incoming and outgoing connectivity. It is likely that an employee will require high outgoing connectivity and low incoming connectivity, or vice versa. Additionally, it is likely that different ICT self-discipline behaviours will take place for each. For instance, when dealing with incoming exchanges through ICTs an employee might be strict with responding or attending to them. Whereas, when generating outgoing exchanges through ICTs an employee might be strict with aligning the right method of communication with the task at hand. Giving ICT connectivity *direction* may yield more accurate results in future.

Third, an employee’s state of ICT connectivity is likely to change throughout the day. During certain times of the day the connectivity of an employee is likely to drop from being highly connected to being passively connected. That is, high exposure to others and constant interaction can reduce to low exposure to others and delayed interaction through ICTs. Future research could consider assessing the change in ICT connectivity as opposed to measuring it as a static notion. Alternatively, future research could consider quantifying the measurement of ICT connectivity for more accuracy. This way, the effect of ICT connectivity on

individual work productivity could be further clarified.

Fourth, it may be useful in future to incorporate work on affordances to further explore the notion of ICT connectivity. Literature on affordances is well investigated in IS research (Bernhard, Recker & Burton-Jones, 2013). Technology affordances might include collaboration, content creation and knowledge aggregation (McLoughlin & Lee, 2007). This suggestion makes space for future research to incorporate relevant theories such as the Technology Affordances and Constraints Theory, which seeks to understand the relationships between users and technology to highlight the outcomes of technologies as a whole (Majchrzak & Markus, 2013). Future research could expand the model from this research and assess how the design, use and administration of ICTs influence ICT connectivity. That way, a better explanation of the consequences of ICT connectivity on individual work productivity could be provided.

***Future research for ICT self-discipline.*** The IPMA analysis in chapter six indicated the need to focus on the concept of ICT self-discipline to enhance individual work productivity. Further exploratory research such as focus groups or action research can take place to better explain the behaviours of ICT self-discipline (Miles & Huberman, 1994; Myers & Newman, 2007). Future research can also investigate the phenomenon from a constructionist theoretical lens to seek any other new views of ICT self-discipline, particularly if focusing on the behavioural aspect. In the long run, this might lead to stronger moderation results of ICT self-discipline,

The results discussed in section 7.2 highlighted the differences of the moderating effect amongst varying work contexts, particularly the industry and organisation an employee worked in. This suggests the need for further investigation on the impact of job types and organisation types to better explain the effect of ICT connectivity on individual work productivity.

Leonardi (2011) highlights the need to ‘imbricate’ the human agency and the material agency. That is, to interweave a human’s goals with the technologies’ features and abilities based on the context they are in. A similar response was provided by participant eight (P8), suggesting the need to switch between

communication media (from email to face-to-face) depending on the context an employee is in (quick and honest response required).

In the example above, the routine is changed and not the technology. Leonardi (2011) questions whether individuals change their routines or change their technology in order to change their work practices overall. His study concluded that “when an existing material agency is imbricated with a new human agency people may be likely to change their routine, and when an existing human agency is imbricated with a new material agency a technology changes” (pg. 163). Thus, focus on the ‘imbrication’ of human and material agency could clarify and introduce new behaviours relevant for ICT self-discipline.

Drilling deeper into the notion of ICT self-discipline could also mean assessing the phenomenon at the decision-making level. Betsch and Haberstroh (2013) suggest that goal and context provide the conditions for the choices we make. For example, person A might need to urgently retrieve a document from person B. The goal is to retrieve the document and the context is urgency. These factors would help person A call person B as opposed to email them. The decisions made that allow ICT self-discipline behaviours to take place may be dependent on such factors. Thus, work on decision-making could further explain the reasons behind the ICT self-discipline behaviours.

Additionally, self-efficacy could be explored to further understand the internal motivations of discipline. Because the topic of this research was highly related to behaviours, the Theory of Reasoned Action could be incorporated in future to explain the effects towards discipline, which predicts human behaviour (Ajzen & Fishbein, 1980). Self-Regulation Theory (Baumeister & Vohs, 2007) could also provide reasons behind the behaviours of ICT self-discipline, explaining the short-term desires of impulsive behaviours.

The suggested theories above could assist in explaining the conscious decisions made by employees, however, it is important to note that some of these behaviours (such as impulsive behaviours) are volitional and are habit as opposed to intentional. These addictions can bias the behaviours towards ICTs (Bernroider, Krumay & Margiol, 2014). Thus, Unconscious Thought Theory may serve as a starting point to highlight employees’ behaviours outside of their

awareness (Dijksterhuis, 2004).

The results showed that the workplace attributes such as job type and organisation type influenced the way ICT self-discipline moderated the relationship between ICT connectivity and individual work productivity. Thus, the Social Cognitive Theory could be incorporated in future work as it suggests that people, environments and behaviours collectively explain how individuals acquire and maintain behaviours (Bandura, 2001). This theory can explain the inter-relation amongst these three factors in the workplace and provide better understanding of employees' behaviours and their ICT self-discipline.

***Future research constructs.*** The low-medium variances ( $R^2$ ) that explained the constructs ICT connectivity and individual work productivity suggested that there are 'missing' factors in the contributed research model. Future additions to the model might include employee expectations, personality types and workplace structure.

One of the key findings in the literature is the change of employee expectations in the workplace where employees are expected to respond more instantly than before (Dery et al., 2014; Mazmanian et al., 2006; Mazmanian, 2013; Mazmanian et al., 2013; Rose, 2013). Future research could look into the influence of changing expectations on ICT self-discipline, perhaps through a longitudinal study to capture the changes in workplace behaviours over time.

The assessment of personality types is another fruitful direction for future research. Generally, personality types can affect human behaviour (Liao & Chunag, 2004). Research highlights that disciplined individuals or those of a conscientious, extraverted or organised personality type can behave differently to others at work (Costa & McCrae, 1992; Dabbish & Kraut, 2006; Malone et al., 1987; Mazmanian, 2013; Perlow, 2012; Shirky, 2008; Tangney et al., 2004). Therefore, future research could assess the influence of personality types (such as the Big Five) on ICT self-discipline to find a more tailored strategy for employees for added effectiveness.

Another potential avenue for future research is to assess the person-discipline fit. Previous work investigates the person-environment fit in terms of person-job,

person-organisation, person-group and person-supervisor fit (Kristof-Brown, Zimmerman & Johnson, 2005). Speier and Venkatesh (2002) assess the person-technology fit in the context of sales force automation. They support that individual characteristics (such as age and gender) are likely to influence an individual's perception towards technology. They apply Identity Theory to explain one of their concluding remarks, that is, "a salesperson is likely to think of him- or herself primarily as a salesperson in general and secondarily as an employee" (pg. 109). Similar concepts can be used to develop a person-discipline fit construct that seeks to distinguish how each personality type would apply discipline in the ICT connected workplace.

Additionally, the results from the quantitative phase suggested that ICT self-discipline was performed differently across work environments (large and small organisations). Although the job requirement for ICT connectivity captures an employee's *job* context, it does not capture the *organisational* context an employee works in. Thus, this research invites future studies on organisational structure and culture to assess their influence on the relationships. A notion assessing the workplace structure required for ICT connectivity could be developed and assessed in future to explain an employee's ICT connectivity and provide further understanding.

