ICTs for employability and empowerment : an analytical framework for addressing the digital divide in urban livelihoods

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**ICTS FOR EMPLOYABILITY AND EMPOWERMENT:
AN ANALYTICAL FRAMEWORK FOR ADDRESSING THE
DIGITAL DIVIDE IN URBAN LIVELIHOODS**

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WEE KIM WEE SCHOOL OF COMMUNICATION AND INFORMATION

2018

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AN ANALYTICAL FRAMEWORK FOR ADDRESSING THE DIGITAL
DIVIDE IN URBAN LIVELIHOODS**

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ABSTRACT

Prevailing discussions in the digital divide field have focussed on the roles which technology access and usage play in achieving economic well-being in the developing countries. However, rising global inequality has given rise to a sub-class of citizens in the developed economies, classified as the *working poor*, for whom the impact of ICTs differs from those observed in developing economies.

This thesis makes use of Amartya Sen's capability approach, as a theoretical framework to examine the dependent variables of well-being, where one's sense of employability was posited as personal economic well-being, for self-perceived employability has been found to be positively correlated with employment outcomes (Fugate, Kinicki, & Ashforth, 2004; Koen, Klehe, & Van Vianen, 2013; McArdle, Waters, Briscoe, & Hall, 2007). In addition to self-perceived employability, self-perceived empowerment is presented as an indication of non-economic well-being.

The independent variables are examined with Selwyn's (2010) digital divide assessment framework guiding the factor analyses to refine the ICT measures of *access*, *usage* and *appropriation* (the predictors) into more granular sub-factors that are based on the participants' attribution of these ICT assets to his or her outcomes of self-perceived *employability* and *empowerment*. Hierarchical regression techniques reveal that, instead of access, higher-order levels of ICT usage and appropriation are positively associated with the dependent variables of personal well-being. The findings challenge traditional digital divide paradigms which advocate that access to technology is a sufficient condition to resolve problems of inequality.

This thesis contributes to the discussion on digital divide from multiple perspectives. Firstly, it broadens the field's scope to include marginalised citizens, in developed countries, who are affected by rising inequality. Secondly, it offers a theoretical insight into the non-economic outcomes of personal well-being, e.g. psychological empowerment, when considering divide outcomes, and thirdly, it provides conceptual clarity to the polysemy of the digital divide inequalities by providing an analytical and methodological measurement guideline to what exactly are the three levels of the digital divide. Lastly, the thesis' results provide a basis for policy recommendations to improve both the economic prospects and the non-economic well-being of those marginalised constituents of society, through higher-order ICT skills' training.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	iii
ABSTRACT	iv
TABLE OF CONTENTS	v
LIST OF TABLES	ix
LIST OF FIGURES	xiii
CHAPTER ONE INTRODUCTION	14
Statement of the Problem	14
The Societal Issue	14
Purpose and Significance of the Study	16
Dependent variables: Employability and Empowerment	16
i) Economic outcomes -- livelihoods and employability	16
ii) Non-economic outcomes -- opportunities and well-being	16
Independent variables: ICT Access, Usage and Appropriation	18
The Digital Divide Conceptual Problem	19
The Digital Divide Methodological Problem	20
Addressing the Digital Divide Conceptual and Methodological problems	21
The Digital Divide in Singapore	23
The Research Questions	24
Structure of the Thesis	25
Inequality	27
Concepts of Inequality	27
Employability and Empowerment	29
Economic outcomes – livelihoods and employability	30
Employability	33
Non-economic outcomes -- opportunities and well-being	35
Empowerment	36
Empowerment and Employability as Agency	38
Empowerment and Employability in a Capability Frame	38

CHAPTER THREE THEORETICAL PERSPECTIVES – DIGITAL DIVIDE	40
First, the Digital Divide Conceptual Problem.....	40
The Digital Divide Concept	41
Levels of Digital Divide	41
Second, the Digital Divide Methodological Problem	46
Disagreements about measuring the Digital Divide	46
Addressing the Digital Divide Conceptual and Methodological problems	46
Context – why Singapore?	47
Same needs, doing the same things, but why different outcomes?.....	48
The Digital Divide in Singapore	49
Measures of the Digital Divide	50
(1) Studies on access of ICTs	50
(2) Studies on usage of ICTs.....	52
(3) Studies on appropriation of ICTs	56
CHAPTER FOUR METHODOLOGY	60
Participants.....	60
Materials	62
Procedure	62
Design and Analyses	63
CHAPTER FIVE FACTOR ANALYSES	65
The Independent Variables.....	65
ICT Access (IV1)	65
Factor Analysis - ICT Access scale.....	66
Re-defining ICT's Access	68
ICT Usage (IV2)	71
Factor Analysis – ICT Usage scale	71
Re-defining ICT's usage	73
ICT Usage of the Singaporean Participant.....	75
ICT Appropriation (IV3).....	77

Factor Analysis – ICT Appropriation scale.....	77
Re-defining ICT’s appropriation	79
ICT Appropriation of the Singaporean Participant	79
Section Summary -- A validated instrument to measure ICT access, usage and appropriation.....	81
The Dependent Variables	84
Self-Perceived Employability (DV1).....	84
Factor Analysis – Employability Scale.....	85
How the Singaporean worker perceives employability	86
Self-perceived Empowerment (DV2)	88
Factor Analysis – Empowerment scale.....	88
Self-perceived Empowerment for the Singaporean worker.....	89
Chapter Summary	91
CHAPTER SIX RESEARCH QUESTIONS AND HYPOTHESES	93
ICT access on Employability and Empowerment.....	94
ICT usage on Employability and Empowerment.....	95
ICT Appropriation on Employability and Empowerment	96
Chapter Summary	97
CHAPTER SEVEN REGRESSION ANALYSES.....	101
Multiple Regression – ICT access, usage and appropriation on Self-Perceived Employability.....	101
Effects of ICT access on employability	101
Effects of ICT usage on self-perceived employability.....	103
Effects of ICT appropriation on self-perceived employability	105
Summary – ICT Access, Usage and Appropriation on Self-perceived Employability.....	106
Hierarchical regression results – Self-perceived Employability outcome.....	108
Multiple Regression Results – Empowerment outcome	112
Effects of ICT access on self-perceived empowerment.....	112

Effects of ICT usage on self-perceived empowerment.....	113
Effects of ICT appropriation on self-perceived empowerment	115
Section Summary – ICT assets on Self-Perceived Empowerment	116
Hierarchical Regression of ICT assets on Self-Perceived Empowerment.....	118
A Note about Multicollinearity	121
Calculating the total effects of individual factors and ICT assets on both self-perceived employability and empowerment.....	121
Structural equation modelling with the measured variables	122
CHAPTER EIGHT CONCLUSION & DISCUSSION	126
Rethinking Inequality and Well-being	126
Rethinking inequality and its constituents	126
Rethinking well-being.....	127
Rethinking the Digital Divide and its dimensions	128
Enhancing Personal Well-Being by Addressing the Digital Divide.....	132
The Research Questions Revisited	132
The Digital Divide Paradigm – evolution from Device to User-focused	136
Theoretical contributions – ICTs’ hierarchy of effects	143
The Digital Divide and Future Research	145
APPENDICES	147
Appendix A	147
Appendix B	149
Appendix C	150
Appendix D	152
Appendix E – Additional Tables	159
REFERENCES	196

LIST OF TABLES

Table 1: Respondents demographics and socio-economic status versus population	61
Table 2: Results of the rotated Factor Analysis of ICT Access	66
Table 3: Resulting categories of the ICT Access scale	67
Table 4: Explications and definitions of the ICT access sub-factors	70
Table 5: Results of the rotated Factor Analysis for ICT Usage	72
Table 6: Resulting categories of the rotated ICT Usage scale	72
Table 7: Explications and definitions of ICT Usage sub-factors	76
Table 8: Results of the unrotated Factor Analysis for ICT Appropriation.....	77
Table 9: Resulting categories of the rotated ICT Appropriation scale.....	78
Table 10: Explications and definitions of the ICT Appropriation sub-factors.....	81
Table 11: Summary of the explicated ICT access, usage and appropriation scales in this study	82
Table 12: Results of the unrotated Factor Analysis for the Employability scale	85
Table 13: Resulting categories of the rotated Employability scale	85
Table 14: Summary and definitions of the Employability sub-factors	87
Table 15: Results of the unrotated Factor Analysis for the Empowerment scale	88
Table 16: Resulting categories of the rotated Empowerment scale	89
Table 17: Summary of the operational definitions of the self-perceived Empowerment scale.	91
Table 18: Summary of the definitions and hypotheses of the three levels of ICT assets.....	99
Table 19: Regression of ICT access on Self-Perceived Employability, over individual factors	102
Table 20: Regression of ICT Usage sub-factors on Self-perceived Employability, over individual factors.....	104
Table 21: Regression of ICT Appropriation sub-factors on Employability	106
Table 22: Summary - Hypotheses Validations of each ICT assets on self-perceived Employability.....	107

Table 23: Block 3 - Regression of demographic, socio-economic factors, ICT access, ICT usage and ICT appropriation on Self-Perceived Employability.....	108
Table 24: R-square for each model and F-test of the change in the R-square, ICT assets on Self-Perceived Employability	109
Table 25:Regression of ICT access on Empowerment, over individual demographic and socio-economic factors	113
Table 26: Regression of ICT usage on Self-Perceived Empowerment, over individual demographic and socio-economic factors	114
Table 27: Regression of ICT appropriation on Self-Perceived Empowerment, over individual demographic and socio-economic factors.....	116
Table 28: Summary - Hypotheses Validations of each ICT assets on self-perceived Empowerment	117
Table 29: Block 3 -- Final model for the hierarchical regression of ICT access, usage and appropriation on self-perceived empowerment, over individual factors.....	119
Table 30: Results of the Variance Inflation Factor (VIF) on all independent variables, to test for Multicollinearity	121
Table 31: Structural Equation Model for the endogenous variables – self-perceived employability and empowerment, exogenous variables being individual control factors, ICT access, usage and appropriation.....	124
Table 32: Re-cap -- explication and definitions of ICT access, usage and appropriation sub-factors derived in this thesis.....	130
Table 33: Re-cap -- Hypotheses Validation of the ICT assets independent variables on the dependent variables of self-perceived employability & empowerment.....	133
Table C 34:Model Fit Summary. For the ICT assets of ICT Access, Usage and Appropriation	150
Table C 35:Model Fit Summary. For the 5-factors Employability Model.....	151
Table C 36:Model Fit Summary. For the 3-factor Empowerment Model	151
Table 37: Item Statistics for the 15-items ICT Access scale.....	159

Table 38: Principal-component factors analysis for ICT Access scale item (unrotated)	160
Table 39: Rotated Factor Matrix from the Factor Analysis for ICT Access	161
Table 40: Alpha Reliability for the ICT Access Factor 1 - ICT Access Outside of Home	162
Table 41: Alpha Reliability for the ICT Access Factor 2 - Instrumental ICT Access	163
Table 42: Alpha Reliability for the ICT Access Factor 3 - Non-Instrumental Access	164
Table 43: Alpha Reliability for the full ICT Access Factor	165
Table 44: Principal Component Factors Rotation for the ICT Usage Factor	166
Table 45: Rotated Factor Matrix from the Factor Analysis of the ICT Usage Factor	167
Table 46: Alpha reliability for the ICT Usage Factor 1 - Higher-Order ICT usage	168
Table 47: Alpha reliability for the ICT Usage Factor 2 - Production ICT usage	169
Table 48: Alpha reliability for the ICT Usage Factor 3 - Lower-Order ICT usage	170
Table 49: Alpha Reliability for the ICT Usage Factor 4 - Consumption ICT usage	171
Table 50: Alpha reliability for the full ICT Usage scale	172
Table 51: Principal-component factors analysis for the ICT Appropriation scale item (unrotated)	173
Table 52: Factor loadings of the ICT Appropriation Scale Items	174
Table 53: Alpha reliability for the ICT Appropriation Factor 1 - Informal ICT Appropriation	175
Table 54: Alpha reliability for the ICT Appropriation Factor 2 - Formal ICT Appropriation	176
Table 55: Alpha reliability for the full ICT Appropriation scale	177
Table 56: Principal component factor analysis of the Self-Perceived Employability scale	178
Table 57: Factor loadings (rotated) of the Self-Perceived Employability scale	179
Table 58: Alpha Reliability for the Self-Perceived Employability Factor 1 - Career Exploration	181
Table 59: Alpha Reliability for the Self-Perceived Employability Factor 2 - Career Planning	182
Table 60: Alpha Reliability for Self-Perceived Employability Factor 3 - Social Capital	183
Table 61: Alpha Reliability for the Self-Perceived Employability Factor 4 - Human Capital	184

Table 62: Alpha Reliability for the Self-Perceived Employability Factor 5 - Career Identity	185
Table 63: Alpha Reliability for the full Self-Perceived Employability scale.....	186
Table 64: Principal component factor analysis of the Self-Perceived Empowerment scale ...	187
Table 65: Factor loadings (rotated) of the Self-Perceived Empowerment scale	188
Table 66: Alpha Reliability for the Self-Perceived Empowerment Factor 1 - Self-Esteem - Self-Efficacy	189
Table 67: Alpha Reliability for the Self-Perceived Empowerment Factor 2 - Community Activism and Autonomy	190
Table 68: Alpha Reliability for the full Self-Perceived Empowerment scale	191
Table 69: Block 1 - Hierarchical Regression of ICT access on Self-Perceived Employability	192
Table 70: Block 2 - Hierarchical Regression of ICT access and usage on Self-Perceived Employability.....	193
Table 71: Block 1 - Hierarchical Regression of ICT access on Self-Perceived Empowerment	194
Table 72: Block 2 - Hierarchical Regression of ICT access and usage on Self-Perceived Empowerment	195

LIST OF FIGURES

Figure 1: Summary of the descriptive statistics for each factor and sub-factor: scale reliability (α), number of items (N) and descriptive statistics for each factor.	92
Figure 2: Visual representation of the hypothesised relationships between ICT assets and outcomes of perceived employability	98
Figure 3: Visual representation of the hypothesised relationships between ICT assets and outcomes of perceived empowerment.....	98
Figure 4: Estimated final model, path diagram for ICT Access, Usage and Appropriation on Employability and Empowerment.....	122
Figure 5: Visual graphical representation of the Hierarchical Regression model of ICT access, usage and appropriation on the individual's self-perceived employability	143
Figure 6: Visual graphical representation of the Hierarchical Regression model of ICT access, usage and appropriation on the individual's self-perceived empowerment	143

CHAPTER ONE INTRODUCTION

Over the last half century, income inequality has increased in almost all developed economies (Galbraith, 2016), including Singapore¹ (Mukhopadhaya, 2014). The problem of income inequality is most acute in large cities, for they tend to be where a country's wealth is created and concentrated (Atkinson, 2015). Income inequality, also known as *wealth inequality* or *wealth disparity*, is also considered a form of social inequality (Sernau, 2011) as it occurs when society offers different, or unequal, opportunities and rewards for different social positions or statuses for individuals, or within a group or society (Witte & Mannon, 2010). Some economists believe that a certain level of income inequality is acceptable in any economy for it gives people the motivation to strive to do their best and improve their livelihoods (Alan, 2017). On the other hand, others believe that in a fair and just society, this social inequality must be addressed by social mobility.

Statement of the Problem

The Societal Issue

This thesis was motivated to investigate the role of information and communication technologies (ICTs) in mitigating social inequality in developed economies. Specifically, I examine the impact of decomposed ICT variables, such as access, usage, and appropriation, on the livelihood expectations of unemployed and/or under-employed workers in Singapore. The independent ICT variables are based on Selwyn's (2004) digital divide model, while the dependent variables of employability and empowerment are the extensions of Sen's (1999) capability approach.

Concepts of Inequality. Because the concepts of inequality are so varied, it is important to first identify the key definitions which are applicable to this thesis. The broad definition of social inequality means that society offers unequal opportunities and rewards for different social positions or statuses within it (Witte & Mannon, 2010). Specifically, the literature has differentiated between various classifications of inequality, along the lines of economic versus non-economic inequalities (Mukhopadhaya, 2014). The below section highlights two of the key differentiation of inequalities.

¹Singapore is both a city as well as a country, and its Gini coefficient is higher than that of many other advanced countries (Tan, 2012)

Economic dimensions of inequality. Most of the scholarly work on inequality use measurements of income and wealth, also known as *wealth inequality* or *wealth disparity* (Burchardt & Hick, 2017). The meaning of income and wealth inequality essentially dictates the situation where different people have different levels of earnings from work or investments (*income*), or the total value of money and other assets minus debts (*wealth*) (Sernau, 2011). Since the 1970's, income inequality has risen in almost all developed economies (Galbraith, 2016), including Singapore (Mukhopadhaya, 2014; Tan, 2012). Some economists believe that a certain level of income inequality is actually desirable for it drives people to do their best and improve their lives (Alan, 2017). On the other hand, others believe that in a fair and just society, this social inequality can be addressed by a better distribution of wealth amongst its people (Norton & Ariely, 2013). In practical research especially, the concept of personal income is easier to quantify and measure even though philosophically, social inequality is also linked to other concepts such as freedom and personal capability (Mukhopadhaya, 2014).

Non-economic dimensions of inequality. The capability approach developed by Sen (1999a) is based on the principle that the quality of human well-being should be considered when evaluating the progress of the development of any cities, country or continent. In this sense, it has been used as an evaluation framework with the concept of development being operationally defined as an extension of individual freedom (Zheng, 2009). In his 1992 book, *Inequality Reexamined*, Sen (1992) suggests that the notion of equality should be based on the capability for functionings. An example of a social functioning, for example, is having self-respect and the autonomy to take part in the life of the community (Sen, 1992). When one says that there are inequalities to social functionings, it means that the freedom-of-action of certain groups of individuals are restricted, resulting in the denial of (equal) recognition and respect to the affected individual/s (Therborn, 2013). From a social dimension, Wilkinson and Pickett (2010) postulate that high levels of inequality negatively affect societal well-being, as unequal societies tend to experience more negative outcomes, like higher crime rates, and violence. In some areas, opioid epidemics are ravaging in certain states of northern America with higher income inequality (TriplettII, 2016).

In this paper, we seek to explore the conceptual terrain of social inequality and social mobility by viewing the debate through its economic as well as non-economic lens. In the process, we explore the following question – what might a capability-inspired study of inequality look like, in addition to its more traditional economic inequality? The second question we will attempt to answer is -- what measurement indices are best for the job of

measuring non-economic inequality? The next section will attempt to explicate what these outcomes are.

Purpose and Significance of the Study

Dependent variables: Employability and Empowerment

To investigate whether ICTs reduce or increases inequality, the dependent variables will need to be explicated. In this thesis, we propose two dimensions of measuring personal outcomes in the context of social inequality – i) monetary (economic) and ii) non-monetary-related (non-economic) consequences.

i) Economic outcomes -- livelihoods and employability

Employability instead of employment. Employment has traditionally been viewed as important for providing a predictable income, social security, health insurance, and rights protections in an urban context (Garrido, Sullivan, & Gordon, 2012). In this current times however, merely being employed is not sufficient for sustained livelihood success because of labour market variability over which the individual has little control (Brown & Hesketh, 2004). While the conventional economic wisdom is for individual productivity to affect income, factors like globalisation and technological disruption are affecting wages more than the personal efficiency of the worker (Pianta & Vivarelli). As such, employability, as opposed to a lifetime of employment, is being posited by scholars as a conceptualisation of sustainable livelihoods (Forrier & Sels, 2003).

Employability as an economic outcome. In terms of its definition, employability refers to the capabilities that individuals are able to demonstrate to the employer, what Heijde and Van Der Heijden (2006) call “occupational expertise” (p.454). Such knowledge and skills are what employers value as the candidates’ ability to do the job (Hogan, Chamorro-Premuzic, & Kaiser, 2013). The instrument used for measuring employability in this thesis is taken from Fugate et al. (2004)’s model, which defines employability as an individual-centred, “psycho-social” concept, which is independent from one’s employment status (p.14). It comprises of the following dimensions: adaptability, career identity, human capital and social capital (Fugate et al., 2004).

ii) Non-economic outcomes -- opportunities and well-being

In addition to the earlier arguments, another suggestion propose that inequality be viewed from a systems approach, as it can severely affect people’s opportunities and personal

well-being (Wilkinson & Pickett, 2010). Well-being is defined generally as a satisfactory condition of being; where the individual enjoys health, contentment and success (Sen, 1985). Within academia, each discipline has its own view of human well-being. For example, economists often focus on income as the key indicator of well-being, ignoring the non-economic aspects like “freedom, education, autonomy, dignity and the ability to participate in society”, essentially what makes life worth living (Deaton, 2013, p.19).

Empowerment as a non-economic outcome. One of the dominant discourse that comes up in the discussions of reducing inequality, is the notion of empowering the poor (Narayan, 2002). This notion stems from two approaches, the societal and individual approach. On the societal level, it requires a change in society’s mindset of seeing poor people as part of the solution (instead of being part of the problem), of enabling them to have a say in institutional decisions that impact their lives especially, which entails making institutions more cognizant to the realities of poor (Narayan, 2002). On the individual level, this mindset change is also about changing the mental models of the poor themselves, for example, changing their feelings of self-belief, sense of confidence and their attitudes toward their lives, toward employment, education and savings (Teo, 2017). The argument for this individual mindset change goes that with this mindset change, the poor themselves will be empowered to do things differently and their lives will hence improve. To illustrate this, Svensson and Mastropirro (2017) found that when job-search programmes were flipped to improve poor people’s self-confidence first (empowerment) before enhancing their job skills (employability), the resulting outcomes to the clients’ well-being were more positive.