#### **7.3.4 Contributions to practice**

Personal management strategies are often put in place to enhance employee performance (Dabbish & Kraut, 2006; Malone et al., 1987; Mazmanian, 2013; Mazmanian et al., 2013; Perlow, 2012; Shirky, 2008). This research contributes implications for managers on how to manage ICT connectivity to improve employee productivity.

Each component of the research model can assist practitioners with their decision-making processes when implementing ICTs in their organisation. Effective decision-making can enhance individual work productivity and in the long run, organisational productivity. The research model can be translated to a set of useful implications for managers, as discussed below.

Job requirement for ICT connectivity indicates that those performing work that requires ongoing interaction with other employees for work-related inputs should expect to have high levels of ICT connectivity. For instance, a software developer in the planning phase of a project may require high levels of ICT connectivity for data gathering. However, as they transition into the development phase they may need to decrease that connectivity to be able to concentrate during the programming. In situations where there is minimal work productivity, managers can assess the employee's job requirement for ICT connectivity against their perceived level of connectivity. The difference between the two can explain if someone is over/under-connected when they are not supposed to be.

Managers can be reassured that ICT connectivity has a positive (but small) effect on individual work productivity. However, because the effect is small it does not mean that managers should encourage excessive ICT connectivity in the workplace. Instead, managers need to have an open mind about implementing ICTs in the workplace to enhance effectiveness and efficiency of processes and increase individual work productivity. The use of ICTs should take place in moderation and careful consideration of the outcomes of these ICTs should be made. For best results, managers should track and ensure the ICT connectivity provided by the ICTs they adopt has more positive influence than negative.

To further enhance individual work productivity, managers can focus on imposing strict ICT self-discipline in the workplace. This means that managers should invest in training their employees on effective workplace strategies and build awareness. However, managers should keep in mind that as ICT self-discipline changes (becomes less strict or less lenient) it may have a negative influence on the effect of ICT connectivity on employee productivity, which will make the positive consequences of ICTs redundant.

In job types with low interdependence (like employees from the education industry) and in large, process-driver (multi-national) organisations ICT self-discipline can enhance the relationship between ICT connectivity and individual work productivity. On the other hand, in job types with high interdependence (like employees in the IT industry) and in organisations with flexible work structures (small organisations) ICT self-discipline can weaken the relationship



between ICT connectivity and individual work productivity. So, the idea is to tailor the levels of ICT self-discipline to the different work settings in return for enhanced individual work productivity.

During the qualitative phase and the model refinement phase, participants emphasized the importance of having strategies to manage work-related ICT connectivity. Participants emphasized the following strategies:

- prioritise and carefully manage incoming-exchanges (while taking advantage of tool notifications) to avoid interruptions to workflow and maintain productivity,
- make quick and ruthless decisions with how responsive to be through ICTs,
- have a filing strategy for tasks,
- pay less attention to less important emails (i.e. the importance of an email if an employee is in the “to” addressee list is higher than if an employee is in the “cc” addressee list),
- be mindful of colleagues’ productivity and avoid interruptions where possible,
- align the task at hand with the appropriateness of the mode of communication, particularly if there is urgency in the task then a more synchronous mode of communication should take place (i.e. a phone call or face-to-face communication) and less urgent tasks should be sent via email.

No doubt employees need to find the optimal ICT connectivity, that is, the right amount of ICT connectivity in order to fulfil their work needs (Cecez-Kecmanovic et al., 2014; Dery et al., 2014). Employees should focus on applying disciplined behaviours like the ones mentioned above to assist them in getting rid of the ‘bad’ connectivity and taking full advantage of the ‘good’ connectivity. It is a matter of filtering information through ICT connectivity and finding the right balance.

In future, practitioners from the software development industry can also use findings from this research to develop mobile applications or software that can

ensure ICT self-discipline in the workplace to enhance individual work productivity. The following section discusses the research limitations.

#### **7.4 Research Limitations**

There are certain factors that may have prevented the accuracy and quality of investigation in this research (Castetter & Heisler, 1984).

First, the research sample covered a wide range of industries. The issue of a research model not being specific enough is that it may miss out on useful details to further explain the relationships. Therefore, future research should apply this model to other contexts and be aware of other influential factors in that area. In support of this, Dery et al. (2014) highlight that “understanding connective choices in practice represents a significant challenge, but it is certainly a frontier worthy of continued exploration” (pg. 569).

In addition, the research sample limited the research to a specific, local, New Zealand (NZ) perspective thus findings may not be generalizable to other contexts (Johnson & Onwuegbuzie, 2004). In this case, it is recommended that future research expands the sample population to other contexts including international perspectives to increase the generalizability of the results (Venkatesh et al., 2010).

Second, the data in this research were gathered in one point in time. Given the rapid change in technology, perceptions towards the phenomena of this research may have changed. For instance, a study by Dery et al. (2014) showed that attitudes and behaviours towards ICTs changed over a five year period. Therefore, future work can assess this research through a longitudinal approach to capture any changes that may have taken place.

Third, as evidenced in the future research suggestions, there are certain contextual factors that can influence the relationships investigated in this research. It is likely that other contextual factors such as work culture and personality types influenced the research outcomes. They were excluded due to the limited size of the research project. Thus, future researchers should consider including such factors to better explain the effect of ICT connectivity on employees, with the influence of ICT self-discipline.

Fourth, this research uses perceptual measures to capture the research phenomena. It is possible that these perceptual measures did not accurately reflect the reality of employees' behaviours. For instance, in a study by Renaud et al. (2006) more than 50% of participants (employees) reported that they checked their emails more than once an hour. The same study showed that when using tracking software, employees checked their email once every 2.53 minutes on average. So, studies in future could assess the research phenomena objectively and perceptually to compare results amongst the measurement methods.

Finally, from a qualitative perspective, data gathering and analysis is a time consuming process and could go wrong because results could be interpreted differently from researcher to researcher (Berger & Luckmann, 1967; Johnson, 1997; Myers & Newman, 2007).

From a quantitative outlook, confirmation bias can occur if the researcher is in favour of his/her hypotheses and focuses on confirming rather than validating them. The standardised and easy to replicate analysis of quantitative data may also prevent the researcher from interpreting findings in multiple ways (Tashakkori & Teddlie, 2010). Further, potential survey errors such as measurement error and sampling error may reduce the accuracy of results (Leedy & Ormrod, 2013; Scandura & Williams, 2000; Straub, 1989).

Careful thought was put into the research design to prevent the qualitative and quantitative measurement issues mentioned above, however, it is still possible that errors may have taken place. To overcome these limitations, future research is encouraged to repeat similar research from a different theoretical outlook or via other research methods. Future researchers should also carry out longitudinal investigation on the topic of inquiry to ensure data gathering and analysis occurs several times prior to confirming results (Jurison, 1996).

The following highlights the research conclusion.

## **7.5 Research Conclusion**

The aim of this study was to bridge the gap in IS literature and to address the ongoing concern in the media about the effect of ICTs in the workplace. Thus, the primary goal of this research was to investigate the effect of ICT connectivity on

individual work productivity with studying how ICT self-discipline influenced that relationship.

The research used a three-phased, mixed method, post-positivist approach. The findings from each of the data gathering phases were consolidated to answer the two research questions RQ1 and RQ2.

The research phenomena were explored during the qualitative phase and the research model refinement phase. The results from these phases highlighted the mixed effects of ICT connectivity on individual work productivity. They also highlighted that an individual's level of ICT connectivity was dependent on the nature of their job.

Further, the results from the qualitative phase and model refinement phase emphasized the importance of ICT self-discipline in an ICT-connected work environment. Employees exercised different strategies in managing information through ICTs. This included ignoring incoming communication through ICTs, initiating communication through the appropriate means and reducing ICT connectivity during stressful work periods. These behaviours varied depending on the work environment an employee came from.

The results from the quantitative phase concluded that job requirement for ICT connectivity positively influenced ICT connectivity and ICT connectivity positively influenced individual work productivity. Therefore, hypotheses H1 and H2 were supported and answered research question RQ1.

Further, ICT self-discipline showed a positive effect on the relationship between ICT connectivity and individual work productivity only for employees with jobs requiring low-medium interdependence. Hypothesis H3a was supported as the moderating effect was not statistically supported for the entire research sample. However, when tested in different groups of the research sample, the differences of the moderating effect of ICT self-discipline (hypothesis H3a) in varying work settings provided useful insights on the research topic (although not all were statistically significant).

The results from the quantitative phase indicated that employees that have jobs with low-medium interdependence or are working in structured and/or highly inter-connected organisations can afford to apply strict ICT self-discipline at work.

Contrastingly, employees that have jobs with medium-high interdependence or are working in small and/or unstructured organisations should be lenient with their ICT self-discipline at work. These results indicate that the employee's job type and organisation type are critical factors to assess prior to investing in ICT self-discipline strategies for work, to enhance the effect of ICT connectivity on individual work productivity.

Moreover, the research findings indicated that ICT self-discipline positively influenced individual work productivity. Thus, hypothesis H3b was supported, which further emphasized the importance of ICT self-discipline in the ICT-connected workplace. This contributed to answering research question two.

The relevance of this research is illustrated by its numerous contributions. This research contributes a new model towards IS theory relevant for explaining and predicting relationships. The model was guided by conjectures from existing theories on human behaviours including Uses and Gratifications Theory, Media Systems Dependency Theory and the General Theory of Crime.

The research expands knowledge on the recent phenomenon of ICT self-discipline, or what is referred to in literature as *self-control* or *individual control* (Derks & Bakker, 2010; Leung, 2011; Mazmanian et al., 2006; Wajcman et al., 2010). Further, this research answers the call for research on ICT and societal changes and the call for further research on the impact of ICTs on employees (Ladd et al., 2010; Majchrzak et al., 2014). This research also expands knowledge on ICT connectivity and job requirement for ICT connectivity within a new, New Zealand, context. Further, a reliable survey instrument capturing the phenomena investigated in this research is contributed to the literature on IS, Communications, Organisational Studies and Psychology.

The findings from this research also address the ongoing concern in the media about the mixed effects of ICT connectivity in the workplace. The research

highlights the importance of ICT self-discipline in the workplace and how it can enhance the effects of ICTs on employees. Further, the findings suggest critical factors that organisations should assess prior to enforcing or suggesting ICT self-discipline strategies for work. This is opposed to having a one-size-fits-all strategy that is commonly suggested in the media.

The results of this study contribute vast opportunities for future research, particularly focusing on factors like job types, work settings, expectations and personality types and their effect on the research phenomena. Future researchers are encouraged to further explore the concept of ICT self-discipline and tailor the contributed research model to varying contexts. Future research should also investigate the topic through other approaches such as in-depth qualitative research or longitudinal studies to gain further understanding.

From a practitioner viewpoint, this study contributes a further developed phenomenon, ICT self-discipline, which is relevant for enhancing individual work productivity in the ICT-connected workplace. Managers are encouraged to be aware of employees' behaviours towards ICTs and should train them on how to face more positive experiences with ICTs. It is critical that the employee's job characteristics and organisational structure are assessed prior to imposing workplace strategies on how to manage ICT connectivity.

This research also contributes implications for practitioners on managing ICTs to assist with decision-making and avoid 'bad' connectivity through ICTs. These implications should help enhance individual work productivity. These findings can also assist with the development of new ICT self-discipline technology applications that can help manage ICT connectivity to enhance individual work productivity.

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## Appendix A – Defining Productivity in IS Literature

Author(s)	Employee productivity in the study	Type of output	Context
(Locke, 2005)	Influenced by the concept of usability, productivity is shaped by the effectiveness, efficiency and satisfaction of achieving a specified goal against time with the use of an ICT.	Objective usability measures and self-assessments of satisfaction	Handheld wireless devices
(Scudder & Kucic, 1991)	Efficiency and effectiveness of employees based on lines of code and performance of software.	Objective measures of total number of lines of code	Software development
(Gebauer, Shaw & Gribbins, 2004)	One of the items that compose the construct of impact is efficiency which relates to benefits from increased productivity of the user and of the people a user interacts with by making better use of time.	Perceived self-reports	Impact of mobile technologies
(Tarafdar et al., 2007)	Self-reported scale that explains how the use of technology can improve the quality of work, improve productivity, accomplish more work than would otherwise be possible, and perform the job better.	Perceived self-reports	Technostress
(Davis et al., 1999)	Increased efficiency and effectiveness, and expansion and/or conservation of the limited time and attention that workers can devote to activities.	-	Curriculum for undergraduate course work
(Igbaria & Tan, 1997)	Individual impact is measured by perceived performance impacts of computer systems on decision-making quality, performance, productivity, and effectiveness of the job.	Perceived self-reports	IT acceptance
(Vuolle et al., 2008)	Perceived employee productivity is a partial productivity measure that can be calculated by dividing the quantities of outputs by the quantities of inputs used (e.g. the number of working hours).	Perceived self-reports	Mobile business service
(Straub & Karahanna, 1998)	The use of media to reduce task delays and improve efficiency, hence, productivity.	Objective measures of performance	Task closure through media choice
(Gorgone et al., 2003)	Personal productivity is gained through effective and efficient use of information technology.	-	Curriculum for undergraduate course work
(Rennecker & Godwin, 2003)	The work accomplished in a given time period with a given set of resources.	-	ICTs in workplace