This colludes with the idea of treating citizens as agents (Boyte, 2013), where individuals with high personal agency are able to act independently and to make their own free choices (Lowe, 2008). Personal agency can be enabled when people develop the identities of themselves as being productive citizens (Boyte, 2013). By this argument, an individual with a higher perception of self-employability sees herself as a *maker* of society, not simply a volunteer, voter, consumer or protestor (Boyte, 2013). As such, an employability-centered citizen is also more empowered, thus creating a virtuous loop for enhancing personal well-being. Back to our earlier questions on what a capability inspired study of inequality will look like, it should look like this -- the dependent variables are operationalised as empowerment and employability, empowerment because it is a yardstick of social well-being and employability as a proxy of economic well-being. Through this, we shall disregard the boundaries of academic disciplines and attempt to tell both the economic and non-economic stories at the same time. From Amartya Sen, we will learn how to think

about what makes life worth living, why we must study well-being taking in to consideration the person and how to enhance human well-being in the end. In doing so, we hope to advance broader development measures and extend such indices beyond economic achievements alone (Haikin, 2012).

Given the earlier arguments, we now come to the question – what can we do about our current state of inequality? What can help meet the needs of the poor -- their material needs (economic outcomes), their social needs and even their dignity needs (non-economic outcomes)? In the next section, we will continue to expand Sen's theory by exploring how the measures of technological achievements can facilitate both economical as well as non-economical outcomes. First thing first, an introduction of what constitutes technological assets and technological gaps, will be advanced in the next section.

Independent variables: ICT Access, Usage and Appropriation

The access to information technology and the skills required to use the technological tools, have been asserted as the solutions to attaining social well-being and income equality (DiMaggio, Hargittai, Neuman, & Robinson, 2001). Often, the declarations of the utility of technology access and skills programmes are made with little evidential support – ensure universal access to technology devices, teach people how to use them and better livelihoods outcomes will ensue (Tufekci, 2005). Scholars and policy makers who subscribes to this stance are generally influenced by the social theorists such as Castells (1996), who espouses a world where the populace with advanced technology skills will be rewarded with rapid career development and hence economic mobility.

Historical research discourse has concentrated on the nature and extent of existing inequities in information technology access – the digital divide. The digital divide schism is centred on whether closing gaps in ownership and access will solve social inequality. However, with increasing diffusion of ICTs, access measures of the digital divide across a range of attributes (region, age, gender, race, etc.) are finding less relevance in the literature (Valadez & Durán, 2007). It is important to emphasise that the current debate focuses not just on disparities in ICT access but on their effective use and appropriate content (Attewell, 2001).

While both sides share the same unstated assumption – people will benefit economically from the access and usage of technologies, there are specification issues at both conceptual and methodological levels. ICT inequalities involve so many layers, each with its own theoretical basis, which makes the conceptualisation and operationalisation of the

theories very onerous to incorporate into main ICT research (Dodel, 2014). The lack of consensus about conceptual dimensions and operational definitions makes it difficult to assess ICT's impact and how to reduce the digital divide (Dodel, 2014; Peña-López, 2009). This consequently furthers the limitations and bias in the digital divide research (Dodel, 2014). What scholars such as Dodel (2014) and Peña-López (2009) are saying is – if we do not always refer to the same things when we talk about ICTs assets and gaps, how can we even begin to measure it? To begin, we need to first address the conceptual problems plaguing the digital divide theories.

The Digital Divide Conceptual Problem

Too many possible meanings for ICT's key terminology

Before we even begin to sort out the polysemy of the digital divide nomenclature, we must first clarify what we understand by the concept of the digital divide.

The digital divide concept. The digital divide essentially a description of the chasm of having access to (versus not having access) and using (versus not being able to use) information and communication technology (Attewell, 2001). In terms of nomenclature, there are similar terms which refer to the digital divide, albeit different emphasis, for example, *digital inclusion*, referring to the policy actions of allowing people to participate and benefit in the information society because of their access and skills to use ICTs (Andreasson, 2015; Selwyn & Facer, 2007; Tsai, 2017) and *digital accessibility*, which commonly refers to transcending peoples' disabilities to accessing and using ICTs (Feingold, 2017). Within the specific terminology of digital divide itself, the concept is also constantly evolving. For example, the term was originally centred on the question of having, or not having, access to technologies (Compaine, 2001), what scholars refer to as the first-level digital divide (Campos-Castillo, 2015) or the “digital *access* divide” (Wei, Teo, Chan, & Tan, 2011). With a global mobile phone internet user penetration exceeding fixed broadband in 2017 (International Telecommunication Union, 2017), the concept of digital divide has evolved to consider the relative inequality between those with more or fewer skills (Hargittai, 2002). This is because access does not necessarily indicate differences in how people use technology as both access and usage have its own grounds for determining and interacting with each other (Hargittai, 2002). This evolution has resulted in scholars espousing the second-level divide (Brotcorne, Damhuis, Laurent, Valenduc, & Vendramin, 2010), what Wei et al. (2011) call the digital *capability* divide. Recently, there are now postulations of a third-level digital divide (Scheerder, van Deursen, & van Dijk, 2017; Tsai, 2017; van Deursen & Helsper,

2015), as this third-level focuses on the outcomes resulting from using technology (van Deursen & Helsper, 2015), also referred to as digital *outcomes* divide by Wei et al. (2011). Essentially, scholars are saying that equal computer access and skills may not necessarily result in equal personal outcomes, as certain groups of people get more out of their technology (van Deursen & Helsper, 2015). Past scholarships investigating the impact of ICT access and usage on personal outcomes has been unable to offer a concise theoretical enlightenment of the reasons behind such effects (Wei et al., 2011). In other words, the scholarship has not yet come to a consensus on why do some groups of people glean better outcomes from using technology, whereas there are other groups who do not reap its benefits at all, despite the same level of usage and skills? Perhaps the field can benefit from a comprehensive overview and categorisation of the predictors of digital outcomes, as this will help identify future research as well as policy efforts to close the divide (Scheerder et al., 2017).

The Digital Divide Methodological Problem

Disagreements on the digital divide measurement guidelines

An analytical measurement of the digital divide have been attempted by Hilbert (2011). After having gone through copious studies and approaches in the literature up till 2011, he classified the digital divide concept into a four-dimension matrix, i) who are the receivers and senders of messages, ii) with which characteristics, e.g. income, education, geography, iii) how sophisticated is the usage and finally iv) in what form is the conduit of the device, for example, fixed or mobile broadband (p.727). According to Hilbert (2011), the variations in definitions arise because different scholars focus on different dimensions, which leads to the problem of having too many measurements.

“For example, counting with only 3 different choices of subjects (individuals, organizations, or countries), each with 4 characteristics (age, wealth, geography, sector), distinguishing between 3 levels of digital adoption (access, actual usage and effective adoption), and 6 types of technologies (fixed phone, mobile... Internet...), already results in $3 \times 4 \times 3 \times 6 = 216$ different ways to define the digital divide”. (Hilbert, 2011, p.728).

There is no right or wrong, as each dimension “seems equally reasonable and depends on the objective pursued by the analyst” (Hilbert, 2011, p.728). Extending this argument further, Barzilai-Nahon (2006) advocates for more robust digital divide models, beyond its current monotypical studies, where scholars typically look at a select few variables that

impact an outcome. Examples of independent variables are income (Ndung'u, Waema, & Mitullah, 2012), gender (Obayelu & Ogunlade, 2006), age (Lin & Chang, 2009) and ethnicity and race (Campos-Castillo, 2015). Transcending beyond such monotopical studies, says Barzilai-Nahon (2006) would require consideration of the following, i) “the purpose of the tool, ii) the level of observation, and iii) the method of approaching the data” (p.269). She also emphasise the need to approach the measurement with a deeper context to what is happening in society (Barzilai-Nahon, 2006, p.269).

Addressing the Digital Divide Conceptual and Methodological problems

Following on the analytical signposting by Barzilai-Nahon (2006), this thesis examines i) the purpose of ICTs towards the enhancement of human well-being where ii) the level of observation is at the individual level. We hope that by examining the digital inequalities at the individual level, important data collection and analysis can help us to determine exactly how far removed (or near) are these people from typical users with regard to ICT access and use (Barzilai-Nahon, 2006). In terms of the iii) method of approaching the data, we want to avoid the typical monotopical methods for measuring the digital divide, and this will be done by considering a more comprehensive index of ICT predictors, arranged in a systematic manner, towards the digital divide outcomes. We also consider the advice from Chen and Wellman (2004), who suggest for any conceptualisation of the digital divide to consider the individual's socioeconomic status and demographic factors.

As such, Selwyn (2004)'s method is deemed the most suitable analytical framework as it addresses multiple hierarchical levels of ICT impacts on human well-being. We hope that Selwyn (2004)'s conceptual model will help us to appreciate the intricacies of the independent variables of this study, as his method requires us to arrange the predictors of ICT outcomes in a hierarchical manner, namely *access*, *usage* and *appropriation*. These are also what Hilbert (2011) deliberates as different levels of the adoption of technology, just that he calls them *access*, *usage* and *effective adoption* instead (p.726). While never seen this way by Selwyn himself, the three levels of access, usage and appropriation, are also conceptually aligned to Wei et al. (2011)'s three levels of digital divide, where the first level digital divide – “digital *access* divide” (access), second level – “digital *capability* divide” (usage) and the third level – “digital *outcome* divide” (appropriation) (Wei et al, 2011, p.170).

We will start the examination of each of the independent variables, starting from the mere physical access (digital access divide) to the effective usage (digital capabilities divide) of ICT devices and the internet. Through that, this thesis gives us better indications on the

capacity or digital competences required to transform ICT assets into economic and non-economic outcomes (digital outcomes divide) for the individual. As such, the methodological questions to help guide this second part of the thesis are:

- What is “access”, “usage” and “appropriation” for the individual? What are the main methods to defining access, usage and appropriation and why?
- What are their components?
- Is there evidence to support the claim that access, usage and appropriation of ICTs have a positive or negative impact on the well-being of the individual? If yes, what is the association of ICTs on well-being?

Context – why Singapore?

Many digital divide researchers consider the field to be socially and geographically concentrated in developing countries (Zheng, Hatakka, Sahay, & Andersson, 2017). Such a paradigm is limiting because all societies “have to address issues of employment, inequality and social exclusion, and continue to face challenges in education, healthcare, public administration, civil society” (Zheng et al, 2017, p.1). By this argument, digital divide occurs in all types of societies, whether they are un-developed, developing or developed.

The economic miracle of Singapore has contributed to the marginalisation of her poorer citizens. Compared to other developed Asian countries, such as Japan, (after accounting for tax rebates and transfers), where her GINI index is 0.412, compared to Japan’s 0.328 (Ong, 2015). Singapore is experiencing a greater class divide now (Chua, Tan, & Koh, 2017). Studies have pointed to Singapore’s ambitions to propel its economy, as the cause for its increasing income inequality (Smith, Donaldson, Mudaliar, Kadir, & Yeoh, 2015). On the other hand, some economists claim that this wage variance is due to differing levels of individual productivity (Gielen, Kerkhofs, & van Ours, 2010) and that the income-diversity in Singapore is negligible, due to its low level of absolute poverty (Mahbubani, 2001). This stance is however refuted by Teo (2018)’s seminal ethnographic study on poverty in Singapore -- the Singaporean poor do work hard but they get back little in return for their labour. The poorest Singaporeans find it particularly demanding to eke out a subsistence, in an expensive metropolis where the high cost of living is exacerbated by ongoing inflation without a corresponding increase in real wages (Nair, 2014).

The key motivation to situate the low-income experience in the wealthy city is this: once we see that inequality is partly about how people can have the same needs and do the

same things and yet have different outcomes, then we as researchers must ask—why are there these differences? The next section will attempt to illustrate the state of inequality in Singapore.

Addressing different economic outcomes in Singapore

As a counter argument to the earlier line of reasoning that less productive workers reap lower wages, incomes in Singapore are correlated to external factors such as globalisation, innovations, and the government's immigration regulations which allow an influx of low-wage foreign workers, which effectively depress local wages (Bhaskaran et al., 2012; Smith et al., 2015). This means that a local blue-collar worker can try really hard in his job, but if the industry he is in is dominated by cheap foreign colleagues, then his wages may be pegged to the lowest denominator (Chor, 2014).

Recognising different non-economic outcomes in Singapore

In terms of social outcomes in Singapore, the National Volunteer and Philanthropy Centre (NVPC) found in 2013 that Singapore fared negatively on overall individual well-being (Lim, 2013). Scholars like Chew (2017) attribute the phenomenon to a populace who are increasingly anxious about their individual income insecurity amidst the rising costs of living. This also suggests that economic and non-economic outcomes may be closely correlated for Singaporeans. In tandem with Teo (2018)'s ethnographic observations, the Singaporean-poor work long hours for little pay, which leads to low levels of personal well-being.

Beyond this, the next important question we need to confront is, can we equalise the economic and non-economic outcomes for all Singaporeans? Can technology help close this divide – in other words, can the accumulation of ICT assets help improve empowerment and employability for Singaporeans? The next section will attempt to examine these questions.

The Digital Divide in Singapore

As the world's second-most networked country, in terms of the Networked Readiness Index (NRI) (World Economic Forum, 2014), the Singapore government approaches the digital divide from a technological deterministic perspective, where its information communication initiatives have improved the accessibility of formal technology for its residents (Chia, Lee, & Yeo, 1998). Barzilai-Nahon (2006) opined that monotypical factors like ICT access are easy to measure, convenient for policymakers to justify allocation of state resources and influence public opinion (p.270). Using access measures however, may be appropriate in one dimension of measuring ICT effects but it does not tell the whole story, for

example, Lim (2017) found while Singapore has one of the highest penetration of smartphone for the elderly compared to other developed countries, less than half of them actually use its in-app functions for internet messaging (e.g. WhatsApp), navigation (e.g. Google Maps), retrieve information about goods and services (e.g. web browser) and online banking. When he asked one of the respondents, a 73-year-old woman, why she prefers queuing up physically in a bank to pay her utility bills instead of using the many self-service kiosks available in every housing estate, she remarked that using the kiosks was just too challenging for her. In Singapore's context, there is little doubt that the physical access factor is well covered by government initiatives but whether it has improved social inclusion for its citizens remains tenuous due to a lack of ICT impact research in Singapore (Lim & Guo, 2015). As such, through using the capability approach and Selwyn (2004)'s analytical framework, we hope to critically examine real-life consequences of information communication technology (ICT) access and usage on the unemployed and under-employed residents in Singapore. By utilising an individual level unit of observation, we want to know how far removed or how digitally-included these people are from the rest of this developed economy. From that, we hope to also develop some policy recommendations for Singapore, on how technology can be better harnessed to help improve its people's economic and psychological well-being.

The Research Questions

Bringing together these two strands of research within the context of Singapore, a developed city-state, this thesis develops an analytical framework that connects the effects of ICTs to both the economic and psychological well-being of the individual. As such, a reiteration of the methodological questions advanced earlier will provide an overarching broad framing of the research question. The second research question will explore for a more specific explication of the impact of the individual's ICT effects on well-being:

BROADLY: Do ICTs have a positive or negative impact on the well-being of the individual? If yes, what is the association of ICTs on economic and psychological well-being?

SPECIFICALLY: Does access, usage and appropriation of ICTs have a positive or negative impact on employability and empowerment. If so, what are the ICT effects in each of the dimensions of access, usage and appropriation?

We hope that the research questions will be answered by presenting an analytical framework that links ICT assets to both economic and non-economic well-being, thereby developing a digital divide model that examines ICT's assets as independent variables, on non-ICT dependent variables.

Structure of the Thesis

This thesis will be structured as follows: Chapter Two (Literature Review - Capabilities) provides a general introduction to the transformation of livelihoods in the 21st century; making a brief examination of the current state of employment and employability within the modern information society. It will cover the plight of the working poor in greater detail, examining the socio-political paradigms that argue that the current *labour markets* and *technology advancement* are the key impediments to social mobility for the working poor in developed economies. Within the meeting point of these two vulnerabilities, this chapter argues that socio-psychological factors, such as self-efficacy and community involvement (*empowerment*), contributes to an individual's employability and social mobility. Chapter Two also illustrates the spatial, cultural and geographical context of working poverty in Singapore, from the community perspective, using the experiences of the 302 unemployed, or under-employed, low-wage workers, who were the constituents of this study.

By drawing upon Amartya Sen's capabilities approach, *employability* instead of employment, and *empowerment* are used as a measure of livelihood capabilities. In doing so, Chapter Two will also provide further theoretical clarification of the capability approach in the context of livelihoods.

In Chapter Three (Theoretical Perspectives – Digital Divide), the different theories of digital divide, and their corresponding models will be scrutinised, finally focusing on Selwyn (2004, 2010)'s understanding of the inequalities that exist in the information age and their relevance to the discourse on individual outcomes of well-being. Each step (*access, usage and appropriation*) of Selwyn's model will be uncovered from among the established theories, before these steps are defined operationally for the hierarchical regression model in this study.

In Chapter Four (Methodology) presents the proposed methodology for testing the new digital divide analytical framework, using the methods of quantitative procedures, and with the intention of integrating and refining the new theory. This is done by making a detailed analysis of the study sample, and by considering the ethics of the data collection

process, the research design and the survey protocol. This sets up the Factor Analyses which will be done in Chapter Five.

Chapter Five (Factors Analyses) explains the quantitative derivation of the independent and dependent variables, using multivariate statistical methods. Exploratory factor analysis is deployed to make further contextual adaptations of each step of the independent variables -- *access*, *usage* and *appropriation*, in the digital divide framework. In this Chapter, the variables specification and items measurement will be mined based on the study metrics used. As an example, respondents in Singapore separated ICT *access* into two categories: *instrumental* and *non-instrumental*, and further segregated devices into those they deemed productive or otherwise. The same trend was observed for the usage factors, where the categories of device use were expanded into higher-order versus lower-order usage, by the Singaporean workers. Through that, we hope to address the conceptual and methodological questions that arise in the field.

With the specific dimensions and measurements of both the dependent and independent variables clarified, Chapter Six (Research Questions and Hypotheses) introduces the research questions, how they are derived, and their resulting hypotheses for validation or refutation in the next Chapter.

In Chapter Seven (Regression Analyses), Selwyn's digital divide hierarchical model is tested, by examining the influence of ICT's access, usage and appropriation (the predictors) on employability and empowerment (the outcomes), first using multiple regression techniques, and then hierarchical regression modelling to understand how the layers of ICT assets influence the dependent variables when added in a stepwise manner. This is done while controlling for individual control factors such as demographic and socio-economic factors. The granularity of each of the ICT resources derived in Chapter Five (Factor Analyses) is entered as independent variables in the multiple regression models. The splits of the independent variables into sub-factors result in different effects on the dependent variables, at different steps of the digital divide. This demonstrates that digital gaps are constantly evolving within the contexts of ICT's access, usage and appropriation.

Finally, Chapter Eight (Conclusion and Discussion) concludes the thesis with suggestions for the integration and refinement of the new theory, given the broader issues of poverty and inequality, and signposts future work that can be derived from this PhD thesis.

CHAPTER TWO LITERATURE REVIEW -- CAPABILITIES

This thesis' literature review examines the existing body of literature on inequality, and how employment as a strategy is commonly used to address the social gaps in human development. This chapter examines the key concepts of inequality and highlight those which are pertinent to this main thesis. The area of research that the thesis covers also goes beyond the economic aspects of development alone, to consider human well-being in the schema of economic development.

Inequality

Concepts of Inequality

Social Inequality

Social inequality generally refers to the situation when society offers unequal opportunities and access to resources to different groups of people based on their social positions or statuses (Witte & Mannon, 2010). Even though income inequality is commonly associated with social inequality, the latter can manifest in different ways beyond monetary indicators, for example, unequal access to education, unequal access to government services and cultural resources (Sernau, 2011). There are many ways to measure social inequality. For this thesis, we shall focus on inequality, based on the notion of i) conditions and ii) opportunities. Inequality-of-conditions refers to the unequal distribution of income, wealth and assets, where occupation is an example of the manifestation of this inequality -- the blue-collar worker versus the billionaire entrepreneur (Crossman, 2017). The inequality-of-opportunities, on the other hand, refers to the unequal distribution of life chances across individuals (Bradbury & Triest, 2016). A job promotion based on nepotism or cronyism, will be an example of the denial of equal opportunity. Specifically, the literature has differentiated between various classifications of inequality, along the lines of economic versus non-economic inequalities (Mukhopadhyaya, 2014). The below highlights two key differentiation of inequalities.