## Appendix B – Interview Protocol

1.0	INTRODUCTION
1.1	<i>Thank interviewee for participation, introduce study focus</i>
1.2	<i>Explain interview structure – inform interviewee that sharing anecdotes of experiences of ICTs in the workplace is recommended.</i>
1.3	<i>Demographic details (gender, age, time in current role, previous education and work experience, experience with ICTs).</i>
2.0	ICT CONNECTIVITY
2.1	What types of electronic communication streams are you exposed to in the workplace ( <i>give examples of networks, devices, applications</i> )?
	2.1.1 Which of these do you use?
	2.1.2 <i>Explain to interviewee that electronic communication streams explained in 2.1.1 will be referred to as ICTs (Information and Communication Technologies). Interviewee has the option of using an alternative term.</i>
	2.1.3 Can you tell me why you have chosen to use these ICTs?
	2.1.4 Are there any workplace policies that might guide or restrict their use?
2.2	What sort of information are you exchanging through these ICTs ( <i>give examples of bulky, short, confidential, sensitive etc</i> )?
	2.2.1 Who is this decided by and why?
2.3	Can you explain how often you are using your ICTs on a daily basis?
	2.3.1 Are there particular times when this will fluctuate?
2.4	Can you describe your level of connectivity to sources of information through these ICTs ( <i>this may require explanation on ICT connectivity</i> )?
	2.4.1 If it varies, can you explain how?
	2.4.2 What drives this connectivity?
	2.4.3 What would be a way to indicate your level of connectivity?
	2.4.4 How do you know whether you are over or under connected?
2.5	<i>Explain we will now be moving to the second part of the interview.</i>
3.0	EMPLOYEE PRODUCTIVITY
3.1	Can you explain how you determine whether you have had a productive day or not ( <i>ask to elaborate on any new factors mentioned other than efficiency and effectiveness</i> )?
	3.1.1 Is there a particular way of measuring this? If so then how if not then why?
3.2	Can you describe when you would refer to yourself as being efficient in your job?
	3.2.1 Could you explain how ICTs have helped in making you efficient, or not?
3.3	How do you know whether you have been effective with your work?
	3.3.1 How have ICTs impacted your effectiveness of the work accomplished?
3.4	Why do you think your effectiveness and efficiency, or productivity in general, is being affected by ICTs in the way that you have just explained ( <i>are there any particular reasons</i> )?
3.5	<i>Explain we will now be moving on to the second part of the interview.</i>
4.0	INDIVIDUAL CONTROL
4.1	Can you tell me of a time when you have had to be consciously careful with how to deal with the information flow through ICTs in order to prevent you from being unproductive ( <i>ask interviewee to elaborate on any new factors mentioned and/or provide examples</i> )?
	4.1.1 Why did you take this approach?
4.2	How do you decide when and where to be connected through ICTs – for instance, some employees decide to take their cellphones to meetings, lunch, everywhere – do you have similar experiences ( <i>probe interviewee for more stories/examples</i> )?
	4.2.1 Why do you do this?
4.3	How responsive are you to communication through ICTs, for example are you responding to emails instantly or is there a particular way that you work?
	4.3.1 Why do you take this approach?
4.4	What do you think is an appropriate mechanism that you might suggest to others, or to try for yourself, to help you manage ICT connectivity to maximise employee productivity?
5.0	CLOSURE
5.1	Are there any other comments you would like to add to end this interview with, or any sections that you would like us to go back to for further discuss?
5.2	<i>Thank participant and state date of when transcript will be sent for their review. Remind them that contact details are available on information form.</i>

## Appendix C – HEC Approval for Interviews

SIM HUMAN ETHICS COMMITTEE  
Comments on Application for Human Ethics Approval

Date: 28 Feb 2013

Principal Researcher: Balsam Al-Dabbagh

Research Project: The effect of ICT connectedness on employee productivity: An investigation of the role of individual control

Supervisor: Eusebio Scornavacca

Reference No: #19685

- Accept
- X Accept with minor changes. (Stated below)
- Accepted with required changes. (Stated below)
- Do not accept in present form. (Changes required as below)

Required Changes (dealing with ethical issues only)

Please ensure that both the information sheet and consent form use the latest VUW letterhead (can be found on SIM's HEC website).

## Appendix D – Interview Information

### INTERVIEW - INFORMATION SHEET

**Project Title:** The effect of ICT connectivity on employee productivity: An investigation of the role of individual control

**Researcher:** Balsam Al-Dabbagh, PhD Student, School of Information Management, Victoria University of Wellington.

Dear <Participant Name>

Thank you for your interest in participating in this research project which investigates the effect of ICT connectivity on employee productivity with the influence of individual control. Your contribution will help the completion of my PhD project at Victoria University of Wellington, so thank you for your time.

#### **Background on Topic**

Information and Communication Technologies (ICTs) are all around us. We use them to connect to multiple sources of information, giving us extended reach and access. This is particularly evident in research investigating the uptake of ICTs in the workplace. Findings show that the level of connectivity between employees has considerably increased as networked and ubiquitous ICTs provide ‘almost constant connectivity’, making employees ‘always on’ and ‘constantly connected’ to people and information. Consequently, employees’ levels of connectivity are increasing.

The increase of such ICT connectivity can produce both positive and negative impacts on employee productivity. Literature suggests that to better understand the effect of ICT connectivity on employee productivity it is essential to further investigate how employees manage their time and productivity in this environment of constant connectivity. Therefore the goal of this research is to explore the effect of ICT connectivity on employee productivity and understand how individual control can influence this relationship.

Findings from this research will contribute a theoretical model to literature on the collective phenomena of ICT connectivity, employee productivity and individual control. From a practical perspective, this study will provide recommendations for organisations and employees on how to more effectively manage the utilization of ICTs. Additionally, findings could inform public policy by providing useful insights for the New Zealand Productivity Commission.

#### **Your Contribution**

Your participation in this research will involve an interview of approximately 40 minutes. The interview will be conducted in March 2013. The interview can be conducted preferably face-to-face if you are in Wellington, or alternatively over the phone or using an Internet video conferencing tool of your choice. The School of Information Management Human Ethics Committee has given ethical approval for this stage of the research.

Your participation in this research project is voluntary. You will have the chance to review and revise the interview transcripts and provide any feedback after the interview has taken place. You may ask to have the information you provide withdrawn without question at any time before the start of data analysis [date to be inserted].

Your name will be kept confidential and the results of the data analysis will be presented in an aggregated form which will prevent individuals to be identified. All data will be password protected throughout the project and destroyed 2 years after the conclusion of the study. The thesis will be submitted for examination to the School of Information Management and deposited in the University Library. The research results may be presented at conferences, and one or more articles may be submitted for publication in scholarly journals.

If you have any questions or would like to receive further information about the project, please contact me at [balsam.aldabbagh@vuw.ac.nz](mailto:balsam.aldabbagh@vuw.ac.nz) or my supervisor, Dr. Eusebio Scornavacca ([eusebio.scornavacca@vuw.ac.nz](mailto:eusebio.scornavacca@vuw.ac.nz)) from the School of Information Management at Victoria University of Wellington, PO Box 600, Wellington, phone: +64 4 463-5103.

Once again, thank you for your participation and I really look forward to learning about your experiences and insights on the effect of ICTs in the workplace.

Balsam Al-Dabbagh

### INTERVIEW - CONSENT TO PARTICIPATE IN RESEARCH

**Project Title:** The effect of ICT connectivity on employee productivity: An investigation of the role of individual control

- I have been given and have understood an explanation of this research project. I have had an opportunity to ask questions and have them answered to my satisfaction.
- I understand that the interview will be recorded and that the audio recordings will be password protected then destroyed two years after the conclusion of the project.
- I understand that I will have the opportunity to review the interview transcripts and provide feedback before data is analyzed.
- I understand that my name and the data I provide will be kept confidential.
- I understand that the results may be used in the researcher's PhD thesis, conference papers, or journal articles.
  
- I understand that I may request that the data I have provided be withdrawn from the research project before data analysis starts [date to be inserted].
- I agree to take part in this research.

**Signed:**

**Name of participant:**

**Date:**

## Appendix E – Research Validation Steps

Chapter	Validation steps	References
4	<p><u>Instrument validity</u>: five iterations of peer reviews by IS professionals to ensure interview protocol was reliable.</p> <p><u>Design validity</u>: interview protocol tested through informal interviews with practitioners outside the IS profession.</p> <p><u>Instrument validity</u>: enhancing interview protocol where necessary after every fifth interview.</p> <p><u>Interpretive (inferential) validity</u>: interview transcript sent to corresponding participant for review. Results reviewed by experts in the IS field.</p> <p><u>Analytical validity</u>: overall rigorous process of reviews.</p>	(Johnson, 1997; Scandura & Williams, 2000; Straub et al., 2004; Venkatesh et al, 2013)
5	<p><u>Interpretive (inferential) validity</u>: updated research model presented to two different panels of IS experts.</p> <p><u>Instrument validity</u>: peer review by IS professionals to ensure focus group protocol was reliable.</p> <p><u>Design validity</u>: tested through informal focus group with practitioners.</p> <p><u>Interpretive (inferential) validity</u>: focus group transcript sent to corresponding participants for review. Results reviewed by experts in the IS field.</p> <p><u>Interpretive (inferential) validity</u>: updated research model presented to two different panels of IS experts.</p> <p><u>Analytical validity</u>: overall rigorous process of reviews.</p>	(Johnson, 1997; Venkatesh et al, 2013)
6	<p><u>Content validity</u>: iterative reviews of items from IS scholars and practitioners and conducting pre-test.</p> <p><u>External (design) validity</u>: three rounds of card sorting, ensuring participants came from a range of roles for generalizability.</p> <p><u>Face validity</u>: pilot survey to test if the instrument measured what it needed to measure.</p> <p><u>Measurement validity</u>: assessing construct reliability.</p> <p><u>Convergent validity</u>: factor/cross-loadings of items.</p> <p><u>Discriminant validity</u>: cross-loadings of items.</p> <p><u>Statistical conclusion (inferential) validity</u>: quantitative findings presented to three expert panels.</p> <p><u>Analytical validity</u>: overall rigorous process of reviews.</p>	(DeVellis, 2011; Hardesty & Bearden, 2004; Hinkin, 1998; MacKenzie et al., 2011; Straub, 1989; Straub et al., 2004; Venkatesh et al., 2013)



## Appendix F – Themes from Interviews

Code	Key Theme	Example
ICN1	The ability to reach information and the ability to be reached by other sources of information through ICTs.	<i>"I immediately think of communication between myself and others, for example with Lync you're always accessible regardless if you're onsite or offsite, the same with email to transfer work...email one to one or one to many and so forth."</i> (P14)
ICN2	ICT connectivity perceived as a condition.	<i>"If I have something really difficult to do I will just not check for hours, but it [instant messaging] still runs in the background it's always there...I'm passively connected, like I'm always connected but I only check once every 25 minutes or something. So the idea is I'm connected and you can catch me but there's a 25 minute lag."</i> (P5)
ICN3	The time spent connected to ICTs explains ICT connectivity.	<i>"Under connected would be being unable to access these ICTs for say 20 minutes consistently, 20 minutes to half an hour."</i> (P15)
ICN4	The scope of information channels an employee is subscribed to explains ICT connectivity.	<i>"If I'm advertising the fact that I do screen sharing and somebody [makes a] request then that's over sharing, that would give me potential to be over connected. To disconnect myself I just wouldn't offer that as an option, if I felt there was no benefit in being connected, then I wouldn't advertise this as an opportunity for them [clients]."</i> (P13)
ICN5	The volume of exchanges made through ICTs explains ICT connectivity.	<i>"When I see other people who make heavy use of Facebook or Twitter, I feel far less connected."</i> (P10) <i>"I base it on my friends who are constantly connected, they use Twitter and stuff...Those people are very connected."</i> (P7)
ICN6	The ubiquity of the ICTs explains ICT connectivity.	<i>"When the phone is on [me] <u>all</u> the time, it shows connectivity."</i> (P4)
IPD1	Individual work productivity defined as the amount of work complete per unit of time.	<i>"I start with a vision of what I want to achieve for the day and if I've achieved them then I've had a productive day"</i> (P10).
IPD2	Efficiency as a key element of individual work productivity.	<i>"Efficiency is you could do more with your resources."</i> (P14) <i>"You know you are efficient when they are getting the job done, or I'm 80% or 90% done."</i> (P3)
IPD3	Effectiveness as a key element of individual work productivity.	<i>"Effectiveness for me is improving the way things are done."</i> (P14) <i>"[effectiveness means] we are doing the right things, people understand things, we are heading toward the right place."</i> (P4)
ICR1	Individual control viewed as an individual's ability to manage their exchanges through information streams.	<i>"The biggest problem with ICTs is the disruption, if you can ignore it then there's no way you will have a negative effect...only reason why I changed from Linux to Mac is...to have the ability to manage how I'm notified, by who I'm allowed to be notified."</i> (P5)
ICR2	Attentiveness as a key element of individual control.	<i>"Sometimes I'm checking emails coming and going if I have some time – but it's at my choice not because I feel I have to...I leave email running in the background but I check periodically because stuff moves quite quickly."</i> (P4)
ICR3	Responsiveness as a key element of individual control.	<i>"I don't feel compelled to respond to an email once I receive it! I can take my time to respond."</i> (P6)
ICR4	Workplace policies shaping restrictions on individual control.	<i>"Certain websites we are not allowed on, when using cell phones we can't make personal calls, external emails won't come in if they have swear words."</i> (P15)