Inequality-of-Conditions: Income and wealth inequality

Economic dimensions of inequality. Most of the scholarly work on inequality use measurements of income and wealth, also known as *wealth inequality* or *wealth disparity* (Burchardt & Hick, 2017). The meaning of income and wealth inequality essentially dictates the situation where different people have different levels of earnings from work or

investments (*income*), or the total value of money and other assets minus debts (*wealth*) (Sernau, 2011). Since the 1970's, income inequality has risen in almost all developed economies (Galbraith, 2016), including Singapore (Mukhopadhaya, 2014; Tan, 2012). Some economists believe that a certain level of income inequality is actually desirable for it drives people to do their best and improve their lives (Alan, 2017). This stance corroborates with the functionalist theory of social inequality within the field of sociology, where some scholars believe that inequality is inevitable and desirable (Kent, 2006). For example, some think that important positions in society, like judges and doctors, require more training and thus individuals who attain such positions should receive more rewards (Crossman, 2017). According to such views, social inequality leads to a meritocracy based on ability (Kent, 2006). On the other hand, others believe that in a fair and just society, this social inequality can be addressed by a better distribution of wealth amongst its people through fiscal policies and transfers (Norton & Ariely, 2013).

In research practice, the concept of personal income is easier to quantify and measure, where the Gini coefficient is the most commonly used statistic to measure the income distribution among a country's residents (Ong, 2015). This is in contrast to measuring inequality of opportunities, which often involves non-quantifiable metrics and is harder to quantify (Kanbur & Wagstaff, 2015). Such non-quantitative metrics are also linked to other concepts such as opportunities, freedom and personal capability (Mukhopadhaya, 2014). This does not mean that the inequality of opportunities is less important in the inequality discourse. In fact, the equality of opportunity is important for a social ideal because it combines concern with the freedom to pursue one's goals or vocation, without arbitrary restrictions based on irrelevant personal characteristics such as birth, nationality, ethnicity, religion or sex (Friedman & Friedman, 1981).

Inequality-of-opportunities, non-economic inequalities

In extending the equality in opportunities concept, in his 1992 book, *Inequality Reexamined*, Sen (1992) suggests that the notion of equality should be based on the capability for functionings. Sen, for most part of his life, has expressed scepticism about measures of inequality in terms of income (Walsh, 1996), believing that poverty should be seen "as the failure of basic capabilities to reach certain minimally acceptable levels" (Sen, 1992, p.109). An example of such a capability for social functioning, is having self-respect and the autonomy to take part in the life of the community (Sen, 1992). When one say that there are inequalities to social functionings, it means that the freedom-of-action of certain

groups of individuals are restricted, resulting in the denial of (equal) recognition and respect to the affected individual/s (Therborn, 2013).

The effects of inequality

From a social dimension, Wilkinson and Pickett (2010) postulate that high levels of inequality negatively affects societal well-being, as higher crime rates, violence and mental health crises tend to plague unequal societies. For example, Sen highlights evidence that men in the Harlem district in New York city have less chance of surviving past 40 years old, than Bangladeshi men, where “being poor in a rich society itself is a capability handicap” (Sen, 1992, p.114). Clearly, capability deprivation can occur even in affluent societies where high inequality exists within that society.

From a socio-political perspective, the advent of social inequality in the United Kingdom was claimed to be the fundamental reason that pushed working-class Britons to exit from the European Union (Higgins, 2016). In the United States, many of the same economic grievances and anxieties dominated the 2016 presidential elections. As a result, working-class white American citizens, who were angry over low wages and declining manufacturing jobs, and who also believed that their woes were caused by trade and immigration, handed the elections to the presidential candidate who stoked those fears and insecurities (Confessore, Cohn, Blinder, Bidgood, & Robles, 2016). Clearly, the lesson for both citizens and policy makers is that they must dissect the socio-economic problems of the working poor clearly, to devise solutions to narrow the inequality gap.

Understanding inequality first, to solve its problems

In this paper, we seek to explore the conceptual terrain of social inequality and social mobility by viewing the debate through its economic as well as non-economic lens. In the process, we explore the following question – what might a capability-inspired study of inequality look like, in addition to its more traditional economic inequality? The second question we will attempt to answer is -- what measurement indices are best for the job of measuring non-economic inequality? The next section will attempt to explicate what these outcomes are.

Employability and Empowerment

Before we begin to investigate whether technology reduce or increases inequality, the dependent variables will need to be explicated. In this thesis, we propose two dimensions of

measuring personal outcomes in the context of social inequality -- monetary (economic) and non-monetary-related (non-economic) consequences.

Economic outcomes – livelihoods and employability

Employability instead of employment

Global trends and inequality. Employment has traditionally been viewed as important for providing a predictable income, social security, health insurance, and rights protections in an urban context (Garrido et al., 2012). By this argument, economic growth is posited as one of the most powerful instruments policy-makers can leverage to reduce poverty and to improve their people's quality of life (Loewe, Altenburg, & Pegels, 2015). With the global economy weakening, and rising unemployment: job quality and social protection remains critical to address income inequality (International Labour Organization, 2016).

In this current times however, merely being employed is not sufficient for sustained livelihood success because of labour market variability over which the individual has little control (Brown & Hesketh, 2004). This is because an uneven economic recovery, since the 2008 financial crisis, and the successive downward revisions in growth projections, have had an adverse impact on the global employment situation (Kyrylych, 2013). In terms of the global employment rates, the number of jobless people worldwide reached 201 million in 2017 (International Labour Organization, 2017). Job creation however, will still lag behind the labour force growth, with the prediction that an additional 2.7 million more people will be unemployed by 2018 (International Labour Organization, 2017).

Income inequality from skill-biased technological change

Incomes are increasingly controlled by globalisation and technological disruption, instead of being dependent on the workforce's productivity (Pianta & Vivarelli). The progress of such rapid technology advancement creates a higher demand for skilled labour. For example, the advent of Artificial Intelligence (AI) has grown quickly since the 2010s (Tate, 2014) given the ubiquitous availability of data, the growing capability of cloud computing and the more powerful algorithms developed by AI researchers (Koh, 2018). As a result, the unskilled workers in OECD² countries find themselves increasingly in unfavourable

² The Organisation for Economic Co-operation and Development (OECD), founded in 1960, is an intergovernmental economic organisation, comprising of 35 member countries. OECD's membership includes many of the world's most advanced countries as well as emerging economies such as Mexico, Chile and Turkey (OECD, 2016). Its main objectives are to promote economic progress and world trade, by ensuring that people of all demographics are prepared for the jobs of tomorrow (OECD, 2013).

economic positions (Juhn, Murphy, & Topel, 1991). Specifically, Webster (2007) postulated that the advent of Information Communication Technologies (ICTs) was a key contributing factor to workers' job anxieties. In terms of the impact on income inequality, Loh and Chib (2016) found that a higher use of ICTs, in the workplace, did not correspond to higher wages for its employees. In fact, the opposite happened – ICT use at work was associated with declining wages for its workers (Loh & Chib, 2016).

The implementation of computer technologies, in factories, means that blue-collar workers can expect limited job expansion as their less skilled roles are automated through ICT. Many trades now demand digital competency, which means that both the organisations and the workforce are forced to adapt to constantly advancing technology. For white-collar workers, the changes range through office, clerical and administrative support positions. As the amount of human aptitude required to perform these roles drops, this also effectively reduces the amount of remuneration that is required to attract people to those middle-skilled jobs, which were previously the domain of the non–university-educated workers (Autor & Dorn, 2013). The decrease in these middle-skill jobs results in more high-skill jobs, as well as lower-skill ones. This expands into an employment phenomenon called *job polarisation*, where job opportunities hollow out from middle-skill jobs, and people will need to work in either high-skill roles or adapt to low-skill jobs (Tüzemen & Willis, 2013). As such, this is not an issue for working class individuals, as there are other groups, like the middle-skill workers, that can be thrown out of work or need to be re-employed in other jobs.

Scholars argue that this situation is the result of a growing mismatch between the technological requirement of today's jobs and the skills that people possess, particularly the elderly members of the population (Moreno-Galbis & Sopraseduth, 2014). Researchers have called this phenomenon the *skill-biased technological change* (Berman, Bound, & Machin, 1998; Machin, 2001; Violante, 1990). This change does not affect only older workers, however, and as industries evolve and technological progress occurs, younger workers are also struggling to adapt. This is especially so in cases where the educational system has failed to impart the requisite work skills to young people (Goldin & Katz, 2008; Jayaram & Engmann, 2014).

The rise of the machines and Artificial Intelligence (AI). Scholars such as Castells (2010) have cautioned that the effects of skill-biased technological change on employment may first manifest themselves in increasingly flexible working arrangements, and eventually veering towards a jobless society (p.267). Castells' predictions may come true within this decade, at

least to some extent. Already in some cases, where jobs are available, they are mostly disadvantageous to workers, offering only *zero-hour* contracts³ (Wright, 2016).

One thing which is constant over these 250 years of technological change, has been the impact of technology on jobs, and with the fast advent of artificial intelligence (AI), where it is posited to have a more disruptive impact on people than computers (The Economist, 2018). For example, experts predict that the creation of new jobs, the elimination of existing jobs and the evolution of job tasks and content will all happen in the near future (Koh, 2018). A recent 2016 Citi Group report warned that approximately 30% of banking jobs might be lost as processes are automated through artificial intelligence (AI). As examples, the rise of digital currency is reducing customers' reliance on the traditional banking systems, and robo-advisors are replacing salespeople and financial consultants (Citi GPS, 2016). These predictions are relevant to a financial capital economy that is dependent on trade and finance, such as Singapore; once these jobs are gone they are unlikely to ever return (Dayani, 2016).

On the other hand, some economists postulate that the end of humans in jobs is a groundless fear because historical evidence have shown that humans simply move to other jobs which machines cannot do (Kletzer, 2018). For example, the hardest activities to automate with AI are those which require creativity, interpersonal relations, caring, emotional range and complexity, dexterity and mobility (Manyika, Chui, & Miremadi, 2016). A global study by Wilson, Daugherty, and Morini-Bianzino (2017) found that many new jobs will be created from the advent of AI, where roles will need to be fulfilled by humans to “complement the tasks performed by cognitive technology, ensuring that the work of machines is both effective and responsible” (p.14). The categories are “trainers” (p.14), where human workers train the AI systems to how to adapt and perform, “explainers” (p.15) who can elucidate how the AI works to non-technical colleagues, and finally “sustainers” who needs to maintain the AI systems to be performing their tasks (Wilson et al, 2017, p.15). Another question with AI is not whether we will lose our job, but it is about how much we will get paid, as humans displaced from jobs will be re-employed in new jobs that may not pay as well as their old jobs (Autor & Dorn, 2013). An example of fastest growing jobs which do not pay as well as the outmoded blue-collar jobs, are health aides, or so-called *pink-collar* jobs -- vocations which are traditionally considered to be women's work (Miller, 2017). Even though such *pink-collar* jobs have less occurrences of layoffs than blue-collar work, the low-

³ Zero contract hours are where the employer is not obliged to provide any minimum working hours (Advisory Conciliation and Arbitration Service, 2016).

educated adult males are reluctant to take the such jobs due to its lower starting pay and job status associated with such service jobs (Miller, 2017).

Based on the above, it is unlikely that humans will continue to enjoy employment outcomes of their own choice. Because of the earlier mentioned trends in global employment and the labour markets -- employability, as opposed to a lifetime of employment, is being posited by scholars as a conceptualisation of sustainable livelihoods (Forrier & Sels, 2003).

Employability

Employability, as explained by scholars within the context of human capital, refers to the capabilities that individuals are able to present to their employers; what Heijde and Van Der Heijden (2006) called ‘occupational expertise’ (p.454), and which employers value as part of the candidates’ ability to be able to do the job (Hogan et al., 2013). The definition of employability has not remained static among researchers. In the last two decades, the operational definition of *employability* has evolved greatly. In a recent meta-analysis of the scholarship’s polysemy of the definition of employability -- Williams, Dodd, Steele, and Randall (2016) found that scholars often associate the term with job satisfaction, employee satisfaction, job success, preserving employment and employee potential. After consulting employer across Canada, the Conference Board of Canada released the Employability Skills 2000+ report, which defines employability simply as “the skills you need to enter, stay in, and progress in the world of work”. (The Conference Board of Canada, 2018). Most researchers tend to agree that employability is the product of i) being aware of one’s skills and capabilities, ii) being able to present properly these competencies in a resume and during a job interview and iii) being able to exploit them and acquire even more new skills, in order to reach one’s own objectives (Svensson & Mastropirro, 2017). While several scholars have developed models of measurable quantitative constructs, the one chosen for this study is the self-perceived employability construct developed by Fugate et al. (2004). This model has been most tested by scholars, and is the most relevant for this thesis’ topic. It defines employability as a “person-centred, psycho-social” concept Fugate et al, 2004, p.14), independent from one’s employment status; comprising of but not limited to *personal adaptability*, *career identity*, and *social and human capital* (Fugate et al, 2004, p.18). Given its individual-focus, whether the person is gainfully employed, or looking for work, Fugate et al. (2004)’s measurement model is by far the most versatile for use on any type of potential interview participant, whether they are in paid employment or not.

The studies above highlighted that the newer technologies that are used, the greater the effect that is felt by the workers, but they fail to explain individual socio-behavioural characteristics. As Violante (1990) asked; does growth in the use of technology generate an observable change in the behaviour of skilled labour, and also in his or her skill premium, “under a plausible model calibration” (p.4)? To answer these deeper questions, a quantitative theory that is built around the socio-psychological attitudinal constructs of the working class towards technological utilisation, will be required.

Employability in a Capability Frame

Labour market and capabilities. Sen and other analysts have written about the labour market in relation to the capability approach, focusing on policy issues of employment versus unemployment (Sen, 1997). In his capability approach theoretical framework, Sen emphasises two normative claims, firstly, the freedom to achieve well-being is an ethical outcome to strive towards for all, and secondly, this freedom is based on the different levels of a person’s capabilities, or utilising opportunities to achieve what he or she has reason to treasure (Ibrahim & Tiwari, 2014). In terms of labour policy designs, the capability approach has been used in specialisations such as youth unemployment activation, school-to-work labour transitions and career counselling (Egdell & Graham, 2017). This is because it is widely believed that a capability approach to active labour market policies will yield positive effects—education, job training, career counselling, which will result in higher economic growth, better remuneration and reducing unemployment (Bovin & Farvaque, 2007, p.58). For example, in unemployment-to-work programmes, the root problem is not unemployment, but rather poverty, or low-productivity employment. In programmes where well-meaning voluntary welfare organisations recommends low-wage jobs to the unemployed, such interventions often overlook the plight of the working poor and the lack of functionings and capabilities that result from these low quality jobs (Comim, Qizilbash, & Alkire, 2008). A capability approach centred labour policy would consider the situation of each jobseeker in terms of his or her capabilities and functionings (Bonvin & Farvaque, 2007). At the individual-level, policies customised to enhancing the human capital of each individual will help them be more adapted to labour demand (Bonvin & Farvaque, 2007).

The individual perspective - capability approach and human capital. On the other hand, scholars such as Orton (2011) disagreed with the human capital dimension to employability; it is not necessarily the prerequisite to employment, since the capabilities of the individual should allow her to engage with life’s activities, like contributing to society -- things which makes life worth living (Orton, 2011, p.355). Sen (1999a) originally posited this, insisting

that the human capital theory of employability is tightly limited, instead preferring to refer to an individual's 'productive resources' (p. 295-296).

Scholars such as Orton (2011); Schneider (2009) further argued in favour of the capabilities approach's being greater than the human capital theory, which they felt focussed only on enhancing education and the generation of income. This is because comparisons of the quality of life are based on what the individual is able to do, i.e. his or her achievements (Nussbaum, 2001). Following this conceptual train of thought, hardships due to poverty and unemployment are not alleviated by increasing liveable income, but by increasing freedom, or what Sen calls "*capability*" (Sen, 1999a, 1999b, 2005).

Self-perceived employability as capabilities. Several employability studies have explored the relationship between perceived employability and the objective measures of hard outcomes such as qualifications and job placements. As contended by Fugate et al. (2004), a higher perception of one's employability does not guarantee actual job placements, but the self-confidence displayed at job interviews certainly enhances an individual's likelihood of getting jobs. For example, Caricati, Chiesa, Guglielmi, and Mariani (2016) found that participants' perceived employability significantly correlates to their employment rate. This corroborates to the self-efficacy theory by psychologist Albert Bandura who posit that our self-beliefs play a major part in determining our chances for success (Bandura, 1997). Berntson (2008) defines perceived employability as "an individual's perception of his or her possibilities of getting new, equal, or better employment" (p. 15). By this argument, one's self-perceived employability can be used to determining actual employability outcomes.

The previous section discussed the deficits of the current labour market policy and its association to social inequality. It explored the capability approach as a new paradigm towards enhancing employability, by providing comprehensive instruments for the evaluation of individual welfare in social policies, in order to narrow the inequality gap (Olejniczak, 2012). In the next section, we will attempt to understand the different social inequality dimensions and their implications when trying to measure non-monetary-related (non-economic) outcomes for the individual.

Non-economic outcomes -- opportunities and well-being

On human well-being. As mentioned earlier in this chapter when we discussed income inequality -- economists often focus on income as the key indicator of human well-being, ignoring the non-economic aspects like "freedom, education, autonomy, dignity and the ability to participate in society", essentially what makes life worth living (Deaton, 2013,

p.19). Within academia, each discipline has its own concepts and measures of human well-being. Early well-being conceptualisations were rather simple, often reducing well-being to feelings of happiness (or pleasure) (Dodge, Daly, Huyton, & Sanders, 2012). As the concept of human well-being subsequently became more widespread in the socio-psychological field, it became necessary to treat well-being as a multidimensional concept (McGillivray, 2007). Amongst the better known multi-dimensional conceptualisations are Sen's capabilities approach (Sen, 1982, 1985, 1999a). According to Sen, human well-being is defined as a satisfactory condition of being; where the individual is contented with his or her life in general (Sen, 1985). Sen's framework of capabilities and functionings is credited for its triangulation to human well-being and economic development (Little, 2011). We want economic development to lead to an overall improvement in human well-being but how should such a goal be assessed and measured?

Empowerment

Empowerment as well-being

According to Hill (2003), this can be done by recognising and analysing how individuals are empowered to adapt to the changing socio-economic milieu (p.128). Sen's capability approach can help us to consider the question of empowerment explicitly in studies that examine how individuals improve their personal well-being (Hill, 2003). Empowerment is a psychological process that defines how individuals harness their beliefs about their own ability to organise and execute actions over issues at the individual and social levels (Zimmerman, 2000). The genesis of the term *empowerment* came from the notion of "power" (Page & Czuba, 1999). This combines two understandings of the word *power*: that which should embolden an individual to use their resources for successful life-management (Rappaport, 1984) and that which helps an individual to cope with problems, in critical stages of their life, in a useful and confident manner (Thomas & Velthouse, 1990). Therein lies the issue of whether empowerment can be considered well-being. As an example, McGillivray (2007) highlights that Sen (1999a) differentiates personal agency (a concept similar to empowerment which shall be explained in the next section) from well-being, arguing that improving empowerment is a separate goal alongside improving well-being. From this, it can be inferred from Sen that increasing empowerment will lead to increasing well-being achievements (McGillivray, 2007).

Empowerment dimensions

The theory of empowerment proposes different ways to measure the construct of empowerment, by considering its different contexts (Zimmerman, 2000). For example, empowerment can occur at the *individual level*, the person achieves enlightenment to what their goals are and how to achieve them (Zimmerman, 2000). At a wider level, where the person interacts with his or her environment, empowerment becomes a *community-level* purpose to achieve resources which were lacking, for example, in seeking to create positive change in one's environment (Zimmerman, 2000). As such, the empowerment theory also links one's mental wellness to how a responsive community supports one's well-being (Perkins & Zimmerman, 1995), or what Zimmerman and Rappaport (1988) refers to as *community activism and autonomy*.

Well-being through empowerment

Empowerment at the societal level. One of the dominant discourse that comes up in the discussions of reducing inequality, is the notion of empowering the poor (Narayan, 2002). This notion stems from two approaches -- the societal and individual approach. On the societal level, it requires a change in society's mindset of seeing poor people as part of the solution (instead of being part of the problem), of encouraging them to participate in institutional decisions that impact them, which requires policy makers to be more empathetic to the realities of the poor (Narayan, 2002). There is an often-communicated stereotype concerning the abilities of low-income groups and minorities -- some people are smarter than others, and some groups are smarter than others and that is the way it is always going to be. This stereotype can also be called a *characterisation frame*. (Kurylo, 2013). A research study by Rattan, Savani, Naidu, and Dweck (2012) confirmed that developed western societies such as the USA have, too often, picked up on this message. Conversely, Rattan et al. (2012) found that, within the south Asian Indian contexts, people believe the contrary, leading to the hypothesis that this is could be a culturally-shaped belief.

Empowerment at the individual level. On the individual level, this mindset change is also about changing the mental models of the poor themselves, for example, changing their feelings of self-belief, sense of confidence and their attitudes toward their lives, toward employment, education and savings (Teo, 2017). The argument for this individual stance is -- with this mindset change, the poor themselves will be empowered to do things differently and their lives will hence improve. To illustrate this, Svensson and Mastropirro (2017) found that when job-search programmes were flipped to improve poor people's self-confidence first

(empowerment) before enhancing their job skills (employability), the resulting outcomes to the clients' well-being were more positive.