## Appendix G – Focus Group Protocol

Item #	Task/Question
1	INTRODUCTION
1.1	Welcome participants and explain the focus group goals, structure and the ground rules.
1.2	Tell us who you are. Name, role description, type of organisation you work for and something interesting about yourself.
1.3	What communication technologies do you have access to in the workplace? Write these on the white board (explain that they will be referred to as ICTs or whatever the group decide).
2	TRANSITION
2.1	Tell us a scenario of your typical work day from when you first wake up to when you go to bed. Let us know what you do with your ICTs during that time.
3	KEY QUESTIONS
3.1	Based on the scenarios explained, how would you describe how connected you are?
3.1.1	BRAINSTORMING ACTIVITY: What is it that helped you identify the connectivity you just explained? Ask participants to rate the relevance of the collective items/factors on the board (group activity).
3.2	BRAINSTORMING ACTIVITY: What term would you use to explain what you've just told us?
3.3	Physically, how are ICTs making you connected?
3.3.1	Emotionally, how are ICTs making you connected?
3.3.2	Do you think there are other components to ICT connectivity?
3.4	In pairs, in the least amount of words, come up with a definition that would best explain ICT connectivity.
3.5	Going back to the scenarios you explained earlier, how you are managing your connectivity? For instance the use of your ICTs and the information flowing through them? Do you only answer urgent calls during meetings, you only chat to colleagues when you have time etc. (or refer back to their examples).
3.5.1	BRAINSTORMING ACTIVITY: What term would you use to explain this?
3.5.2	BRAINSTORMING ACTIVITY: What is it that helped you identify <term X> you just explained? Ask participants to rate the relevance of the collective items/factors on the board (group activity).
3.6	BRAINSTORMING ACTIVITY: What influences what you have just explained (group activity)?
3.7	In pairs, in the least amount of words define what would be the best way to explain individual control.
3.8	To put what we have just discussed into context, think back to when you were last in the office – How did ICT connectivity assist you? What impact did it have? Give us a scenario or event that illustrates this.
3.8.1	Based on what you've just explained, how did <term X> (individual control) play a role in this? Give us a scenario or event that illustrates this.
4	ENDING QUESTIONS
4.1	Suppose you had one minute to summarise what we have discussed this evening to your boss – what would you say? You will be strictly timed.
4.2	Thank participants for participation and explain next steps.

## Appendix H – HEC Approval for Focus Groups

### SIM HUMAN ETHICS COMMITTEE Comments on Application for Human Ethics Approval

Date: 1 November 2013

Principal Researcher: Balsam Al-Dabbagh

Research Project: The effect of ICT connectedness on individual productivity: An investigation of the role of individual control

Supervisor: Alan Sylvester

Reference No: 20354

- Accept
- X Accept with minor changes. (Stated below)  
Accepted with required changes. (Stated below)  
Do not accept in present form. (Changes required as below)

Required Changes (dealing with ethical issues only)

Information Sheet

1. Normally, a focus group participant can only withdraw during the conduct of the focus group. Once completed, it is not normally possible to withdraw as a participant's contributions are interactively combined with contributions from other participants. Please amend the withdrawal statement accordingly.

2. Please include phone contact details for the researcher and supervisors (excepting Eusebio).

Consent Form

3. Please remove the withdrawal statement (as per point 1 above).

4. It is generally recommended that tick boxes should only be used where genuine choice is offered – such as with video/audio recording. Please amend accordingly (note that the consent form template on the SIM HEC website would be useful as a guide, even though it is intended for interview-based data collection).

## Appendix I – Focus Group Information

### FOCUS GROUP - INFORMATION SHEET

**Project Title:** The effect of ICT connectivity on individual productivity: an investigation of the role of individual control

**Researcher:** Balsam Al-Dabbagh, School of Information Management, Victoria University of Wellington

Dear <Participant Name>

My name is Balsam Al-Dabbagh and I am a PhD candidate at Victoria University of Wellington. My research is investigating the effect of ICT connectivity on individual productivity, with the influence of individual control.

**THE ISSUE** – Employees like yourself work in a constantly connected environment where smartphones and laptops are the vehicles of communication. Think back to when you last sent a text message or sent an email, it is very likely this was 2 or 3 minutes ago. What we do not realise is the mixed set of consequences that such connectivity can have on our lives. Is this disrupting you or making you more efficient? Learning to manage these communication streams means getting the best out of these technologies and inhibiting the worst.

**THE IDEA** – I would like to seek your views on this topic and learn about how communication technologies affect you in the workplace and to learn about the strategies that you follow to manage the effect of the communication technologies you use.

**A SIMPLE FAVOUR** – I would be delighted to have you participate in a focus group discussion in collaboration with other employees like yourself to explain your thoughts on the topic of study.

**WHAT'S IN IT FOR YOU** – Networking with others in the industry, learning techniques on how to deal with your communication technologies, and a break from work to provide insight on how your workplace can improve its communication facilities.

**FOCUS GROUP STRUCTURE** – The focus group will consist of 4-6 employees including yourself. The discussions are informal but will have a set of questions for you to answer. The discussions are expected to last between one hour and one hour and a half, or earlier if the discussion goals have been met. Discussions will be video and audio recorded and transcribed and kept confidential where names of participants will not be disclosed. All data collected from participants will be destroyed within 2 years after the PhD submission. Participants will sign a confidentiality form to confirm that they will not share confidential information shared in discussions.

Your assistance will provide the necessary data for my PhD and accelerate its progress. Once complete, my PhD thesis will be submitted for marking to the School of Information Management, and subsequently deposited in the University Library. Should you wish to withdraw from the focus group, you may do so during the conduct of the focus group, and the data collected up to that point will not be used in the research. For more information on my research please feel free to contact me via email [balsam.aldabbagh@vuw.ac.nz](mailto:balsam.aldabbagh@vuw.ac.nz) (ph: 021 170 4684), or my supervisors Dr. Allan Sylvester via email [allan.sylvester@vuw.ac.nz](mailto:allan.sylvester@vuw.ac.nz) (ph: 04 463 6813), and Dr. Eusebio Scornavacca via email [escornavacca@ubalt.edu](mailto:escornavacca@ubalt.edu).

Thank you very much for your time. I look forward to hearing from you.

Balsam Al-Dabbagh

## FOCUS GROUP - CONSENT TO PARTICIPATE IN RESEARCH

**Project Title:** The effect of ICT connectivity on individual productivity: an investigation of the role of individual control

**Researcher:** Balsam Al-Dabbagh, School of Information Management, Victoria University of Wellington ([balsam.aldabbagh@vuw.ac.nz](mailto:balsam.aldabbagh@vuw.ac.nz))

- I have been given and have understood an explanation of this research project. I have had an opportunity to ask questions and have them answered to my satisfaction.
- I understand that focus groups will be recorded and that the video and audio recordings will be password protected then destroyed two years after the conclusion of the project.
- I accept to be video and audio recorded.
- I confirm that I will keep focus group participant information confidential and to myself only.
- I understand that my name and the data I provide will be kept confidential.
- I understand that I will have the opportunity to provide feedback on the focus group findings by the date provided at the time of correspondence.
- I understand that the results may be used in the researcher's PhD thesis, conference papers, or journal articles.
- I understand that I may request that the data I have provided be withdrawn from the research project before data analysis starts [date to be inserted].
- I agree to take part in this research.