Empowerment and Employability as Agency

According to Morrison (2012), most policy-makers agree on the individual centric dimension of employability as *absolute* employability, where employability is an individual attribute that can be subject to changes or improvement depending upon his or her own efforts to learn (p.8). On the other hand, *relative* employability is connected to other socio-demographic facts of the individual, for example, the age, type and location of dwelling, gender of the person (Svensson & Mastropirro, 2017), which affects how a job seeker is perceived by employers, in comparison to other candidates in a hierarchical jobs market. This hierarchical job market, for example, remains strongly stratified by social class, with job seekers from working class backgrounds suffering persistently lower potential income returns than their middle-class peers, as observed by Furlong and Cartmel (2005). This *relative* employability is becoming more important as an indicator of career success (Morrison, 2012). In this sense, employability is not perceived didactically by the individual as just a repertoire of skills, rather it is an accumulation of personal experiences and connections acquired through learning (Svensson & Mastropirro, 2017).

This corroborates with the idea of treating citizens as agents (Boyte, 2013), where individuals with high personal agency are able to act independently and to make their own free choices (Lowe, 2008). Personal agency can be enabled when people develop the identities of themselves as being productive citizens (Boyte, 2013). By this argument, an individual with a higher perception of self-employability sees herself as a *maker* of society, not simply a volunteer, voter, consumer or protestor (Boyte, 2013). As such, an employability-centered citizen is also more empowered, thus creating a virtuous loop for enhancing personal well-being.

Empowerment and Employability in a Capability Frame

Within the context of the capability approach, employability is strongly associated with empowerment because employability accords the individual the access to gainful employment and by extension, greater control of his or her social destination in life (Arthur & Rousseau, 1996). As explained by Olejniczak (2012), unemployment limits capability by restraining resources and reducing instrumental freedoms, with the risk of all these deprivations being passed onto their descendants.

With that, we are back to our earlier questions on what a capability inspired study of inequality will look like. Given the literature review, it can look like this -- the dependent variables are operationalised as empowerment and employability. Empowerment because it is a yardstick of social well-being and employability because it is a proxy of economic well-being. Through this, we shall disregard the boundaries of academic disciplines and attempt to tell both the economic and non-economic stories at the same time. From Amartya Sen, we will learn how to think about what makes life worth living, why we must study well-being for the person holistically, and how to enhance human well-being in the end. In doing so, we hope to advance broader development measures and extend such indices beyond economic achievements alone (Haikin, 2012).

Given the earlier arguments, we now come to the question – what can we do about our current state of inequality? What can help meet the needs of the poor -- their material needs (economic outcomes), their social needs and even their dignity needs (non-economic outcomes)? In the next Chapter, we will continue to expand Sen's theory by exploring how the measures of technological achievements can facilitate both economical as well as non-economical outcomes. First thing first, an introduction of what constitutes technological assets and technological gaps, will be advanced in next Chapter on theoretical perspectives of the digital divide.

CHAPTER THREE THEORETICAL PERSPECTIVES – DIGITAL DIVIDE

The access to information communications technologies (ICTs) and the skills necessary to use the ICTs have been posited as the means to achieving higher social well-being and income (DiMaggio et al., 2001). More often than not, the benefits of technology access and skills programmes are declared without much basis supporting it – make technology available to everyone, teach them how to use it and all lives will be better (Tufekci, 2005). This viewpoint is known to come from social theorists such as Castells (1996), who advocates information technology skills being associated with economic and social mobility.

Historical research discourse has concentrated on the nature and extent of existing inequities in information technology access – the digital divide. The digital divide schism is centred on whether closing gaps in ownership and access will solve social inequality. However, with the increasing diffusion of ICTs, access measures such as region, age, gender, race, etc., are finding less relevance in the literature (Valadez & Durán, 2007). The current debate focuses not just on disparities in ICT access but on their effective use and appropriate content (Attewell, 2001).

There are however specification issues at both the conceptual and methodological levels for the digital divide. This is because the concept of ICT inequalities are affiliated to so many theoretical levels, which makes it very difficult to conceptualise and operationalise as an ICT research overall (Dodel, 2014). The lack of consensus about main conceptual categories and operational terminologies makes it difficult to assess ICT's impact and how to reduce the digital divide (Dodel, 2014; Peña-López, 2009). This consequently furthers the limitations and bias in the digital divide research (Dodel, 2014). What scholars such as Dodel (2014) and Peña-López (2009) are saying is – if we do not always refer to the same things when we talk about ICTs assets and gaps, how can we even begin to measure it? To begin, we need to first address the conceptual problems plaguing the digital divide theories.

First, the Digital Divide Conceptual Problem

As mentioned by Dodel (2014), there are too many possible meanings for ICT's key terminology within the digital divide nomenclature. Before we even begin to sort out the polysemy of the digital divide jargon, we must first clarify what we understand by the concept of the digital divide.

The Digital Divide Concept

The term *digital divide* basically refers to the gap between having *access* (versus not being able to have access to) and *usage* (versus not being able to use) information and communication technology (Attewell, 2001). While nobody is exactly sure when the industrial revolution evolved into the digital revolution, scholars posited that it began as early as the late 1950s with the use of digital computers and digital record keeping (Nicholas, 2015). However, research indicates that the spread of ICTs, with their resulting social and economic advantages did not apply to all the constituents it touched, creating what is currently known as the "*digital divide*" (OECD, 2001; Selwyn, 2004; Selwyn & Facer, 2007; van Dijk & Hacker, 2003). Andreasson (2015)'s book on digital divides and e-inclusion noted that the term *digital divide*, has been used to denote digital disparities, especially between groups of people differentiated by their race, gender, socio-economic and/or disability status etc. Other terms emanating from this perspective have included "*racial digital divide*" (Chen & Wellman, 2004) and "*gender digital divide*" (Dixon et al., 2014).

Different definitions. In terms of its varying definitions, the digital divide is also linked to other synonyms, albeit with different emphasis, for example, *digital inclusion*, referring to the policy actions of allowing people to participate and benefit in the information society because of their access and skills to use ICTs (Andreasson, 2015; Selwyn & Facer, 2007; Tsai, 2017) and *digital accessibility*, which commonly refers to transcending peoples' disabilities to accessing and using ICTs (Feingold, 2017).

Levels of Digital Divide

Level 1 - Digital Access Divide

Within the specific terminology of digital divide itself, concepts and terminologies are also constantly evolving. For example, the term was originally centred on the question of having, or not having, access to technologies (Compaine, 2001). As consumer-level technologies are rapidly becoming significant factors in reinforcing the pre-existing inequities in modern society, people who lacks access to ICT will be increasingly side-lined as the communication devices, the internet, email, and other web-based technologies become essential tools of trade in the market economy (Nicholas, 2015; Selwyn & Facer, 2007; Valadez & Durán, 2007). Rather than pigeon-holing the definition of the digital divide as having (or not having) access to the World Wide Web, some authors argue that "*access*" is made up of three components: *devices*, *conduits* and *computer literacy* (Attewell, 2005; Attewell, 2001; Nicholas, 2015).

Access via devices. ICT projects are too often based on equipment, software and/or internet connections, neglecting the human dimensions for technology to be appropriated (Warschauer, 2002). For example, Sugata Mitra's hole-in-the-wall experiments in the mid-2000's, which were essentially outdoor five-station computer kiosks to let India's slum children access a computer (Mitra, 2005). The idea was to allow the urban poor to teach themselves computer operations, but the actual usage at the kiosks revealed a different reality (Clark, 2013). There were no supervision of the children learning the computer software and they ended up playing games instead (Warschauer, 2002).

About a decade later, the One-Laptop-Per-Child programme, conceived to provide low-cost laptops for developing countries (OLPC, 2013), had similarly not produce notable academic achievements in the children who received the devices. Like the hole-in-the-wall experiments, the netbook was supposed to be connected to the internet, but a lack of network infrastructure in most rural areas meant that the children using them were not online to utilise the resources available on the world wide web (Hachman, 2012).

Each of the programmes described earlier was motivated by the intent to improve people's lives through the provision of a mobile device or computer access but they often ran into unexpected challenges which did not exactly achieve the outcome of reducing inequality (Warschauer, 2002). As such, the digital divide, argue Warschauer (2003), should not only be limited by the physical access to devices, but also to the support which people need to be able to deploy the technology effectively and efficiently, like the availability of broadband communications. Therein lies the second of the access components – conduits.

Access via conduits. Having access to a *conduit* means having the support or connections, for example, electricity supply or telephone lines, which enables the physical device to do what it is supposed to (Warschauer, 2002). In the case of ICT access, this access to a *conduit* can also refer to the technologies that enable data to move across the internet (Kuttner, 2012). In this day and age, such conduits could be in the form of copper-line DSL, fibre cables or mobile broadband for internet access, and existing inequality in a country can be further magnified if internet access is unequal (Crawford, 2016). As Crawford (2016) found out, the high costs of high-capacity, 1,000Mbps-download internet access are often out of reach of the poorer constituents in the country. This resulted in a division, which Kuttner (2012) defined as “internet-haves” and the “internet-have-nots” (p.3), an example of a “have-not” can be in the form of slow service through dial-up or mobile wireless because these are the only internet access options available to them. A study by the Joan Ganz Cooney Centre, found that poorer families depend on the Internet just as much as their richer peers, but what

the poor has available is often just a simple smartphone, in most cases because they cannot afford other kinds of equipment or the required subscription fees for home broadband (Rideout & Katz, 2016). For poorer households, such an access gap can manifest in the inadequacy of “personal improvement”, for example, video streaming, which facilitates connections with friends and relatives in faraway places, and enable high school students to access online classes, completing schoolwork and learning (Kuttner, 2012, p.3). By this argument, the ‘internet-have-nots’ are being held back from a better social destination, due to the lack of connections (Dizard, 2016).

The two components of access describes what scholars consider the first-level digital divide (Campos-Castillo, 2015) or the digital *access* divide, what Wei et al. (2011) refer to as the “inequality of access to information technology” (p.170) in one’s homes, workplaces and/or in schools.

Level 2 – The Digital Capability Divide

Access via higher computer literacy. With a global mobile phone internet user penetration exceeding fixed broadband in 2017 (International Telecommunication Union, 2017), the concept of digital divide has evolved to consider the relative inequality between those with more or fewer skills (Hargittai, 2002). This is because access does not necessarily indicate differences in how people use technology as both access and usage have its own grounds for determining and interacting with each other (Hargittai, 2002). For example, without computers and internet access at home, these individuals are already disadvantaged in lacking the necessary *conduit* to hone their computer literacy skills (Cox, 2009). By that argument, the phenomenon that people lack the necessary digital literacy skills causes them not to be able to utilise the technology in an effective and efficient matter befitting of its use (House of Commons, 2016).

The concept of digital literacy refers to one’s ability to comprehend and critically assess information, from different sources through ICT devices as well as the internet (Ferrari, Punie, & Redecker, 2012). Based on this definition, i) computer literacy is considered one of the many literacies under the umbrella of digital literacy, whereas the other three are ii) information literacy, iii) social media literacy and iv) network literacy (F-infotech, 2016). The arguably most popular definition of *information literacy* is offered by Koltay (2011) who says that “information literate people are able to recognise when information is needed” (p.215). Forster (2015) called for a more refined definition of information literacy to extend beyond its information gathering functions to focus on its

outcomes. This is so that the concept of information literacy can have wider application beyond the information field (Forster, 2015). According to Vanwynsberghe, Boudry, and Verdegem (2015), *social media literacy* refers to “the *technical* and *cognitive competencies* users need to use social media in an effective and efficient way for social interaction and communication on the web” (p.85), where *technical competencies* refer to one’s knowledge and skills to produce and disseminate content on social media, and *cognitive competencies* involves the critical analysis of social media content for appropriateness and truthfulness, based on its given context (Daneels & Vanwynsberghe, 2017). *Network literacy*, being the latest emerging digital literacy, has to do with computer network knowledge and skills, such as the uses, value and operating principles of digital communication networks (Pegrum, 2010). Looking at the definitions of the various literacies under the digital literacy umbrella, there seems to be a logical progression from the more fundamental skills, i.e. computer literacy, towards the higher, more transformative levels, e.g. network literacy. This skills progression model, in line with the literature on digital literacies, is best illustrated by the Canada’s Centre for Digital and Media Literacy (MediaSmarts, 2018).

This leads to what scholars now considers the second-level divide (Brotcorne et al., 2010), or what Wei et al. (2011) call the digital *capability* divide. The understanding of the digital divide has evolved from a linear “access to the assets” view to an access to “basic skills” view (Mendoca et al, 2015, p.194). This second level of the digital divide considers the varying levels of digital literacy skills among people (Hargittai, 2002), what van Dijk (2005c) distinguish as three levels of digital skills succession, starting from the basic to the more advanced skills – “operational, information and strategic skills” (p.92). Per van Dijk (2005c), *operational skills* are defined as “skills to operate computer and network hardware and software” (p.71), *information skills* are the skills needed to “search, select, and process information in computer and network” (p.73) and *strategic skills* are “capacities to use these sources as the means for specific goals and for the general goal of improving one’s position in society” (p.74). In a later book, van Dijk and van Deursen (2014) observed that one’s economic participation, i.e. job opportunities, is correlated to the level of digital skills succession one is able to obtain. For the worker who is not able to obtain higher skills access to keep up with the demand of digital skills needed at the workplace, he or she will be left behind (Rooney, 2017). As such, the growing income inequality in developed economies is accounted for by its unequally divided ICT skills access (Goldin & Katz, 2008).

Level 3 – The Digital Outcome Divide

Where ICTs are ubiquitous, framing the digital divide theory inside access issues does not sufficiently explain the inequality or impact on workers in a developed country. This thesis argues that the binary model of having access versus not having access, is insufficient to reflect the technological social dynamics in a polarised information society, where the problem is not only about ICT access but includes inadequate education support under the structural parameters of a developed country grappling with social stratification.

In other words, the issue of access (or lack thereof) to ICTs raises complex questions, for example, how much connectivity should be accorded to individuals who are yet unskilled on how to utilise such connectivity and how much skills training is necessary to enable these individuals to take advantage of such access (Selwyn, 2004). As explained earlier with regards to the concepts of the second level digital divide, physical access to ICTs is impractical if the individual does not possess the necessary skills and knowledge to use that technology productively (van Dijk, 1999). Because the concept of ICT is one of the first factors economists use to explain the inequality that is caused by skill-biased technological change, the concept of ICT literacy needs to be first addressed within the confines of digital and economic outcomes (Card & DiNardo, 2002). This digital outcome divide (Wei et al., 2011) is what scholars refer to as the third-level digital divide (Scheerder et al., 2017; Tsai, 2017; van Deursen & Helsper, 2015), focusing on outcomes resulting from using technology. In other words, it is the inequality of personal outcomes, for example, differences in learning achievements and personal productivity successes, which are the result of how the individual uses the technology, while taking into account his or her personal factors (Wei et al., 2011). Essentially, what scholars are saying is that equal computer access and skills may not necessarily result in equal personal outcomes, as certain groups of people get more out of their technology (van Deursen & Helsper, 2015). Past research looking at the impact of the digital divide has not been able to offer a concise theoretical enlightenment of the reasons behind such effects (Wei et al., 2011). In other words, the scholarship has yet to come to a consensus on why some groups of people glean better outcomes from using technology, while others who do not reap its benefits at all, despite starting from the same level of usage and skills. Perhaps the field can benefit from a comprehensive overview and categorisation of the predictors of digital outcomes, as this will help identify future research as well as policy efforts to close the divide (Scheerder et al., 2017).

Second, the Digital Divide Methodological Problem

Disagreements about measuring the Digital Divide

Hilbert (2011) attempted a meta-analysis of the measurements of the digital divide. After poring through copious studies and approaches in the literature up till 2011, he classified the digital divide concept into a four-dimension matrix, i) who are the receivers and senders of messages, ii) with which characteristics, e.g. income, education, geography, iii) how sophisticated is the usage and finally iv) how does the individual connect to the device, e.g. fixed or mobile broadband (Hilbert, 2011, p.727). A smorgasbord of definitions emerges because different scholars concentrated on different dimensions, which leads to the problem of having too many measurements (Hilbert, 2011).

“For example, counting with only 3 different choices of subjects (individuals, organizations, or countries), each with 4 characteristics (age, wealth, geography, sector), distinguishing between 3 levels of digital adoption (access, actual usage and effective adoption), and 6 types of technologies (fixed phone, mobile... Internet...), already results in $3 \times 4 \times 3 \times 6 = 216$ different ways to define the digital divide”. (Hilbert, 2011, p.728).

There is no right or wrong, as each dimension “seems equally reasonable and depends on the objective pursued by the analyst” (Hilbert, 2011, p.728). Extending this argument further, Barzilai-Nahon (2006) advocates for more robust digital divide models, beyond its current monotopical studies, where scholars typically look at just a few selected predictors that impact an outcome. Examples of such outcomes are income (Ndung'u et al., 2012), gender (Obayelu & Ogunlade, 2006), age (Lin & Chang, 2009) and ethnicity and race (Campos-Castillo, 2015). Transcending beyond such monotopical studies, says Barzilai-Nahon (2006) would require consideration of the following, i) “the purpose of the tool, ii) the level of observation, and iii) the method of approaching the data” (p.269). She also emphasise the need to approach the measurement with a deeper context to what is happening in society (Barzilai-Nahon, 2006, p.269).

Addressing the Digital Divide Conceptual and Methodological problems

Based on the analytical signposting by Barzilai-Nahon (2006), this thesis examines i) the purpose of ICTs towards the enhancement of human well-being where ii) the level of observation is at the individual level. By doing so, we can determine exactly how far removed (or near) are these people from typical ICT users, with regards to ICT access and

use (Barzilai-Nahon, 2006). In terms of the iii) method of approaching the data, we want to avoid the typical monotopical methods for measuring the digital divide, and this will be done by considering a more comprehensive index of ICT predictors, arranged in a systematic manner, towards the digital divide outcomes. The advice from Chen and Wellman (2004) is important for this study, who suggest that any conceptualisation of the digital divide need to consider the user's socioeconomic status and demographic factors.

As such, Selwyn (2004)'s method is deemed the most suitable analytical framework as it addresses multiple hierarchical levels of ICT impacts on human well-being. We hope that Selwyn (2004)'s conceptual model will help us to appreciate the intricacies of the independent variables of this study, as his method requires us to arrange the predictors of ICT outcomes in a hierarchical manner, namely *access*, *usage* and *appropriation*. These are also what Hilbert (2011) deliberates as different levels of the adoption of technology, just that he calls them *access*, *usage* and *effective adoption* instead (p.726). While never seen this way by Selwyn himself, the three levels of access, usage and appropriation, are also conceptually aligned to Wei et al. (2011)'s three levels of digital divide, where the first level digital divide – “digital *access* divide” (access), second level – “digital *capability* divide” (usage) and third level – “digital *outcome* divide” (appropriation) (p.170).

I will start the examination of each of the independent variables, starting from the mere physical access (digital access divide) to the effective usage (digital capabilities divide) of ICT devices and the internet. By doing so, the capacity or digital competences required to transform ICT assets into economic and non-economic outcomes (digital outcomes divide) for the individual will emerge. As such, the methodological questions to help guide this first part of the thesis are: What is “access”, “usage” and “appropriation” for the individual? How to define access, usage and appropriation and why? What are their components?

Before we dissect the different levels of ICT assets, an introduction to the geographical study context is necessary to understand the relations of the IVs to their DVs.

Context – why Singapore?

Many digital divide researchers limit the research in this field to developing countries where most of the global poor are situated (Zheng et al., 2017). Such a paradigm however, is limiting because all societies “have to address issues of employment, inequality and social exclusion, and continue to face challenges in education, healthcare, public administration, civil society” (Zheng et al, 2017, p.1). By this argument, the phenomenon of digital divide

exists in all types of societies, whether they are un-developed, developing or developed and the issue will need to be examined regardless of the locale of study.

The economic miracle of Singapore has contributed to the marginalisation of her poorer citizens. Compared to other developed Asian countries, such as Japan, (after accounting for tax rebates and transfers), where her GINI index is 0.412, compared to Japan's 0.328 (Ong, 2015). Singapore is experiencing a greater class divide now (Chua et al., 2017). Local scholars have pointed to Singapore's relentless chase for economic growth, as the cause of its increasing income inequality (Smith et al., 2015). On the other hand, some economists claim that this wage variance is due to differing levels of individual productivity (Gielen et al., 2010) and that the low absolute poverty level in Singapore mean that the poor are actually not in a dire state, compared to the penurious in our neighbouring countries (Mahbubani, 2001). This stance is however refuted by Teo (2018)'s seminal ethnographic study on poverty in Singapore -- the Singaporean poor do work hard but they get back little in return for their labour. The poorest Singaporeans find it particularly demanding to eke out a subsistence, in an expensive metropolis where the high cost of living is exacerbated by ongoing inflation without a corresponding increase in real wages (Nair, 2014).

The key motivation to situate the low-income experience in the wealthy city is this: once we see that inequality is partly about how people can have the same needs and do the same things and yet have different outcomes, then we as researchers must ask—why are there these differences? The next section highlight the state of inequality in Singapore.

Same needs, doing the same things, but why different outcomes?

Different economic outcomes for Singaporeans

As a counter argument to the earlier line of reasoning that less productive workers reap lower wages, globalisation and technological disruption have been blamed for the incomes disparity in Singapore, in addition to state policies encouraging the influx of low-wage foreign workers, which depresses local wages (Bhaskaran et al., 2012; Smith et al., 2015). This means that a local blue-collar worker can try really hard in his job, but if the industry he is in is dominated by cheap foreign colleagues, then his wages may be pegged to the lowest denominator (Chor, 2014).

Different non-economic outcomes for Singaporeans

In terms of social outcomes in Singapore, a survey conducted by the National Volunteer and Philanthropy Centre (NVPC) found in 2013 that Singaporeans reported a negative score on overall individual well-being (Lim, 2013). This suggests that locals are

increasingly anxious about their stagnating incomes insecurity amidst high inflation (Chew, 2017). This also suggests that economic and non-economic outcomes may be closely correlated for Singaporeans. Per Teo (2018)'s ethnography study of the working poor in Singapore, she found that the constituents often put in long hours at work, immense caregiving responsibilities at home, which leads to high levels of psychological stress.

Beyond this, the next important question we need to confront is, can we equalise the economic and non-economic outcomes for all Singaporeans? Can technology help close this divide – in other words, can the accumulation of ICT assets help improve empowerment and employability for Singaporeans? The next section will attempt to examine these questions.

The Digital Divide in Singapore

As the world's second-most networked country, in terms of the Networked Readiness Index (NRI) (World Economic Forum, 2014), the Singapore government approaches the digital divide from a technological deterministic perspective, where its information communication initiatives have improved the accessibility of formal technology for its residents (Chia et al., 1998). Barzilai-Nahon (2006) opined that monotopical factors like ICT access are easy to measure, convenient for policymakers to justify allocation of state resources and influence public opinion (p.270). Using access measures however, may be appropriate in one dimension of measuring ICT effects but it does not tell the whole story, for example, Lim (2017) found less than half of the older residents in Singapore actually use their smartphones' in-app functions for internet messaging (e.g. WhatsApp), navigation (e.g. Google Maps), retrieve information about goods and services (e.g. web browser) and online banking. This is particularly contrasting when Singapore has one of the highest penetration of smartphone for the elderly compared to other developed countries (Lim, 2017). When he asked a 73-year-old woman, why she shuns the many self-service kiosks available to pay her utility bills, she remarked that using the kiosks was just too challenging for her and preferred to queue up at the bank instead. In Singapore's context, there is little doubt that the physical access factor is well covered by government initiatives but whether it has improved social inclusion for its citizens remains tenuous due to a lack of ICT impact research in Singapore (Lim & Guo, 2015). Through using the capability approach and Selwyn (2004)'s analytical framework, we hope to critically examine real-life consequences of information communication technology (ICT) access and usage on the unemployed and under-employed residents in Singapore. By utilising an individual level unit of observation, we want to know how far removed or how digitally-included these people are from the rest of this developed

economy. From that, we hope to also develop some policy recommendations for Singapore, on how technology can be better harnessed to help improve its people's economic and psychological well-being.

Measures of the Digital Divide

Numerous researchers have attempted to define the measures of the digital divide. To provide a general overview of research on digital divide measures, studies can be categorised in the following groups: (1) studies analysing the degree and mobility of access of ICTs, (2) studies characterising the usage evolution with ICTs and (3) studies exploring individuals' appropriation of ICTs in their work lives, in school and informally.

(1) Studies on access of ICTs

As stated earlier in this chapter, most of the digital divide literature tended to focus on access issues (Sey et al., 2015). There are myriad ways of looking at the dimensions of ICT access. In this first level, Dewan and Riggins (2005) describe the access divide as the narrowest of the digital divides, as it refers only to hardware and software access (Wei et al, 2011, p.171). This also means that the ability to access ICTs is only due to the individual's ability to buy the physical assets or some other capability to obtain access to the devices (Selwyn, 2004). Selwyn (2004) proposes two dimensions of looking at the access stage – a) a theoretical dimension and b) an effective dimension. The theoretical access dimensions allude to ivory-tower decisions taken by policy-makers or scholars to build ICT infrastructure, to enable greater public access to computers, for example tele-centres and public libraries. Often, these policy decisions are done without any consideration to the individual's real access in practice. As chastised by Selwyn (2002), implementers have not considered the vital considerations individuals take into account when accessing ICTs, including its “qualitative concerns of privacy and ease of use” (Selwyn, 2004, p.347). It seems that there are myriad ways of looking at the dimensions of ICT access in the first level of the digital divide. The next section represents a summary of the indicators of ICT access, culled from various researchers over the years.

Pre-existing socio-demographics and ICT access. Numerous studies have indicated that the digital access divide expand across demographic, ethnic and socio-economic dimensions. For example, scholars like May (2012) found that pre-existing inequality in the person's socioeconomic status, e.g. gender, education and financial poverty status is closely correlated to his ICT access. Scholars are especially keen to understand how demographics

play out in the exclusion of the ICT-haves versus the have-nots. For instance, in many of the countries in the African continent, men are able to access ICTs more easily than women (Anne, Christoph, & Alison, 2011). In a report by the International Telecommunication Union (2014), the researchers found that individual variables like race and languages, result in segregation of ICT access between certain groups in some of the South American countries

Types of device access. Digital divide studies in the early years tended to focus on physical access to digital media technologies, for example, Wise (1997) stated that the term *access* refers to the availability of *physical* ICT facilities to people. Selwyn (2004) expanded the idea of quality access to ICT along the lines of ‘effective’ access, meaning to consider the individual’s access experience. In terms of the individual’s access experience, Davis (1993) further explains that time, personal costs, the environment and privacy and ease of use affects how people access ICTs.

Location of ICT access. The ease of location of the ICT asset determines whether the individual would use the ICT resource, where it is expected that if the individual finds it easy to locate the ICT resources, the greater the tendency to use such resources (Selwyn, 2004). For example, Aramide, Ladipo, and Adebayo (2015) found in their Nigerian study, that if the computer is easily located in the classroom or laboratory, there is higher propensity for the science teacher to use the ICT device.

Internet access. In tandem with the location of ICT access, home internet access has long been considered the most important type of ICT access as it allows greater autonomy of use than public access at work or community facilities (Hassani, 2006; Lim, 2009). Having internet access in the privacy of her home also allows the citizen to benefit from the availability of both the private sector as well as government-provided ICT services and applications – this is advantageous for advancing public policy improvements (International Telecommunication Union, 2014). The internet access divide still matters in low-income communities, argues Chen, Li, and Straubhaar (2017), as patterns of access divide are based on a combination of home and mobile internet access. For example, it involves the location, convenience and comfort of access, as well as whether people have uninterrupted or intermittent access to online information (DiMaggio & Hargittai, 2001; van Dijk, 2005b). Given the difficulty of accessing computers and smart phones in some African countries, due to the high prices charged by the telco companies, the mobile phone has become the main access to the internet for constituents in Africa (Stork, Calandro, & Gillwald, 2013).

Frequency of internet access. A study of Dutch residents by van Deursen and van Dijk (2014) found that people with lower education levels tend to access the internet more

frequently than people with higher educational levels. The reasons for access are however different between these two groups: the lower educated constituents access their ICTs more often for “social interaction and gaming. than for educational purposes, information seeking, or work-related reasons” (van Deursen & van Dijk, 2015, p.381), the latter are what Hargittai and Hinnant (2008) termed as capital enhancing activities. This shows that frequency of internet access may not be indicative of the individual making gainful use of the internet (van Deursen & van Dijk, 2015).

From the first-level digital access divide to the second-level digital capability divide

From the above studies on ICT access, we can see that the digital access divide is a nuanced continuum of assets availability based on the combination of home and mobile internet access, which includes i) the dis-connected (neither having home nor mobile internet access), ii) mobile-only access, iii) home-only connection and iv) hyper-connected (having both home and mobile internet access) (Chen et al., 2017). In a study of distance learners in India, Awadhiya and Gowthaman (2014) found that learners who maximise their distance learning tend to be hyper-connected, i.e. they have desktops or laptops at home with frequent internet access, browsing social networking sites and educational sites, thereby optimising the benefits from the online courses.

It is important to differentiate ICT access from ICT usage, because access obviously and expressly leads to different usages (Selwyn, 2004). To understand how the digital-access-divide affects the next two levels of the digital divide, it is important to investigate how people use the internet after obtaining access (van Deursen & van Dijk, 2015), or what Hargittai (2002) refers to as the second level digital divide, or the “digital capability divide” (p.170) by Wei et al. (2011).

(2) Studies on usage of ICTs

The studies in this second group generally explain the types of ICT usage by examining the frequency and types of usage activities, while considering the contextual personal variables of the individual, for example demographic, socio-economic status, and skill levels (Hinostroza, Matamala, Labbé, Claro, & Cabello, 2015). Usage studies are copious but most of such reported usage typologies are not easily applicable to broader ICT users because new ICT devices and applications are invented quickly with its uses evolving rapidly (Hinostroza et al., 2015). Nonetheless, these scholars have tried to build some semblance of general categories of ICT usage based on frequency and types of ICT usage.

Frequency of ICT usage. A multi-studies approach to examining the different types of media-users was done by Brandtzæg (2010), who plodded through twenty-two research papers. He found a range of ICT users based on their frequency of ICT usage – ranging from non-users to advanced users. Similarly, Hashim (2008) examined the usage of ICT by Malaysian women, based on adopters categories of “*innovator, early adopter, early majority, late majority and laggard*” (p.320).

Types of usage. This group of studies characterise users’ activities by differentiating between groups of users. For example, by comparing digital natives against digital immigrants (Fernández-de-Álava, Quesada-Pallarès, & García-Carmona, 2017). On the topic of digital nativism however, there are numerous scholars who attribute the phenomenon to merely generational differences, not ICT usage characteristics. On the other hand, Helsper and Enyon (2009) propose that one’s education level, the amount of experience in using the technology, and the self-confidence which comes from such usage, are more important than one’s age (generational differences) in explaining variations in ICT usage. Despite the difficulties in widespread application of usage studies, most studies presented ICT users based on generally similar typologies – entertainment, communication for socialising, formal communication for work, information-seeking, and productivity etc. (Hinostroza et al., 2015).

Contextual personal variables. As advised by Chen and Wellman (2004) and Barzilai-Nahon (2006), any conceptualisation of the ICT usage need to be based on personal contextual factors, such as socioeconomic status and demographic factors. Like the digital access divide, studies on ICT usage have shown inequality across a variety of demographic, ethnic and geographic dimensions. Among these dimensions, income and education, which are representative of one’s socio-economic status, have been shown to be the strongest predictor for ICT usage versus non-usage (Jung, Qiu, & Kim, 2001). For example, individuals who are less educated, tend to have less access to physical ICTs (van Dijk, 2005a), have lower-order ICT skills (Hargittai, 2002), and tend to use the Internet for less productive purposes (Hargittai & Hinnant, 2008).

Measurements of ICT Usage within the Digital Divide framework

With regards to the digital divide, usage dimensions are analysed somewhat differently, in addition to the general usage studies highlighted above. This is because the objectives of most digital divide studies are to understand how we can close the divide. For example, DiMaggio and Hargittai (2001) identified five critical usage dimensions to counter digital inequality, i) “technical” (devices, hardware and connections) of internet access, ii)

“autonomy” in their use of the internet, iii) “skill” that people possess in using the internet, iv) “social support” and v) “purposes” for why people use ICTs (p.8).

i) *Technical - hardware, devices and connections.* These studies highlight how inequality in the adequacy of hardware, software and internet connections limit how users benefit from internet access, given that ICT usage is dependent on the physical availability of suitable equipment (DiMaggio & Hargittai, 2001). For example, Davison and Cotten (2003) found differences in ICT usage between broadband and dial-up users, where the latter is not able to access certain sites due to the slower connection. There are also studies which look at how different devices impact usage, for example Mac Callum and Jeffrey (2013) observe that students’ usage of ICTs varies when they are using a computer (e.g. searching and downloading from the internet) vis-à-vis a mobile device (e.g. sending and receiving texts).

ii) *Autonomy – location where users access the internet.* ICT users with access to the Internet can reap more benefits than users who are not able to access the World Wide Web as easily (Dimaggio & Hargittai, 2001). For example, home internet usage is generally associated with better school performance for students, than those who use computers outside of their home (Romani, 2009). With regards to the location of ICT usage, the issue of home internet access and usage is closely related to the costs of usage, as Okello, Okello, and Ofwona-Adera (2009) found that the high prices charged by telecommunication companies in Kenya, is the biggest obstacle to using mobile phones; in addition to the difficulty of charging the phone battery, particularly in remote rural areas.

iii) *Skills in using the internet.* As the gap in access closes, the gap in digital skills will impact usage in turn (van Dijk & Hacker, 2003). There are many studies which examine internet competence to the individual’s capacity to use the internet for the purposes of his or her choosing (DiMaggio & Hargittai, 2001), where the lack of e-skills is the most cited reason by respondents, for their low usage of the internet (Schmidt & Stork, 2008). Given the transformative role of ICTs, scholars are calling for more attention on the development of ICT skills in the populace to resolving inequality (May & Diga, 2015).

iv) *Social support for users.* The availability of social support is paramount as ICT reaches more people, as the former is associated with one’s motivation to use the ICT and develop her e-skills further (DiMaggio & Hargittai, 2001). Social support can be in the form of formal technical assistance from professionals, e.g. IT technical support staff, and friends and family members who can help in problem-solving of ICT issues (DiMaggio & Hargittai, 2001). For example, Hsiao, Tu, and Chung (2012) found that peer support increases a student’s computer self-efficacy, which in turn is strongly associated with computer use. In

Taiwan, Lin, Tang, and Kuo (2012) discover that by simply providing empathetic understanding to their peers of middle-aged and elderly women, the learners can acquire ICT skills more efficiently and effectively.

v) *Purpose of ICT usage*. Most digital divide studies in this category tend to place higher priority on ICT usage purposes that enhance one's economic productivity, for example, Ershova, Hohlov, and Shaposhnik (2015) found that economic factors are the main conditions for purposeful ICT usage in Russia. This indicates that most scholars tend to equate digital equality outcomes to economic indicators than non-economic psychological outcomes. Besides economic purposes, there are research which examines ICT usage for greater participation in society and civic engagement (Gaved & Anderson, 2006). ICT usage for consumption of entertainment, like playing games (Harvard Business Review, 2013) tend to be confined to private sector domain of app developers, even though studies have shown that game-based learning can result in beneficial outcomes too (Open Education Europa, 2016). From these studies, one can glean that to get a better handle on understanding people's ICT usage behaviour, it is the critical dimensions of *purposes* which allow researchers to gain behavioural insights on the social cognition of ICT's usage.

From digital capability divide to digital outcome divide

The shift from ICT access to ICT usage has revealed new disparities, which scholars such as Brotcorne et al. (2010) have called this the "second order digital divide", with ICT access being referred to as the "first order digital divide" (p.2). At the individual level, this *digital capability divide* (Wei et al., 2011), is explained by Zhu and Chen (2013) as the "ability, or lack thereof, to use ICTs among those who have access" (p.71). As explained by Ono (2005), even if an individual has plenty of opportunities to access ICT devices and the internet, it does not mean that he or she will be utilising ICTs more than another person, who has less access than him or her. This is supported by Bonfadelli (2002) and van Deursen and van Dijk (2014) who found that just by having internet access does not mean that the constituents will become more well-versed in truths and conversant about issues in general, as citizens may use ICTs for entertainment rather than learning purposes. Within this second level of digital capability divide, there still exists multiple erroneous assumptions made, that any use of the internet or mobile phones will somehow benefit the poor (Kang, 2010). Given these unrefuted assumptions, the discussion about the provision of information communication infrastructure needs to include ICT usage (Andreasson, 2015). For example, Robinson et al. (2015) found that disadvantaged young people in the United States who lack

access to ICTs, tended to ration their screen time, which can deprive him of opportunities to develop ICT skills, a luxury which his wealthier peers are able to so do. Based on this argument, it is important to understand the different dimensions of usage, within the usage paradigm, as differing ICT uses requires different amounts of effort and time to be invested. This thesis will attempt to create definitions of ICT usage based on the *purposes* of ICT usage as well as the *skills* required to perform certain usage activities. The proposed *purpose of ICT usage* and *skills for ICT usage* dimensions are inferred from the above scholarship, as well as the methodology of this research and they will be proposed in the next Chapter based on the factor analyses.

(3) Studies on appropriation of ICTs

Most of the studies in this third group deploy qualitative research methods for assessing the digital divide. The utility of qualitative methods is in gleaning more incisive descriptions about the participants' behaviour, especially towards their use of ICTs (Dey, Binsardi, Prendergast, & Saren, 2013). By the early-2000s, the term *appropriation* was beginning to take on more complex meanings than just access or usage, because the usage of ICTs has become a key part of our everyday lives (Karnowski, 2009). The process of how mobile phones are integrated in the user's life, which the authors termed as *appropriation*, is first explained in the Mobile Phone Appropriation (MPA) model by Wirth, Von Pape, and Karnowski (2008). The MPA model incorporates the diffusion of innovations theory by Rogers (2003) and the theory of planned behaviour by Ajzen (1985) together with other concepts which explains how and why users deploy technology in their daily living (Lee, Karnowski, von Pape, & Cionea, 2016). As such, the MPA model theorises that handphone uses are determined by factors such as "functional, symbolic, normative and restriction evaluations" (Lee et al, 2016, p.401). Given the above explication, the MPA model is much more extensive and detailed than Selwyn (2004)'s general concept of technology appropriation, when the ICTs of choice in the early 2000's were mostly confined to desktops and laptops, whereupon there were not many studies then on why and how people adapt their mobile phones to personal outcomes of usage. Besides the MPA model and Selwyn's concept of appropriation, there are other studies on ICT appropriation, which will be discussed and grouped below.

Different meanings for different participants. Specifically, the studies in this group found that using a computer and or the internet, hold varying connotations for different groups of users, and these meanings change with one's age, physical, social, emotional, and cognitive

development (Dey et al., 2013; Dey, Newman, & Prendergast, 2011; Facer, Furlong, Furlong, & Sutherland, 2003; Mackay & Gillespie, 1992; Stewart, 2003). In presenting his digital divide model, Selwyn (2004) explained that appropriation is a “meaningful use of ICT...where the ‘user’ exerts a degree of control and choice over the technology and its content, thus leading to a meaning, significance and utility for the individual concerned.” (p.349). For example, Facer et al. (2003) found that the computer offers different utility for different groups of children in the early 2000’s, and these can be grouped into the following tools: “communication device, entertainment medium, information resource, and production tool” (p.11). The researchers found that the specific use of these tools is mediated by the family’s socio-economic background of the child (Facer et al. 2003).

Adapting technology. Put simply, appropriation is defined as the customisation of technology; the way in which technology or technological artefacts are adopted, shaped and then used by the individual (Kirk, Swain, & Gaskin, 2015). It is presumptuous to think that people are always led by technology, as they either adapt to or reject innovations totally (Mackay & Gillespie, 1992). For example, Dey et al. (2013); Dey et al. (2011) found that the Bangladeshi farmers’ use of mobile phones extended beyond its initial device adoption stage, as these farmers appropriate the device with the support of their social and institutional networks, provide their own ideas on how to use the devices and further adapt them to their own lifestyle. In another example, in a more urban setting, researchers found that an e-mail account is more than a communication tool when its inbox is also used as a holding unit for flagged posts and key documents (Dey et al., 2013). Interestingly, such usage adaptation enables the participants to achieve more than their original purposes from the ICTs, which may not have been foreseen by the original ICT designers (Dey et al., 2013; Dey et al., 2011).

Engagement with the ICT. An individual’s engagement with ICT is dependent upon how he or she develops his or her connections with technologies and how he or she is able to take advantage of the physical and social infrastructures, which enable access to be of use, for him or her (Garnham, 1999). Appropriation is also based on how usage maintains or increases one’s social and economic status (Jung et al., 2001). It links the concepts of adoption and consumption, including the processes of resistance and rejection, and examines how people find their own uses for ICTs and then shape them to fit their own homes, activities and values (Stewart, 2003).

The digital outcome divide – appropriation of ICTs for ICT outcomes

The studies on appropriation, mentioned above, are on the one hand, necessary to sort out the ambiguity of the notion but on the other hand, they suggest future directions for research concerning the application of ICTs access and usage in the context of personal outcomes. For example, we see that the mere acquisition of ICT skills (*mastery*) is not enough if its proficiency is not adapted or properly employed (Haugeryd, 2011, p.227). The learner must be able to contextualise the knowledge (*appropriation*) to achieve his or her individual learning outcomes (Haugerud, 2011). From the various studies on ICT appropriation mentioned earlier, the individual must first derive personal meaning from engaging with the ICT before she can adapt or contextualise the technology. We believe that it is only after the derivation of personal meaning, adaption and engagement, can the personal outcomes from ICT access and usage, be clearer for the individual.