**Signed:**

**Name of participant:**

**Date:**

## Appendix J – Themes from Focus Groups

Code	Key Theme	Example	Freq	Ext
FCN1	Being connected to ICTs and exposed to others.	“At the heart of it all is about staying in touch and being able to reach anybody at any time virtually, via an application such as Skype or email or call or text.” (P22)	21	P18, P19, P20, P21, P22, P23, P24
FCN2	ICT connectivity is not active communication/ availability.	“I guess the other word is availability but connectivity is wider than that...the availability is more like people can contact you and you can contact people or you can search things. Connectivity is you get connected it doesn't matter if you are unavailable to others.” (P19)	7	P18, P19, P21, P23, P24
FCN3	ICT connectivity is determined by the employee's nature of work.	“That's so true, in my previous job I was working in a large accounting firm it was very formal and very structured and I could only reply during lunchtime but now with the nature of my job at the moment, my friends know the nature of my job so I haven't trained myself yet.” (P21)	10	P16, P18, P20, P21, P23, P24
FPD1	Productivity is concerned with completing work within a designated timeframe.	“Getting things done in the dedicated time.” (P20)	8	P16, P18, P19, P20, P23, P24
FPD2	ICT connectivity affects individual work productivity.	“The fact that now with a multitude of modes of communication at your fingertips, I think productivity on the whole has declined. While largely speaking effectively quantum leaps from writing letters to email, from that perspective we have advanced we're efficient we're productive.” (P23)	13	P16, P17, P18, P19, P20, P21, P22, P23, P24, P25
FSD1	Having a strategy to deal with communication through ICTs.	“I don't have email pop ups, you don't need to respond instantly to a text message, it's only phone calls you respond to immediately. I don't use push notifications in general. All my notifications are off I don't get anything pushed to me, I turn off push notifications. If I want to I can find stuff out myself.” (P20)	18	P16, P17, P18, P18, P20, P21, P23, P25
FSD2	Having discipline in a connected context affects how well ICTs impact employees.	“Communication technologies are really really important in our lives and we need to continue to use them to help us, being connected means there's less down time and making decisions and getting information and helps you to do what you need to do but at the same time we just need to make sure they [ICTs] don't overwhelm us and the employee has the best control of that mechanism.” (P16)	12	P16, P17, P20, P21, P22, P23, P24, P25

## Appendix K – Pilot Card Sorting Information

### Card Sorting – Pilot Round: Instructions

Dear Participant,

Thank you for your time to participate in this exercise. Your help will assist in developing a survey tool for my PhD research – investigating the effect of ICT connectivity on individual productivity with the influence of self-discipline.

There are four simple steps required:

- 1) You will be given a set of statements, put in random order. Read through them to see what they are seeking.
- 2) Group the statements according to what you think the cards are seeking.
- 3) For each group provide a label (name) and a 1-sentence description of what you think the group statements are seeking.

Let us do an example to make sure the instructions are clear.

### Card Sorting – Pilot Round: Trial Exercise

Item	Group
I hate classical music.	Music genres: feelings towards music genres.
I love RNB and Hip Hop songs.	Music genres: feelings towards music genres.
I have a soft spot for country music.	Music genres: feelings towards music genres.
I always enjoy eating bananas.	Food enjoyment: level of enjoyment of food intake.
I always enjoy eating cupcakes.	Food enjoyment: level of enjoyment of food intake.
I never enjoy consuming carrots.	Food enjoyment: level of enjoyment of food intake.
I always drink a lot of beer.	Alcohol intake: amount of alcohol intake.
I drink at least five cocktails a day.	Alcohol intake: amount of alcohol intake.
I have three glasses of wine for breakfast.	Alcohol intake: amount of alcohol intake.
I enjoy fishing.	Not fitting.
I love to bake.	Not fitting.

## Appendix L – Open Card Sorting Information

### Card Sorting – Open Round: Instructions

Dear Participant,

Thank you for your time to participate in this exercise. Your help will assist in developing a survey tool for my PhD research – investigating the effect of ICT connectivity on individual productivity with the influence of self-discipline. This exercise should only take 40 minutes at maximum.

There are four simple steps required:

- 4) You will be given a set of statements, put in random order. Read through them to see what they are seeking.
- 5) Group the statements according to what you think the cards are seeking.
- 6) For each group provide a label (name) and a 1-sentence description of what you think the group statements are seeking.

Let us do an example to make sure the instructions are clear.

- 7) Once you have completed steps 1-3 I will review your answers and ask brief questions (where necessary) on why you decided to group statements in the way you have.

Here are some useful notes to consider:

- 1) There is no limit to how many groups of statements you have.
- 2) Each statement cannot belong to more than one group unless you feel it is necessary to.
- 3) You may discard statements if you feel they do not fit in any group.
- 4) ICT or ICTs imply Information and Communication Technologies such as devices and applications through electronic media (smartphones, email, social media etc.).

Thanks again for your participation.

### Balsam Al-Dabbagh

PhD Candidate

Victoria University of Wellington

### Card Sorting – Open Round: Trial Exercise

Item	Group
I hate classical music.	Music genres: feelings towards music genres.
I love RNB and Hip Hop songs.	Music genres: feelings towards music genres.
I have a soft spot for country music.	Music genres: feelings towards music genres.
I always enjoy eating bananas.	Food enjoyment: level of enjoyment of food intake.
I always enjoy eating cupcakes.	Food enjoyment: level of enjoyment of food intake.
I never enjoy consuming carrots.	Food enjoyment: level of enjoyment of food intake.
I always drink a lot of beer.	Alcohol intake: amount of alcohol intake.
I drink at least five cocktails a day.	Alcohol intake: amount of alcohol intake.
I have three glasses of wine for breakfast.	Alcohol intake: amount of alcohol intake.
I enjoy fishing.	Not fitting.
I love to bake.	Not fitting.



## Appendix M – Closed Card Sorting Information

### Card Sorting – Closed Round: Instructions

Dear Participant,

Thank you for your time to participate in this exercise. Your help will assist in developing a survey tool for my PhD research – investigating the effect of ICT connectivity on individual productivity with the influence of self-discipline. This exercise should only take 40 minutes at maximum.

There are five simple steps required:

- 1) You will be given a set of statements written on yellow paper. They are put in random order. Read through them to see what they are seeking, try to identify the underlying idea for each one.
- 2) You will be given a set of categories with definitions written on orange paper. These are groups for you to put the statements in. One group will be provided for irrelevant items, the group is called “discard items”.
- 3) Take the time to place the statements in their appropriate group according to what you think each statement is seeking.

Let us do an example to make sure the instructions are clear.

- 4) Once you have completed steps 1-3 I will review your answers and ask brief questions (where necessary) on why you decided to group statements in the way you have.
- 5) You may provide any feedback on items that are repeating, or require re-wording, or you think are missing in the categories.

Here are some useful notes to consider:

- 6) Each statement cannot belong to more than one group unless you feel it is necessary to.
- 7) You may discard statements if you feel they do not fit in any group.
- 8) ICT or ICTs imply Information and Communication Technologies such as devices and applications through electronic media (smartphones, email, social media etc).

Thanks again for your participation.

**Balsam Al-Dabbagh**

PhD Candidate

Victoria University of Wellington

### Card Sorting – Closed Round: Trial Exercise

Item	Group
I hate classical music.	Music genres: feelings towards music genres.
I love RNB and Hip Hop songs.	Music genres: feelings towards music genres.
I have a soft spot for country music.	Music genres: feelings towards music genres.
I always enjoy eating bananas.	Food enjoyment: level of enjoyment of food intake.
I always enjoy eating cupcakes.	Food enjoyment: level of enjoyment of food intake.
I never enjoy consuming carrots.	Food enjoyment: level of enjoyment of food intake.
I always drink a lot of beer.	Alcohol intake: amount of alcohol intake.
I drink at least five cocktails a day.	Alcohol intake: amount of alcohol intake.
I have three glasses of wine for breakfast.	Alcohol intake: amount of alcohol intake.
I enjoy fishing.	Not fitting.
I love to bake.	Not fitting.