Another point worth mentioning is that most of the above-mentioned studies on ICT access, usage and appropriation were usually conducted in isolation instead of holistically considering all three dimensions of access, usage and appropriation. For example, a digital access divide study would look at access and usage, but it does not include appropriation and outcomes metrics. To name a few, the only exceptions were the research done by DiMaggio and Hargittai (2001); Selwyn (2010); Wei et al. (2011) and Dodel (2014), who expanded the digital divide model to consider the relationship between the access, usage and appropriation of technologies and valued individual-level outcomes, with detailed investigation on the individual benefits of having such ICT assets for different subgroups, based on individual demographics and socio-economic status.

It is also worth mentioning that the research on digital outcome divide and ICT appropriation is thus still under-developed. It is hoped that this thesis may signpost future research to consider the contexts of the usage and appropriation of technology, particularly how ICT appropriation may be better understood within the environment of inequality research.

Before we glean a better idea on the capacity or digital competences required to transform ICT assets into economic and non-economic outcomes (digital outcomes divide) for the individual, we need to examine each of the independent variables of ICT access, usage and appropriation. To do that, we need the below methodological questions to help guide us on explicating the IVs: What is “access”, “usage” and “appropriation” for the individual? What are their components?

Considering the status of ICT access, usage and appropriation in Singapore, the next Chapter will explain the research methodology used to test the application of the proposed ICT framework.

CHAPTER FOUR METHODOLOGY

This chapter presents the methodology that to test the new analytical framework using quantitative procedural methods. The chapter describes the participants of the study and the questionnaire that was administered. It gives a detailed analysis of the study's sample, putting emphasis on the ethics that governed the research design, data collection and survey protocol.

Participants

The participants in this study's sample were 302 adults, who were attending ICT training at a not-for-profit employment assistance organisation in Singapore, called the Devan Nair Institute for Employment and Employability⁴ (or "e2i" for short). The trainings took place between the 1st of April 2016 and the 18th of May 2016.

The racial/ethnic composition of the participants was: Chinese (64.57%), Malay (15.89%), Indian (12.91%) and others (6.62%). A table of the participants' demographics and socio-economic status compared with those of the population of Singapore can be found in Table 1 (Singapore Department of Statistics, 2016b). The difference between Singapore's percentages of Malay, Indian and Others and the sample participants, in terms of its racial representation, are small. The Chinese sample in this study represents less (-9.73%) than their Singapore population at large (see Table 1, for details).

The gender ratio was relatively balanced at female (52.65%) and male (47.35%), which is representative of the Singaporean population. Most of the participants were older Singapore residents, aged 45 years and above (62.25%), which was a significantly larger representative percentage than the population of Singapore. One in every two participants had an education level of secondary school or lower (50.34%), with 42.72% having only secondary school qualifications and 7.62% having below secondary school qualification. This figure is closely in-line with the general population except that there are more secondary school educated participants in our sample than the population's percentage, while participants who did not finish secondary school are less than the population's representation. Half of the participants reported household incomes which were in the lower 50% of the national median monthly wage. More than half (55.96%) of the participants were

⁴ The mandate of the institute is to help the unemployed find jobs through counselling, placement and job training (e2i, 2016).

unemployed at the time of the survey, and 21.52% of them had been unemployed for six months or more. Based on that, the sample of participants was relatively close to the general Singaporean population.

Table 1: Respondents demographics and socio-economic status versus population

	Demographics	Respondents	Singapore Population⁵	Difference
Racial/ Ethnicity	Chinese	64.57%	74.30%	-9.73%
	Malay	15.89%	13.40%	2.49%
	Indian	12.91%	9.10%	3.81%
	Others	6.62%	3.20%	3.42%
Gender ratio	Female	52.65%	50.90%	1.75%
	Male	47.35%	49.10%	-1.75%
Age	18-24yrs old	2.98%	6.63%	-3.65%
	25-34yrs old	11.92%	14.38%	-2.46%
	35-44yrs old	22.85%	15.65%	7.20%
	45-54yrs old	33.77%	15.68%	18.09%
	55-64yrs old	18.21%	14.02%	4.19%
	65yrs & above	10.26%	12.40%	-2.14%
Education	Below secondary school	7.62%	29.10%	-21.48%
	Secondary school	42.72%	18.90%	23.82%
	Post-secondary school	6.95%	9.10%	-2.15%
	Polytechnic Diploma	16.56%	14.70%	1.86%
	University	26.16%	28.20%	-2.04%

All the participants were either citizens, or permanent residents, of Singapore. Each participant was paid a nominal remuneration of five Singapore dollars for their participation. Subjects under the age of twenty-one years old or participants who were not able to sign for themselves were not included in the study.

⁵ Source: Singapore Department of Statistics (2016a) and Singapore Department of Statistics (2016b)

Ethical Considerations

The Nanyang Technological University's Institutional Review Board gave their approval for the ethical components of this research project, as well as the pilot test project before it, on the 25th of September 2015 (Appendix A).

Materials

The study comprised of a closed-ended questionnaire which was administered at the employment institute. Data were collected through a questionnaire containing 110 items (Appendix D). Most of these were five (5) Likert-scale items based on a scale from "Strongly Agree to Strongly Disagree".

Other questions asked for demographic information, such as race/ethnicity, gender, age, education level, household income and current employment status. All the information that was used in this analysis was derived from the questionnaire data.

Each participant signed, and was given a copy of, the informed consent form (Appendix B). The consent forms and confidential information are kept separate from the data, in a locked cabinet in the Principal Investigator's office in WKWSCI, Nanyang Drive.

Procedure

Tasks

A paper-based survey was administered to fifteen (15) ICT classes at the Employment and Employability Institute (e2i), between the 1st of April 2016 and the 18th of May 2016. The surveys were conducted on the second day of training of each course. The participants were given a briefing before each survey to assure them about confidentiality, the risks and the researcher's duty of care towards them. They were also able to ask questions about the survey. Following the question and answer session the researcher left the classroom to give the participants time to complete their individual questionnaire. The researcher then returned to the room after an hour to collect the completed questionnaires and to distribute the token payment of SGD\$5.00 to each participant for his or her completed questionnaire.

Design and Analyses

Effect Size

Because the dependent measures and treatments of a study, such as this, have not been previously investigated and/or published, an estimation of the effect size is generally difficult to quantify (Fern & Monroe, 1996). For example, reported employability studies by Gerards, de Grip, and Witlox (2014), did not give an account of the effect sizes and, therefore, it was difficult to infer the power and sample size to be used in this thesis' study. If we took a medium effect size of 0.15, a desired statistical power level of 0.8 and a significance level of 0.05, with approximately 20 predictors in every hierarchical set, the minimum sample size, which would be required for a significance test, for the study would be no less than 176 participants (Soper, 2014). That being the case, the sample size used in this study satisfied these criteria.

First Pilot Study – 2014

A first pilot questionnaire was developed in 2014 and formed the basis of this thesis' questionnaire. The purpose of the 2014 pilot study was to test the theory, validate the scales and identify study implementation issues, e.g. time, and cost of the logistical problems during the survey conducted in e2i.

It was tested on a pilot group of (n=78) adults. The participants were attending ICT training at the Employment and Employability Institute, Singapore (e2i), in the period October – November, 2014. The results and findings of this pilot study were published in Loh and Chib (2017)'s paper.

Second Pilot Study – 2016

The initial 2014 pilot study provided suggestions for improving the validity of the ICT scales used. For this reason, a longer questionnaire, with an extended number of scales for ICT access, usage and appropriation was subsequently developed in 2016. The new (2016) survey was tested on a group of Nanyang Technological University students (n = 194), over the period 22 February - 23 March 2016 (Appendix C). For example, the ICT Access scale used in the 2014 pilot was a binary scale of 'have' or 'have-not'. The 2016 pilot improved the scale to a 5-point Likert scale of access frequency instead.

The 2016 pilot also included the additional non-economic measure of empowerment outcome as outlined in the earlier literature review. A confirmatory factor analysis of ICT access, usage and appropriation scales used in the 2016 pilot study were derived using structural equation modelling techniques.

The statements or questions in the questionnaire that the respondents reported as unclear were further adapted for easier understanding in the main study. The CFA helped specify the number of factors required for each measurement and which measured variable is related to which latent variable. In all, this 2016 pilot study helped confirm the measurement framework of this researcher's thesis questionnaire and afforded the confidence to proceed to this thesis' main study.

Main Study - 2016

The data analysis is done using three procedures. Firstly, an exploratory factor analysis was conducted to define the categories of the participant's ICT assets. The purpose of the factor analysis is to help us answer the methodological questions: what is "access", "usage" and "appropriation" for the individual? What are their components? Secondly, some descriptive analyses will be deployed to describe the participants' ICT access, usage and appropriation profiles.

Thirdly, the technique of hierarchical linear regression analyses will be used to understand the participants' levels of ICT access, usage and appropriation as predictors on their self-perceived empowerment and employability, as independent variables.

The factor analysis of the independent and dependent variables will be given its detailed explication in chapter five next.

CHAPTER FIVE FACTOR ANALYSES

In this chapter, the categories of the ICT assets of access, usage and appropriation will be constructed through an exploratory factor analysis, first by using the principal component extraction method to sort out the clusters and then re-grouped through the Varimax rotation method. The factor analysis was culled from on the set of items from the survey questionnaire in Appendix D. These are done using the Stata (version 14) software programme.

The Independent Variables

ICT Access (IVI)

According to Selwyn (2004)'s digital divide model, effective provisioning of ICT goods rests on their i) *location*, as well as the ii) type of device (*material*). These two factors enable individuals to use ICTs for their desired, or required, activities (Selwyn, 2004, 2010).

All the ICT access factors used in our study were variables measured on a continuous scale based on the frequency of access. The continuous variables were created on a Likert scale of 1 – 5, where 1 – No Access, 2 – One day per week, 3 – Between two to three days per week, 4 – Between four to six days per week and 5 – Every day of the week. While using global time-estimates would have resulted in a more robust metric scale, e.g. 0 to 1 hours, 1 to 2 hours etc., the feedback received from the participants during the first two pilot studies for this thesis, reveal that it was difficult for them, especially the older participants, to recall the time spent in accessing their devices or place of internet access. Common ordinal scales used for frequency measurements where 1 – Never, 2 – Rarely, 3 – Sometimes, 4 – Frequently and 5 – Always was too vague and difficult for the participants to answer conclusively during the pre-pilot tests. Insofar, the ICT Access scale can be treated as a metric scale, in addition to an ordinal scale.

ICT location access. The measures used in our questionnaire, for places of internet and mobile broadband access were referenced from Selwyn, Gorard, and Furlong (2004) and Awadhiya and Gowthaman (2014)'s projects. An example of a question he asked is, "Circle the frequency that best fits your personal agreement regarding your place of internet access since January this year, e.g. your own home?".

ICT material access. In order to determine material access, the scales measuring access to devices such as personal computers and mobile phones were taken from Zhang (2014), Mendonça, Crespo, and Simões (2015) and van Deursen and van Dijk (2015)'s studies. An

example of a question about material access, in our study is “Circle the frequency that best fits your personal agreement regarding your ICT access since January this year, e.g. desktop personal computer?”. For both sets of ICT location access and ICT material access questions above, a specific time frame was included within the question itself, e.g. “since January this year”, to avoid recall bias.

Reliability tests. Measured together, the ICT access scale’s alpha in this study was .84 (Appendix E, Table 50). A list of all the questions used in creating the 15-items scale as well as details of its reliability scores is also found in Table 50.

Factor Analysis - ICT Access scale

The principal-component factors analysis found four components with eigenvalues greater than one (Table 2). The initial statistics from the factor extraction shows that the first three components explained a large proportion of the variance (cumulative 55.38%) (see Appendix E, Table 38). The rotated factor matrix from the factor analysis, for ICT Access, suggests that its items can be grouped into four subscales (Appendix E, Table 39). As with established conventional treatment for cross-loadings (Henseler, Ringle, & Sarstedt, 2015), Factor 4 was dropped as both items in this factor were cross-loaded in Factor 1, with more than 0.20 difference in their respective factor loading. The same treatment was also applied to other items which were cross-loaded in more than one factors, with the resulting items retained in the factor with the higher factor loading, e.g. Feature mobile phone without internet connection were given to Factor 3, even though it was cross-loaded with Factor 1. The results are summarised in Table 3 below.

Table 2: Results of the rotated Factor Analysis of ICT Access

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	5.16	2.59	0.30	0.30
Factor2	2.57	0.89	0.15	0.45
Factor3	1.68	0.64	0.10	0.55
Factor4	1.04	0.15	0.06	0.62

Table 3: Resulting categories of the ICT Access scale

Factor	Category Name	Activities	Factor Loading	Alpha Cronbach Reliability (internal consistency)	Mean	SD
<i>Factor 1</i>	<i>ICT access outside of home</i>	Tablet e.g. Apple iPad, Samsung Galaxy Tab etc.	0.42	0.86	1.88	0.83
		Digital reader device, e.g. Kindle	0.59			
		Gaming device, e.g. Xbox, Nintendo, PlayStation	0.56			
		Cyber cafe or Internet Café	0.70			
		A relative's home	0.74			
		A friend's home	0.78			
		My workplace	0.52			
		My place of study	0.63			
		Community Clubs / Community Centres	0.77			
		Public libraries	0.75			
<i>Factor 2</i>	<i>Instrumental ICT access</i>	Desktop personal computer (PC)	0.60	0.78	3.86	1.15
		Mobile computer, e.g. laptop, netbook	0.70			
		Smartphone e.g. iPhone, Samsung, Blackberry etc. with internet connection.	0.73			
		Internet in my own home	0.70			
<i>Factor 3</i>	<i>Non-Instrumental ICT devices</i>	Smartphone e.g. iPhone, Blackberry, Samsung etc. without internet connection.	0.46	0.60	1.19	1.08
		Feature mobile phone e.g. Nokia 100, 130 etc., with internet connection	0.55			
		Feature mobile phone e.g. Nokia 100, 130 etc., without internet connection	0.59			
<i>Factor 4</i>	<i>ICT Access at the workplace and at school</i>	My workplace	0.43	N.A.	N.A.	N.A.
		My place of study	0.41			

Internal consistency coefficients. As can be seen from Table 3 above, the Cronbach's alpha for the *Non-Instrumental ICT access* is 0.6 (Appendix E, Table 42), which is acceptable although an alpha of 0.8 is a better indication of the scale's reliability (Gliem & Gliem, 2003).

Re-defining ICT's Access

ICT Access Factor 1 - ICT access outside of the home

Given the ubiquitous availability of a broadband infrastructure at home and in almost all workplaces in Singapore, most households access the internet from home. This is not surprising as most participants were unemployed or under-employed workers, without a tangible physical workplace to call their own. This is also demonstrated in the mean score of the subscale for these 302 participants: *Internet access outside of home*, which is 1.89 (Appendix E, Table 40), where the Likert scale of 1 corresponds to “no access” and 5 to “frequent access”. While the mean of 1.89 shows that the participants seldom access ICT access outside of their homes, it is nonetheless a strong first factor, with an eigenvalue of 5.16, and this is 30.25% of the total possible of 17 factors calculated from the factor analysis (Appendix E, Table 39). As such, this sub-factor is notable and should be considered as part of the ICT access factor, of the first-order digital divide hierarchy.

ICT Access Factors 2 and 3 -- Instrumental vs non-instrumental access

On the individual level, Selwyn (2004) argues that “access to a personal computer does not guarantee a connection to the internet, any more than ‘access’ to the internet is a guarantee of effectively being able to access every available website and online resource” (p.348). How people think about the basic instrumentalities of the “Information Society” extends beyond physical access, which includes scrutiny of how ICT access can be made more beneficial to the individual, or what Gurstein (2007) term as “effective use” (p.46). Decisions about instrumentality of the ICT access are often made based on the individual’s conception of which ICT access is worthwhile, for example, when people access the technology as *instrumental* towards productive goals, instead of *non-instrumental* goals such as leisure (Kolko & Racadio, 2014).

ICT access Factor 2 -- Instrumental ICT devices access. For key instrumental outcomes, Sey et al. (2013) defines these as “income, access to employability resources, education, health, government information & services, and time savings” (p.120). Coincidentally, such activities are also specific to areas of higher priority to international development, such as the United Nations’ Sustainable Development Goals (United Nations, 2015). For the Singaporean workers who participated in this study, instrumental ICT access are made through traditional ICT devices such as desktop computers, laptops and smartphones with internet connection. The high mean score of 3.86 indicate that these items are very frequently accessed. With an eigenvalue of 2.57, and proportion of 15.1% of the total possible factors calculated from the

factor analysis, the Instrumental ICT Access sub-factor is a notable factor of the ICT Access main factor.

ICT access Factor 3 -- Non-Instrumental ICT devices access. As mentioned in the earlier Chapter, the instrumentality of the ICT access are often based on the individual's conception of which ICT access are worthwhile, for example, when people access the technology as *instrumental* towards productive goals, instead of *non-instrumental* achievements such as leisure (Kolko & Racadio, 2014). Specifically, Sey et al. (2013) highlights examples of non-instrumental ICT impacts as "pursuing interests & hobbies, pursuing leisure activities, meeting people, and maintaining communication with family & friends" (p.120). The factor analyses which yielded the sub-factor of *Non-Instrumental ICT device* show that unemployed and/or under-employed workers in Singapore tend to view ICT devices in a rather binary manner in terms of the impacts which access to the ICTs would bring, e.g. productive (instrumental access) versus non-productive (non-instrumental). This is an indication that workers make clear distinctions between access for productive or non-productive impacts, based on the type of activities associated with the specific technology, for example gaming and chatting which is deemed as non-productive or non-instrumental (Kolko & Racadio, 2014). The *Non-Instrumental ICT Access* sub-factor has a mean of 1.91, which indicates that most of the participants do not own feature phones smartphones (without or without internet connection) and smartphones if they are without internet connection. With an eigenvalue of 1.68, and 9.90% of the total proportion of calculated factor analysis, this Non-Instrumental ICT access is noteworthy sub-factor too.

Given the above explication of the sub-factors, the ICT Access factor is more of an indication of ICT device ownership, where the Singapore participants clearly differentiates between devices which they own (located at home) and thus have more frequent access to, versus devices which they do not possess and thus the low frequency of access reported. Table 4 below summarises the definitions of each of the three ICT access sub-factors.

Table 4: Explications and definitions of the ICT access sub-factors

Factor	Category Name	Activities	Operational Definition of the Sub Factor
<i>Factor 1</i>	<i>ICT access outside of home</i>	Tablet e.g. Apple iPad, Samsung Galaxy Tab etc.	The individual's access of ICT devices as well as the internet outside of his or her home.
		Digital reader device, e.g. Kindle	
		Gaming device, e.g. Xbox, Nintendo, PlayStation	
		Internet at the Cyber cafe or Internet Café	
		Internet at a relative's home	
		Internet at a friend's home	
		Internet at my workplace	
		Internet at my place of study	
		Internet at the Community Clubs / Community Centres	
		Internet at the Public libraries	
<i>Factor 2</i>	<i>Instrumental ICT access</i>	Desktop personal computer (PC)	Access to ICTs for purposes of (but not limited to) income generation, access to employability resources, such as training, health, government information & services, and general personal productivity.
		Mobile computer, e.g. laptop, netbook	
		Smartphone e.g. iPhone, Samsung, Blackberry etc. with internet connection.	
		Internet in my own home	
<i>Factor 3</i>	<i>Non-Instrumental ICT devices</i>	Smartphone e.g. iPhone, Blackberry, Samsung etc. without internet connection.	Access to ICT devices for purposes of (but not limited to) the pursuit of non-productive activities.
		Feature mobile phone e.g. Nokia 100, 130 etc., with internet connection	
		Feature mobile phone e.g. Nokia 100, 130 etc., without internet connection	

ICT Usage (IV2)

The number of alternatives in usage variables is many and varied. In order to test the usage of ICTs against the employability outcome for this study, the scales used for computer, mobile phone and internet usage variables were a reduced version of those used in Barry, Murphy, and Drew (2015) and Selwyn et al. (2004)'s projects, the latter of which were tested on 1,001 adults in the United Kingdom. An example of a usage question that was implemented in our study is, "How often do you use your ICT devices to look for information related to your work, on the worldwide web?"

As with the ICT Access scale, the usage variables are continuous, and created on the same Likert scale of 1 – 5, where **1** – No Usage, **2** – One day per week, **3** – Between two to three days per week, **4** – Between four to six days per week and **5** – Every day of the week. Table 43 in Appendix E shows the alpha reliability score, of .898, for the 21 questions used to create the scale.

Factor Analysis – ICT Usage scale

The factor analysis of the ICT Usage scale revealed that there were five potential factors, with eigenvalues greater than 1.0 each. After factor rotation, there are five discernible usage sub-factors, accounting for 64.88% of the variance (Table 5 below). Factor 5 has an eigenvalue of 1.08 (Appendix E, Table 44), with only two items with high loadings, US_LS8: *Using ICTs to buy goods and services on-line* and US_LS9: *Using ICTs to browse/surf the worldwide web for no specific purpose* (see Appendix E, Table 45). Factor 5's low eigenvalue indicates that this factor does not contribute significantly to the explanation of the variances in the variables. As such, Factor 5 can be dropped to reveal only four discernible ICT usage factors. As with the ICT Access factor scale, Usage items which are cross-loaded with the higher loading are allocated to the Factor of choice. For example, the item US_LS7: *Using ICTs to access online gamble sites to place bets* was given to Factor 2 instead of Factor 4, because the former has a higher loading of .62 over .41. The clusters and their metrics are summarised in Table 6 below.

Table 5: Results of the rotated Factor Analysis for ICT Usage

Factor	Variance	Difference	Proportion	Cumulative
Factor1	4.06	0.42	0.18	0.18
Factor2	3.64	0.07	0.16	0.33
Factor3	3.57	1.37	0.16	0.49
Factor4	2.19	0.74	0.10	0.59
Factor5	1.46	.	0.06	0.65

Table 6: Resulting categories of the rotated ICT Usage scale

Factor	Category Name	Usage Activities	Factor Loading	Alpha Cronbach Reliability (internal consistency)	Mean	SD
<i>Factor 1</i>	<i>Higher Order ICT Usage</i>	Perform online-banking transactions	0.54	0.89	2.53	1.02
		Write and edit letters, reports and other documents	0.74			
		Look for products and services/gathering product information online.	0.74			
		Fiddle around on your ICT device/explore different parts of the device to develop your own knowledge.	0.66			
		Look for information related to work/business/study on the worldwide web.	0.74			
		Organise the ICT device's files/memory.	0.66			
		Create and manipulate images, e.g. photographs.	0.57			
		Download software, music, films or images from the Internet.	0.50			
<i>Factor 2</i>	<i>Production ICT Usage</i>	Access online gamble sites, e.g. <i>singaporepools.com.sg</i> , to place bets.	0.62	0.84	1.47	0.77
		Create music.	0.78			
		Create films or animations or videos.	0.88			
		Participate in educational courses/lessons, e.g. <i>Coursera</i> , on the World Wide Web.	0.66			
		Make / maintain your own website product information.	0.77			
<i>Factor 3</i>	<i>Lower-Order ICT Usage</i>	Surf the Internet.	0.82	0.86	3.94	1.17
		Send/read emails.	0.75			
		Access online news.	0.78			
		Send text messages.	0.81			
		Access social media, e.g. Facebook, Twitter.	0.66			
<i>Factor 4</i>	<i>Consumption ICT Usage</i>	Play games.	0.63	0.71	2.76	1.22
		Listen to music.	0.79			
		Watch videos.	0.80			
<i>Factor 5</i>	<i>N.A.</i>	Buy goods and services on-line.	0.64	N.A.	N.A.	N.A.
		Browse/surf the worldwide web for no specific purpose.	0.54			

Re-defining ICT's usage

The different theoretical viewpoints on the Digital Divide highlighted the issue of addressing the development of ICT skills in the populace to resolving inequality (May & Diga, 2015). At the same time, one's expectations of ICT usage, what Dimaggio and Hargittai (2001) define as the *purpose* for why people use ICTs (p.8), determines people's ICT usage behaviour. To understand the component of the ICT usage of the Singapore worker, some understanding of the purposes and skills of ICT Usage in general, is in order.

Purposes of ICT Usage

The meaning of personal productivity can be highly personal and span a wide dimension, for example, the goal of using ICTs can range from maximising profits in a business to getting a task done faster so that the individual can have some mental and physical resources left over to pursue leisure interests (Duffy, 2017).

Purposes for using the mobile phone. The notion of consumption usage contrasts with production usage in that, the latter is viewed in terms of its effect on the individual's socio-economic security, e.g. partaking in activities which are deemed economically or socially beneficial, such as employment, education and learning (Selwyn, 2002). Mobile devices are increasingly deployed for personal production purposes using productivity apps, for example the Evernote Scannable app by Evernote, takes photos of paper business cards and turn them into contact files for easy retrieval (Duffy, 2017). For most people, mobile phones mean communication, but there are different purposes for the device, as found by Dilaver (2014). One group of her participants considered the mobile phone as specific to the practical aspects of communication, i.e. using the phone "for passing on a particular message" (p.1219), while another group relates to the device as a more emotional object for social exchanges (Dilaver, 2014). Specifically, some of her participants considered the mobile phone to be a form of excessive consumption given the time spent on chatting with others (Dilaver, 2014). In more examples of consumption usage, a Harvard Business Review (2013) report revealed that in a developed economy, 68% of consumers' smartphone use happens at home, with users spending almost half of their time "seeking relaxation or entertainment by watching a funny video, reading a gossip website, playing solitaire or even window shopping for fun" (p.30). In another report, four in ten internet users in the United Kingdom have ever played games online, where the games are mostly loaded on the mobile phone already, than games played over the internet using the mobile phone (Ofcom, 2016).

Purposes for using the computer. While ICTs have been found to have a positive influence on productivity and economic growth, there are increasing calls to consider the non-economic objectives of ICTs' impact. For example, American studies found that African-American and Hispanic youth spent more time on computers than white youth did, yet the former group's educational attainment was lower (Warschauer & Matuchniak, 2010), raising further doubts about usage and how productive usage can be encouraged (Andreasson, 2015). In another study, Patterson and Patterson (2017) found that using laptops in college classrooms has a significant negative effect on grades for students from the lower socio-economic levels, because these students tended to access distracting programmes and websites during class. Narrowing the digital divide for this profile of users requires the acquisition of skills and positive study habits, and consequently, for the realisation of personal outcomes for these students (Zilka, 2016).

Skills for ICT Usage

van Dijk and Hacker (2003) had posited that as the gap in ICT access closes, the gap in digital skills will impact usage. As highlighted in the earlier literature review, the advent of the digital society creates demands for higher skill requirements and skills-inequality within advanced economies, what economists refer to as "skill-bias" (Berman et al., 1998; Card & DiNardo, 2002; Weiss & Garloff, 2011), ICTs favoured those individuals who can perform more complex technological tasks. On the lower end of the spectrum, basic ICT skills are rudimentary knowledge for simple uses of ICT, whereas on the higher end of the skills scale, higher-order ICT usage requires more complex capabilities of the individual, i.e. "higher-level literacy for creative engagement in digital media and ability for ICT-mediated interaction" (Mendonca et al, 2015, p.192).

In evaluating the efficacy of Microsoft's Technology, Innovation and Initiative (TII) programme in Portugal, Ruivo and Cruz (2010) had assumed that the knowledge would improve the respondents' employment opportunities as the training included learning how to search for jobs using the internet. However, the programme's major achievement was in fact an enhancement of the psychological empowerment of the trainees, many were elderly participants with neither basic ICT knowledge nor skills (Ruivo & Cruz, 2010). Through this, it can be said that the *purpose* and *skills* dimensions are intertwined together when it comes to achieving outcomes intended by ICT usage.

ICT Usage of the Singaporean Participant

Dimensions of Skills and ICT Usage

Factor 1 -- Higher-order ICT usage. As mentioned in the literature review chapter earlier, higher-order ICT usage demands more exacting capabilities of the individual, for example, users tend to need a higher level of digital literacy to creatively use digital media as well as engaging in ICT-mediated interaction (Mendonça et al., 2015). Some of the examples of items grouped under the Higher-order ICT usage category in this research are report-writing on the ICT devices, researching for business development and creating digital images. These are all ICT uses that require a higher level of technical skills than activities such as text messaging. The mean score ($\mu=2.53$) (Appendix E, Table 46) shows that there are some levels of ICT usage amongst the participants. This may also indicate that the ICT skills level amongst the participants are varied, from high to low.

Factor 3 -- Lower-order ICT usage. Lower-order ICT usage such as surfing the internet, reading or sending emails, reading online news, sending and receiving text messages and browsing social media requires more basic ICT skills, compared to higher-order ICT usage such as drafting a report (Mendonça et al., 2015). The high mean indicates that this is the most frequent form of ICT usage for the participants ($\mu=3.93$) (Appendix E, Table 48).

Dimensions of Purposes for ICT Usage

Factor 2 -- Production ICT usage. According to Selwyn (2002), production usage is viewed in terms of its impact on the individual's socio-economic security, e.g. activities like gainful employment, learning and education. In the factor analyses conducted earlier, items that fell under Production usage of the ICT devices were: music and film creation, attending online educational programmes for learning and knowledge as well as the creation and maintenance of websites. These are activities that typically contributes to one's personal development or achievements in socio-economic, security goals, such as employment, education and training. The low mean usage ($\mu=1.47$) (Appendix E, Table 47), shows the lack of advanced ICT skills for this group of workers, for production usage such as video-making and HTML coding for creating and maintaining websites, would usually require more complicated cognitive abilities (Kolko & Racadio, 2014).

Factor 4 -- Consumption ICT usage. Contrary to production usage, consumption ICT usage reflects the 'non-productive' uses of technology, where users spend more time in passive leisure on their devices. For example, the factor analyses on the ICT usage of the Singaporeans revealed that non-serious activities such as playing games, listening to music

and watching videos were grouped under consumption usage in the factor analysis. The mean score also shows that the participants engage in more consumption usage ($\mu=2.76$) (Appendix E, Table 49) than production usage ($\mu=1.47$) (Appendix E, Table 47).

Given the above explication of the sub-factors, Table 4 below summarises the definitions of each of the three ICT access sub-factors.

Table 7: Explications and definitions of ICT Usage sub-factors

Factor	Category Name	ICT Usage Activities	Operational Definition of the Sub Factor
<i>Factor 1</i>	Higher Order ICT Usage	Perform online-banking transactions	ICT usage which requires higher capabilities and literacy of the individual, e.g. being able to creatively use digital media as well as engaging in ICT-mediated communication.
		Write and edit letters, reports and other documents	
		Look for products and services/gathering product information online.	
		Fiddle around on your ICT device/explore different parts of the device to develop your own knowledge.	
		Look for information related to work/business/study on the worldwide web.	
		Organise the ICT device's files/memory.	
		Create and manipulate images, e.g. photographs.	
		Download software, music, films or images from the Internet.	
<i>Factor 2</i>	Production ICT Usage	Access online gamble sites, e.g. <i>singaporepools.com.sg</i> , to place bets.	ICT usage for achieving the individual's socio-economic, security goals, such as employment, education and training.
		Create music.	
		Create films or animations or videos.	
		Participate in educational courses/lessons, e.g. <i>Coursera</i> , on the World Wide Web.	
		Make / maintain your own website product information.	
<i>Factor 3</i>	Lower-Order ICT Usage	Surf the Internet.	ICT usage which requires basic skills such as surfing the internet, reading or sending emails, reading online news, sending and receiving text messages and browsing social media
		Send/read emails.	
		Access online news.	
		Send text messages.	
		Access social media, e.g. Facebook, Twitter.	
<i>Factor 4</i>	Consumption ICT Usage	Play games.	ICT usage for the 'less-productive' utilities of technology, where users deploy ICTs, often for passive leisure, non-serious activities such as playing games, listening to music and watching videos
		Listen to music.	
		Watch videos.	

ICT Appropriation (IV3)

Based on the theoretical conceptualisation described in the Chapter before, the ICT appropriation variables are an indication of the user's ICT attribution to the device usage, what Selwyn (2004) posit as the “meaningful use of ICT... where the user exerts a degree of control and choice over the technology and its content, thus leaning to a meaning, significance and utility for the individual concerned” (p.349). Due its immaturity as a relatively new construct in the literature, appropriation variables are more complex and harder to operationalise (Dodel, 2014). According to Lee et al. (2016), most of the ICT studies done to examine the process of technology appropriation is thorough the qualitative research method of inquiry. Given this trend, it is important to recognise that the purpose of curating an ICT appropriation scale is not to predict the adoption of technology with surgical precision, but rather to identify sets of appropriation patterns for use in this study (Lee et al., 2016). It is also important to look at the most recent testable scales that are available in the literature, given the advance of ICT technology and their features. With this in mind, professional appropriation items were taken from Araque et al. (2013)'s study on lower-educated, low-income adults in an urban community in south Los Angeles. An example of an appropriation question from this scale is “having access to ICTs can help me get a job”. At the same time, personally relevant items were based on Wong, Chen, Lee, Fung, and Law (2014)'s interviews of 250 senior citizens in Hong Kong. A sample statement on how appropriation is attributed to one's well-being from Wong et al (2014)'s scales is “I feel that I am quite smart because I have learnt to use ICTs”.

Factor Analysis – ICT Appropriation scale

The ICT appropriation variables are statements with ratings on a continuum, created on the Likert scale of 1 – 5, where **1** – Strongly Disagree, **2** –Disagree, **3** – Neither Agree or Disagree, **4** – Agree and **5** – Strongly Agree. The principal component factor analysis revealed three possible factors with eigenvalues greater than 1.0, accounting for 61.54% of the variance (Table 8 below).

Table 8: Results of the unrotated Factor Analysis for ICT Appropriation

Factor	Variance	Difference	Proportion	Cumulative
Factor1	5.37	3.24	0.36	0.36
Factor2	2.13	0.39	0.14	0.50
Factor3	1.74	0.79	0.12	0.62

The varimax rotation reveal two clearly distinguishable sub-factors, explaining for 48.85% of the variances (Appendix E, Table 52). The third factor is found to be negatively worded items which were re-coded, e.g. AP_EM1r “Using ICTs will not help me in my job search”, AP_EM3r “Obtaining ICT skills will not help me get a better job” and AP_EM7r “I do not know how to take online classes”. Such reverse-coded items frequently produce unexpected factor structures (Netemeyer, Bearden, & Sharma, 2003), which seems to have happened in this case. The problem of participant miscomprehension also results when the scale composed of phrases that include negation words (Swain, Weathers, & Niedrich, 2008). In this case, Factor 3 does not have much interpretability beyond the fact that they are all the reverse-coded items in the ICT Appropriation scale (Weijters, Baumgartner, & Schillewaert, 2013). Based on the above assessment, it is thus recommended for Factor 3 to be dropped. Table 9 below shows the proposed categories of the ICT Appropriation scale, based on the varimax rotation technique.

Table 9: Resulting categories of the rotated ICT Appropriation scale

Factor	Category Name	ICT Appropriation Statement	Factor Loading	Alpha Cronbach Reliability	Mean	SD
Factor 1	<i>Informal ICT Appropriation</i>	Knowing about ICTs makes me feel as though I am ‘at the cutting edge’	0.60	0.87	3.78	0.92
		Through information provided by ICTs, I understand more about what is happening in society	0.69			
		I feel that I am quite smart because I have learnt to use ICTs	0.56			
		Learning how to use ICTs creates more topics for me to communicate with others	0.79			
		Learning how to use ICTs enables me to make more friends	0.77			
		Learning how to use ICTs provides me with more ways to connect with overseas relatives and friends	0.74			
		If I do not know about ICTs, I may become an outcast in society	0.69			
		If I do not learn how to use ICTs, I may experience more inconvenience in my life	0.76			
Factor 2	<i>Formal ICT Appropriation</i>	Having access to ICTs can help me get a job	0.64	0.86	3.74	0.64
		I know how to subscribe to websites, e.g. JobStreet.com, National Jobs Bank etc.,	0.83			
		I have filled out job applications online	0.87			
		I have used ICTs to submit my resume/job application	0.87			
Factor 3	N.A.	Obtaining ICT skills will not help me get a better job*	0.79	0.67	3.66	0.86
		I do not know how to take online classes through ICTs *	0.80			
		I am not confident in handling general problems around daily ICT applications*	0.69			

Re-defining ICT's appropriation

The appropriation of ICT is the third level in the digital divide model that is attributable to differences in personal outcomes. The factor analysis for the ICT Appropriation construct in this study show that the participants clearly distinguish ICT appropriation for formalised outcomes like jobs and employability; versus ICT appropriation for more informal achievements such as sharing and enhancing one's social networks. The high mean scores for both sub-factors ($\mu=3.78$ for *Informal ICT Appropriation*; $\mu=3.74$ for *Formal ICT Appropriation*) also indicate that participants highly agree about the usefulness of ICTs in their lives, whether it is to gain higher employability or result in greater self-efficacy.

ICT Appropriation of the Singaporean Participant

Factor 1 - Informal ICT Appropriation

Appropriation for enhancing social capital. Research has found that Internet use is correlated to increased social capital for users (Hampton & Wellman, 2003; Steinfield, Ellison, & Lampe, 2008), as well as a heightened general knowledge for the respondents (Tewksbury, Weaver, & Maddex, 2001). In the factor analysis, participants acknowledge the utility of ICT usage to enhancing their own social capital by statements such as “learning how to use ICTs enables me to make more friends”, and keeping abreast of current general knowledge by statements such as “through information provided by ICTs, I understand more about what is happening in society”.

Appropriation for self-efficacy. From a psychological perspective, Gigler (2011) argues that ICT appropriation is one of six dimensions of individual empowerment that he called informational capabilities, relating them to Sen's capability approach (Gigler, 2011, p.15). Individuals who experience higher self-efficacy are thus ‘psychologically-empowered’ where they are more likely to achieve their objectives in life (Diener, 2003, p.3). This is reflected in the Singaporean worker's agreement to the ICT appropriation statement as “I feel that I am quite smart because I have learnt to use ICTs”. On the other hand, whether a person can achieve personal outcomes also depends on how he or she utilises existing skills and resources available (Diener, 2003, p.6). In studies about the achievement of ICT skills, Hughes (1998) found that students who have higher ICT skills are likely to be more empowered, more confident about achieving their goals. Similarly, Lin et al. (2012) observe that having ICT skills correlates positively with self-esteem in middle-aged Taiwanese women. Such higher levels of self-efficacy from ICT learning is also revealed in agreement

by the Singaporean participants in this study, such as “learning how to use ICTs creates more topics for me to communicate with others”.

The more empowered the individual is, the more he or she is willing and able to become a lifelong learner (Mezirow, 1997), thereby creating a virtuous loop to further self-development and individual empowerment. This is especially so for ICT-related skills: the ICT learners who keep learning and becoming more information literate, can access, choose, use, analyse, interpret, and generate information (Hughes, 1998).

Factor 2 - Formal ICT Appropriation

Appropriation for employability enhancement. Hargittai and Hinnant (2008) posit that users who engage in capital-enhancing activities on the internet, e.g. seeking government information, financial and health services, or exploring career or job opportunities, are more likely to enjoy upward mobility. At the higher-level digital divide of ICT appropriation, impact results from the beneficial use of ICT, what Wei et al. (2011) call the digital outcome divide. To which, Andreasson (2015) terms this usage of ICTs for their productive purposes as “useful usage” (p.xxiii), from a Finish Minister who quoted the usage of office software as “useful usage”. In the context of enhancing personal well-being, the question is whether ICTs are being successfully used to increase the quality of life and to provide jobs and income. In a study of African cities, Cheneau-Loquay (2008) found that the appropriation of ICTs contributed to new services which are adapted to its poor constituents and as a result, generated informal employment opportunities for the communities there. In another Singapore example, the answer seems positive too, where formally funded rehabilitation clinics are incorporating augmentative communication devices to help the visually-handicapped constituents get on with their lives in the areas of education and employment (Lim & Guo, 2015). In Los Angeles, low-income families who participated in a computer training programme reported feeling more confident about looking for jobs online and updating their resumes, when previously they sought employment opportunities informally, through word-of-mouth (Araque et al., 2013). For the Singaporean participants in this study, the same confidence attributed to ICT appropriation is reflected in such statements of agreement such as “having access to ICTs can help me get a job”.

Given the above explication of the ICT appropriation sub-factors, Table 10 below summarises the definitions of each of the two ICT appropriation sub-factors.

Table 10: Explications and definitions of the ICT Appropriation sub-factors

Factor	Category Name	Appropriation Statement	Operational Definition of the Sub Factor
<i>Factor 1</i>	Informal ICT Appropriation	Knowing about ICTs makes me feel as though I am ‘at the cutting edge’	The attribution of the usage of ICTs to less formal tasks such as communicating and engaging in social interactions with friends, and relatives.
		Through information provided by ICTs, I understand more about what is happening in society	
		I feel that I am quite smart because I have learnt to use ICTs	
		Learning how to use ICTs creates more topics for me to communicate with others	
		Learning how to use ICTs enables me to make more friends	
		Learning how to use ICTs provides me with more ways to connect with overseas relatives and friends	
		If I do not know about ICTs, I may become an outcast in society	
		If I do not learn how to use ICTs, I may experience more inconvenience in my life	
<i>Factor 2</i>	Formal ICT Appropriation	Having access to ICTs can help me get a job	The attribution of the usage of ICTs to formalised tasks or capital-enhancing activities that are related to employability access, education, income or work-related reasons.
		I know how to subscribe to websites, e.g. JobStreet.com, National Jobs Bank etc.,	
		I have filled out job applications online	
		I have used ICTs to submit my resume/job application	

Section Summary -- A validated instrument to measure ICT access, usage and appropriation

The purpose of this chapter is to develop measurement models of ICT access, ICT usage and ICT appropriation to be used in thesis’ survey questionnaire. Previous scholarships have attempted to similarly refine the access, usage and appropriation items, but few studies have presented such a nuanced view of all three levels of digital asset – access, usage and appropriation. The factor analyses offered more nuanced views of how ICT can be accessed, used and appropriated by low-wage, and low-educated workers in Singapore. The methodology also revealed a continuum of access ranging from instrumental to non-

instrumental, as well as the different layers of usage from higher-order to lower-order and production to consumption usage. Finally, the expectations of the positive outcomes that provided digital resources might bring, termed as formal and informal ICT appropriation in this thesis, may offer practical methodological insights to digital inclusion in disadvantaged communities. A summary of the developed scale for the ICT access, usage and appropriation is presented in Table 11 below.