## Appendix N – HEC Approval for Online Survey

### SIM HUMAN ETHICS COMMITTEE Comments on Application for Human Ethics Approval

Date: 13 March 2014

Principal Researcher: Balsam Al-Dabbagh

Research Project: The effect of ICT connectivity on individual work productivity: An investigation of the role of ICT self-discipline

Supervisor: Allan Sylvester

Reference No: 20749

- Accept
- X Accept with minor changes. (Stated below)
- Accepted with required changes. (Stated below)
- Do not accept in present form. (Changes required as below)

#### Required Changes (dealing with ethical issues only)

##### Application Form

5(m) – asking participants to email the researcher for a summary of results can be awkward given the participant has no idea as to when such a summary will become available. One alternative would be to create a separate page through Qualtrics that enables the participant to request the results summary by providing an email address which would not be linked back to the data they provided. Another would be to send the summary to all candidate participants – regardless of whether or not they participated. Please use an alternative approach for feedback provision, or explain why the current approach would be best.

##### Consent Form

Second bullet point has little meaning or purpose here – it normally is used for interviews and focus groups where the researcher has to ensure such an explanation reaches the participant. In this case it is attached to the survey. Please remove it.

The last bullet point will need to be modified based on point 1 above.

#### Additional Comments (dealing with non-ethical issues only)

Information Sheet – second paragraph, last sentence, under Research Background, anthropomorphises the survey by saying it “seeks to find the effect” and “seeks to understand”. Consider rewording this sentence.

## Appendix O – Online Survey Screenshots

Dear Participant,

Thank you for taking part in this study.

### Research Background

At work you may use a number of devices such as smartphones, laptop and computers. Through these devices you may use a number of applications such as email, social media and other online tools. These devices and applications are what we refer to as Information and Communication Technologies (ICTs). ICTs in this research are any device or application that you use to send and/or receive information electronically.

ICTs are making employees more connected to people and other sources of information, increasing their levels of ICT connectivity. This survey seeks to find the effect of ICT connectivity on individual work productivity with the influence ICT self-discipline.

### What is Required

This survey contains questions on your experience with ICTs at work. At the start of each section, a definition of what is being sought will be provided. You may find that some questions sound repetitive - they are supposed to. Please answer all questions as well as you can, you will not be able to modify answers once you pass the page.

### The Benefits

By completing this survey you will be in the draw to win a \$100 (NZD) shopping voucher. Your answers will assist in developing work strategies and tools that will make YOU more productive. Results from this survey will contribute to my PhD research at Victoria University of Wellington (New Zealand), so thank you in advance.

0%  100%

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### Survey Consent Form

Please read the following statements:

- The survey should last around 10 minutes.
- Participation is voluntary.
- I understand that the data I provide will be kept anonymous and confidential and cannot be attributed to me.
- I understand that survey data will be password protected then destroyed five years after the conclusion of the project.
- I understand that the results may be used in the researcher's PhD thesis, presentations, conference papers, or journal articles.
- I can withdraw from the survey by closing the survey. Any data up to that point will not be used.
- If I have any questions I can contact the researcher Balsam Al-Dabbagh, balsam.aldabbagh@vuw.ac.nz (04 463 5103) or the researcher's supervisors Dr. Allan Sylvester, allan.sylvester@vuw.ac.nz (04 463 6813), or Dr. Eusebio Scornavacca, escornavacca@ubalt.edu.

**By moving on to the following page you accept all the above statements and you agree to take part in this research.**

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### What is your current employment status?

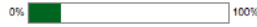
- Unemployed
- Part time employee
- Full time employee
- Self employed
- Contractor

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**Do you use ICTs to perform your job?** Remember, ICTs in this research are any device or application that you use to send and/or receive information electronically.

- Yes
- No



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### ICT Connectivity at Work

ICT connectivity is defined as the degree to which an individual is connected to ICTs at work during a typical work-day. ICTs are any device or application that you use to send and/or receive information electronically. For each statement below please indicate to what extent you agree.

In a typical work-day...

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
I am often disconnected at work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am connected to ICTs the entire time.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I always have my ICTs with me everywhere I go.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I perceive myself to have a high level of ICT connectivity.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I spend all of my day connected through ICTs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



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### ICT Self-Discipline

ICT self-discipline is defined as the degree to which an individual is able to regulate behaviours towards the use of ICTs at work. ICTs are any device or application that you use to send and/or receive information electronically. For each statement below please indicate to what extent you agree.

In a typical work-day...

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
I am always able to refuse communications through ICTs that are not immediately relevant for my work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is hard to stop myself from using ICTs even if I know they are unnecessary.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it very difficult to ignore my ICTs when they are nearby.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am always able to stay focused and do not let ICTs interrupt me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am highly disciplined when using my ICTs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am good at ignoring incoming communication through ICTs, even if I am tempted to check them.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



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**Individual Work Productivity**

Individual work productivity is defined as the extent to which an individual perceives him/herself to have accomplished their expected work in a typical work-day. For each statement below please indicate to what extent you agree.

**In a typical work-day...**

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
I am always productive.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I always accomplish more work than I had expected.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I always accomplish my work within the time allocated for it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I hardly ever get my work done on time.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I always accomplish the work I expected to.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



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**Job requirement for ICT connectivity**

Job requirement for ICT connectivity is defined as the degree to which an individual requires the support of ICTs to perform his/her job. ICTs are any device or application that you use to send and/or receive information electronically. For each statement below please indicate to what extent you agree.

**In a typical work-day...**

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
My job requires me to be connected to ICTs the entire time.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is essential to be connected to ICTs to perform my job.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My job heavily requires me to be connected to ICTs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My job requires me to be constantly connected to ICTs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My job cannot be performed if I am disconnected from ICTs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



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**Gender:**

- Male
- Female

**Age group:**

- Less than 20
- 20-29
- 30-39
- 40-49
- 50-59
- 60+

**Ethnic group:**

- New Zealander
- Maori
- Pacific Peoples
- Asian
- Middle Eastern
- European
- Latin American
- African
- Other



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**Which industry do you work in?**

- Accounting
- Administrative & office support
- Advertising, arts & media
- Agri-business
- Banking, finance & insurance
- Call centre & customer service
- Community services
- Construction
- Consulting & strategy
- Design & architecture
- Education & training
- Engineering
- Executive & general management
- Government & council
- Healthcare
- HR & recruitment
- IT
- Legal
- Manufacturing, transport & logistics
- Mining, resources & energy
- Real estate & property
- Sales
- Science and technology
- Tourism and Hospitality
- Other

**What is your occupation?**

**What type of organisation do you work for (please tick all that apply)?**

- Large
- Small-Medium
- Small
- Multi-national
- Government
- Not for profit
- Non-Government Organisation
- Self-employed
- Other

**Which country do you work in primarily?**

**Additional comments (optional)**



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Thank you very much for taking the time to fill in this survey. Click [here](#) if you would like to receive a summary of the research results or if you would like to be in the draw to win a prize. Do not worry you will remain anonymous, we will not be able to match your email address to the data you have provided. Thanks again!



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