Table 11: Summary of the explicated ICT access, usage and appropriation scales in this study

Group	Variable	No. of Items (n)	Alpha (α)	Mean (μ)	Std. Dev. (σ)
ICT Appropriation	Informal ICT Appropriation	8	0.87	3.78	0.91
	Formal ICT Appropriation	4	0.86	3.74	0.64
ICT Usage	Consumption ICT usage	3	0.71	2.76	1.22
	Production ICT usage	5	0.84	1.47	0.77
	Lower-Order ICT usage	5	0.86	3.94	1.17
	Higher-Order ICT usage	8	0.89	2.53	1.02
ICT Access	Instrumental ICT devices access	5	0.76	3.86	1.15
	Non-Instrumental ICT devices access	4	0.60	1.91	1.08
	ICT Access outside of home	6	0.88	1.88	0.85

Developing a clearer distinction between first and second level ICT assets

The key purpose of this chapter was to answer the methodological questions to guide the next part of this thesis: What is “access”, “usage” and “appropriation” for the individual? How to define access, usage and appropriation? What are their components?

As detailed in the theoretical perspectives Chapter, previous scholarships have attempted to similarly refine the access, usage and appropriation items, but few studies have presented such a nuanced view of all three levels of digital asset – access, usage and appropriation. The factor analyses revealed a continuum of access ranging from instrumental to non-instrumental, as well as the different layers of usage from higher-order to lower order and production to consumption usage. Finally, the expectations of the positive outcomes that provided digital resources might bring, termed as formal and informal ICT appropriation in this thesis, may offer practical methodological insights to digital inclusion in disadvantaged communities.

The factor analyses revealed conceptual alignment to Wei et al. (2011)'s three levels of digital divide, where the first level digital divide -- digital *access* divide (access), second level -- digital *capability* divide (usage) and third level -- digital *outcome* divide (appropriation).

Differentiating first level digital assets. In Öktem, Demirhan, and Demirhan (2014)'s paper about e-governance, the authors placed access items as part of internet usage levels in its factor analysis. Doing so can be problematic however, as the constituents of study, who were university students, were found to have similar "access to the basic socio-economic conditions to use ICTs" (p.1939, Oktem et al, 2014). Separating access factors clearly from usage factors, which is done in this paper, would be a better method to distinguish the effects between access and usage and thereby understanding the different level of effects on the outcomes. This chapter also offers a refined picture of access divide by considering the distinction of home (or outside of home), instrumental and non-instrumental access.

Identifying second-level digital assets. This chapter uses a factors' extraction similar to that used in Ward and Parr (2010) investigation of computer usage by teachers. Therein, the researchers extracted five technology usage factors from 185 items: Generic Pedagogical Use, Specific Pedagogical Use, Preparation Use, Core Professional Work and Personal Use. The authors predicted that the perceived need to do well in their jobs was a crucial motivating force for the use of ICTs in their study group of professionals (n=199), who were in employment. They also acknowledged that further research would be needed to measure the effectiveness of new usage factors, and to provide a stronger rationale for the use of ICTs in terms of employment outcomes. The factor analysis presented in this thesis offers a more updated definition of ICT usage which includes new usage items such as participation in online courses, which is a phenomenon that is more prevalent amongst working people since the proliferation of the huge, open online courses (MOOCs) in 2012 (Marques, 2013).

Clarifying third-level digital assets. While access and usage differences are important to consider within digital inclusion interventions, recent scholars have called for a new layer of ICT asset levels, i.e. concerning how people anticipate the positive changes that both access and usage of ICTs could bring (Chen et al., 2017). Digital inclusion programmes, at the local and national levels, aim to bridge digital divides in communities by providing ICT access and skills to usage the technology (Araque et al., 2013; Bui, 2017; Duncan, 2013). Yet little has been understood, till now, about the results people expect from the positive changes that access and usage may bring. As such, appropriation factors contribute to understanding the user's anticipation of the positive changes that ICT access and usage may bring them. This

paper finds that formal appropriation is aligned with users' expectations of upward mobility, in terms of employability. For this reason, informal appropriation may also be aligned to an improvement in the participants' quality of life.

In summary, the earlier section on the factor analyses of the independent variables examined the additional dimensions and layers of divides, which provide a more holistic picture of digital divides, within a community of unemployed and under-employed workers. The next section will explicate the dependent variables of employability and empowerment.

The Dependent Variables

Self-Perceived Employability (DVI)

The 25-items in the perceived employability scale were derived from Fugate et al. (2004)'s measurement model of employability, which consists of five inter-related psycho-social dimensions: *career exploration*, *career planning*, *social capital*, *human capital* and *career identity*. The full scale was tested in McArdle et al. (2007)'s study of 416 unemployed Australians, as well as Koen et al. (2013)'s test of 3,438 long-term, unemployed welfare beneficiaries across two time frames. Koen et al. (2013)'s paper reported a Cronbach's Alpha (α) reliability of .89 (Time 1) to .91 (Time 2) for the overall *employability* scale.

Within the individual-level, employability scholars like Vanhercke, De Cuyper, Peeters, and De Witte (2014) acknowledge that there are potential limitations of using self-report of employability, instead of objective measures such as employment status, as key indicators for social outcome. On the other hand, self-perceptions are important, as psychologists have found that individuals tend to act upon their perception than on objective reality (Roskies & Louis-Guerin, 1990). This is also in line with Sen (1999)'s notion of agency, where the individual, instead of the employer, holds the most responsibility over his or her career (Garrido, Sullivan, Gordon, & Coward, 2009). The focus for this thesis, is therefore based on the individual level of self-perception, in congruence with the psychological approach to employability.

An example of an employability question, derived from Koen et al. (2013)'s paper used in this thesis is "Circle the number that best fits your personal agreement regarding your skills and qualifications, e.g. I have a good work history." The continuous variables were created on a 5-point Likert Scale of 1 to 5 for agreement, where **1** – Strongly Disagree, **2** – Disagree, **3** – Neither Agree or Disagree, **4** – Agree and **5** – Strongly Agree.

Factor Analysis – Employability Scale

The principal component factor analysis revealed six possible factors with eigenvalues greater than 1.0, accounting for 63.79% of the variance (

Table 12). The varimax rotation showed five clearly distinguishable sub-factors emerged, which explained 48.85% of the variances (Appendix E, Table 56). The sixth factor was revealed as negatively worded items which were re-coded, e.g. E1_CP1r “I have not really decided what my career objectives should be”, E1_CP5r “my career objectives are not clear” and E1_CP6r “I change career objectives frequently”. Similar to the ICT appropriation scale, the reverse-coded items produce the unexpected factor structures (Netemeyer et al., 2003; Swain et al., 2008), making Factor 6 having little interpretability beyond the fact that they are all the reverse-coded items in the employability scale (Weijters et al., 2013). It is thus recommended for Factor 6 to be dropped. With the retention of the five factors, their loadings reflect the five inter-related psycho-socio dimensions based on Fugate et al (2004)’s measurement model. Table 13 below shows the categories of the employability scale for the Singaporean participants, based on the varimax rotation.

Table 12: Results of the unrotated Factor Analysis for the Employability scale

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	6.76	3.59	0.24	0.24
Factor2	3.17	0.49	0.11	0.35
Factor3	2.68	0.62	0.10	0.45
Factor4	2.06	0.40	0.07	0.52
Factor5	1.66	0.12	0.06	0.58
Factor6	1.54	0.63	0.06	0.64

Table 13: Resulting categories of the rotated Employability scale

Factor	Category Name	Employability Statement	Factor Loading	Alpha Cronbach Reliability	Mean	SD
Factor 1	Career Exploration	Went to various career orientation programmes?	0.77	0.90	2.43	1.06
		Obtained information on specific jobs or companies?	0.67			
		Initiated conversations with knowledgeable individuals in my career area?	0.88			
		Obtained information on the labour market and general job opportunities in my career area?	0.75			
		Sought information on specific areas of career interest?	0.87			
Factor 2	Career Planning	I have a plan for my career	0.81	0.87	3.68	0.74
		I have a strategy for achieving my career goals.	0.87			
		I know what I need to do to reach my career goals.	0.80			
Factor 3	Social Capital	I am good at making friends	0.76	0.88	3.66	0.77
		I help other people	0.88			

		I ask others if I can be of help	0.84			
		I do nice things for people	0.84			
Factor 4	Human Capital	My level of education is sufficient for getting a job in my area of work	0.65	0.82	3.53	0.64
		My skills for doing the type of work I want to do are up-to-date	0.54			
		I have a good work history	0.69			
		An employer would be impressed with my qualifications	0.72			
		I have good job reference	0.71			
		My work qualifications are not very good *	0.45			
Factor 5	Career Identity	Even if I win a great deal of money at 4D or ToTo, I would continue to work somewhere	0.53	0.81	4.01	0.61
		Having a job is very important to me	0.72			
		I would hate to be on welfare, e.g. long-term Comcare etc.	0.68			
		I would soon get very bored if I have no work to do	0.76			
		The most important things that happen to me involve work	0.69			
		If welfare benefits were really high, I would still prefer to work	0.74			

How the Singaporean worker perceives employability

Taken as an overall factor, the self-perceived employability factor for the Singaporean participants yielded a Cronbach's alpha of $\alpha=.88$ (Appendix E, Table 63), which is comparable to Koen et al (2013)'s Australian study of 416 participants where their reliability estimates were $\alpha=.89$. In the Singapore sample, the participants relate most strongly with Career Identity, particularly with statements such as "having a job is very important to me" ($\mu=4.22$). The respondents also display a sense of confidence about their perceived skills and qualifications (Human Capital), with affirmative statements as "I have a good work history" ($\mu=3.86$). Their self-beliefs about their level of social capital is also moderately healthy, giving affirmation to statements such as "I do nice things for people", for when a worker step outside of her workload and volunteer to help her colleagues, it opens the door to new insights, learning and career opportunities (McCord, 2015). Career exploration entails looking around for opportunities and career planning means preparing for future job opening whether within or outside one's current work environment (Koen et al., 2013). These are indicative of one's readiness to cope with unexpected career upheavals and explore job possibilities (Koen et al, 2013). The mean scores for career exploration and career planning ($\mu=3.68$) indicate that the Singapore participants are more focused on achieving career goals in their current roles (career planning, $\mu=3.68$), than being proactive and learning about their job environment to address threats and opportunities (career exploration, $\mu=2.43$) (Fugate et al., 2004). A summary of the operational definitions of the self-perceived employability scale is presented in Table 14.

Table 14: Summary and definitions of the Employability sub-factors

Factor	Category Name	Self-perceived Employability Statement	Operational Definition of the Sub Factor
Factor 1	Career Exploration	Went to various career orientation programmes?	The individual's readiness to cope with changes in his or her labour situation by exploring his or her career possibilities.
		Obtained information on specific jobs or companies?	
		Initiated conversations with knowledgeable individuals in my career area?	
		Obtained information on the labour market and general job opportunities in my career area?	
		Sought information on specific areas of career interest?	
Factor 2	Career Planning	I have a plan for my career	The individual engaging in planning activities, looking ahead for the next career achievement, setting and pursuing career goals.
		I have a strategy for achieving my career goals.	
		I know what I need to do to reach my career goals.	
Factor 3	Social Capital	I am good at making friends	A reflection of the individual's social skills, formal and informal social networks and support that he or she can tap on to facilitate career success.
		I help other people	
		I ask others if I can be of help	
		I do nice things for people	
Factor 4	Human Capital	My level of education is sufficient for getting a job in my area of work	The individual's knowledge and competencies which includes one's experience, training, skills and knowledge.
		My skills for doing the type of work I want to do are up-to-date	
		I have a good work history	
		An employer would be impressed with my qualifications	
		I have good job reference	
		My work qualifications are not very good *	
Factor 5	Career Identity	Even if I win a great deal of money at 4D or ToTo, I would continue to work somewhere	The individual's work values and motivation to work.
		Having a job is very important to me	
		I would hate to be on welfare, e.g. long-term Comcare etc.	
		I would soon get very bored if I have no work to do	
		The most important things that happen to me involve work	
		If welfare benefits were really high, I would still prefer to work	

Self-perceived Empowerment (DV2)

The 14-items in the empowerment scale measured aspects of the participant's feelings of psychological empowerment: i) self-efficacy - self-esteem, and ii) community activism & autonomy. It was based on Rogers, Chamberlin, Ellison, and Crean (1997)'s empowerment scale model, which the researchers deployed on testing 271 members of self-help programmes, in the USA. The reliability of the scale tested revealed the $\alpha = .86$. Their scale model was subsequently adapted by: Baumann, Meyers, Le Bihan, and Houssemand (2008) to survey 69 long-term unemployed individuals in Luxembourg, where $\alpha = .86$; Lloyd, King, and Moore (2010)'s project to survey 61 patients with mental illness, where $\alpha = .87$ and also Bejerholm and Björkman (2011)'s study of 120 adults seeking employment assistance in Sweden, where $\alpha = .85$. Like the employability scale earlier, the continuous variables are on a 5-point Likert Scale of 1 to 5 for agreement, where **1** – Strongly Disagree, **2** –Disagree, **3** – Neither Agree or Disagree, **4** – Agree and **5** – Strongly Agree.

Factor Analysis – Empowerment scale

Appendix E, Table 68 contains the full list of question used in creating the 14-item-scale as well as its corresponding alpha scores. The principal component factor analysis revealed three possible factors with eigenvalues greater than 1.0, accounting for 58.51% of the variance (Table 15 below).

Table 15: Results of the unrotated Factor Analysis for the Empowerment scale

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	6.99	4.76	0.39	0.39
Factor2	2.23	0.91	0.12	0.51
Factor3	1.32	0.33	0.07	0.59

Like the employability scale, the last factor was revealed as negatively worded items which were re-coded, e.g. E2_SE7r “I do not see myself as a capable person”, E2_PW1r “I feel powerless most of the time”, E2_PW2r “you can’t fight the government, and E2_CO2r “I am generally pessimistic about the future*”. With the same treatment for the employability scale for such reverse coded items which yielded the out of place factor structures, it is recommended for Factor 3 to be dropped. With the retention of the five factors, their loadings reflect two of the empowerment dimensions based on Rogers et al (1997)'s empowerment measurement model. *Table 16* below shows the categories of the employability scale for the Singaporean participants, based on the varimax rotation.

Table 16: Resulting categories of the rotated Empowerment scale

Factor	Category Name	Empowerment Statement	Factor1	Alpha Cronbach Reliability (internal consistency)	Mean	SD
Factor 1	Self-Esteem, Self-Efficacy and Control	I generally accomplish what I set out to do	0.77	0.90	3.95	0.50
		I have a positive attitude about myself	0.79			
		When I make plans, I am certain to make them work	0.77			
		I am confident about the decisions I make	0.82			
		I am able to overcome barriers	0.76			
		I feel I am a person of worth, at least on an equal basis with others	0.60			
		I am able to do things as well as most other people	0.62			
		I feel I have a number of good qualities	0.63			
		I can pretty much determine what will happen in my life	0.53			
Factor 2	Community Activism and Autonomy	People have a right to make their own decisions, even if they are bad ones	0.70	0.81	4.06	0.54
		People should try to live their lives the way they want to	0.71			
		People working together can have an effect on their community	0.71			
		People have more power if they join together as a group	0.72			
		Working with others in my community can help to change things for the better	0.65			
		I can pretty much determine what will happen in my life	0.53			
Factor 3	N.A.	<i>I feel powerless most of the time*</i>	0.80	N.A.	N.A.	N.A.
		<i>You can't fight the government*</i>	0.71			
		<i>I do not see myself as a capable person*</i>	0.65			
		<i>I am generally pessimistic about the future*</i>	0.73			

Self-perceived Empowerment for the Singaporean worker

In this study, the empowerment scale yielded a Cronbach's alpha of .91 and is considered reliable. The findings of the factor analysis of the empowerment scale allow us to set a framework for understanding what Rogers et al. (1997) call "the imprecise concept of empowerment" (p.1045). As evidenced in the factor analysis, the self-esteem—self-efficacy

sub-factor ($\mu=3.95$, $\alpha=0.90$) is more consistent than the community activism factor ($\mu=4.06$, $\alpha=0.81$), even though based on their mean scores, the participants rated their level of community activism to be slightly higher than their sense of self-efficacy.

Self-esteem, self-efficacy & control. The concept of self-efficacy is commonly referenced to the concept of internal-locus-of-control by Rotter (1966). Per Rotter (1966), when one has a higher sense of self-efficacy, she believes she can produce a result she desires in a specific area. Self-efficacy is related one's internal locus of control, which is how much control the individual feels like she has over a situation (Tiggemann & Winefield, 1984). As such, people with high self-efficacy for a task will most likely also have a higher internal locus of control for success in that task (Ajzen, 2002). Compared to studies of unemployed individuals such as the one done by Tiggemann and Winefield (1984), where the unemployed individuals display a higher sense of personal powerlessness and loss of locus of control than their employed counterparts, the Singaporean sample, with their relatively high mean score of $\mu=3.95$ for self-esteem—self-efficacy, does not appear to display such helplessness during their unemployment experience in the training institute where the study for this thesis was conducted. This could be due to the numerous unemployment help services offered by the government, notwithstanding the relatively low national unemployment rate of 2.2% (Ministry of Manpower Singapore, 2018).

Community activism & autonomy. One's level of engagement with his community has been found to be positively correlated to his self-perceived level of empowerment (Christens & Speer, 2011) and improved personal well-being (Klar & Kasser, 2009). This is because the empowered individual understands the use of community mobilisation to effect social change and through that, his self-confidence and sense of personal control increases in tandem with this understanding (Zimmerman, 1995). Such an empowered person also values autonomy (Rogers et al., 1997), which is referred to as choice and agency in Sen (1999)'s capability approach, as detailed in the literature review chapter earlier. In this Singapore sample, the research participants were recruited through their enrolment in the ICT training classes. Their collective identity as trainees, or learners, may have contributed to their feelings of being a part of a community of apprentices during this period of employment transition.

Higher sense of empowerment than employability

By examining the mean scores of their self-perception of employability and empowerment, it is interesting to note that the Singapore participants rate their empowerment (higher than their employability. As per Svensson and Mastropirro (2017), a higher sense of

empowerment simply means that the participant have a greater sagacity of her own agency and what she can become (employability). In the Singapore sample, the participants feel more empowered psychologically because of higher self-efficacy and a sense of belonging to community. A higher empowerment will also lead to a higher employability because it provides one with the necessary coping mechanism to deal with the complexity and speed of today's labour market (Svensson & Mastropirro, 2017). A summary of the self-perceived empowerment scale is presented in Table 17.

Table 17: Summary of the operational definitions of the self-perceived Empowerment scale

Factor	Category Name	Empowerment Statement	Operational Definition of the Sub Factor
Factor 1	Self-Esteem, Self-Efficacy and Control	I generally accomplish what I set out to do	The individual's sense of self-worth and belief that he or she can control his or her destiny and life events.
		I have a positive attitude about myself	
		When I make plans, I am certain to make them work	
		I am confident about the decisions I make	
		I am able to overcome barriers	
		I feel I am a person of worth, at least on an equal basis with others	
		I am able to do things as well as most other people	
		I feel I have a number of good qualities	
		I can pretty much determine what will happen in my life	
Factor 2	Community Activism and Autonomy	People have a right to make their own decisions, even if they are bad ones	The individual's propensity to harness energy into action to affect changes in his or her environment.
		People should try to live their lives the way they want to	
		People working together can have an effect on their community	
		People have more power if they join together as a group	
		Working with others in my community can help to change things for the better	
		I can pretty much determine what will happen in my life	

Chapter Summary

Nuances of ICT access, usage and appropriation towards well-being outcomes. From the descriptive statistics, the higher mean score for Instrumental ICT access ($\mu=3.86$) with the high average lower-order ICT usage ($\mu=3.94$) may indicate that the participants access computers, laptops and for lower order usage. This can be further investigated through

conducting inferential statistical analysis on the data. Furthermore, statements of agreement about ICT appropriation yielded high mean scores ($\mu=3.76$), which hints at the attribution the participants make -- how the meaningful usage of technology can contribute to their well-being outcomes. A correlational analysis can help to establish whether there is an association between ICT access, ICT usage, ICT appropriation and the two well-being outcomes of self-perceived employability and empowerment. Refer to Figure 1, for a visual summary of the measurements of each of the sub-scales.

Thus, the methodological questions answered in this chapter provides for a more specific analysis of the individual's ICT effects and the explication of his or her well-being. We saw that access, usage and appropriation each has deep incisive components. As highlighted in the paragraph earlier, the descriptive analysis hints at the possibility that ICTs may have an impact on the well-being of the individual. The next chapter shall list and discuss each of the questions and accompanying hypotheses that determine the methods of analysis to understand the association of ICTs on well-being.

Figure 1: Summary of the descriptive statistics for each factor and sub-factor: scale reliability (α), number of items (N) and descriptive statistics for each factor.

CHAPTER SIX RESEARCH QUESTIONS AND HYPOTHESES

This thesis sets out to understand the impact of the levels of ICT assets on one's well-being, given the context of inequality in a developed economy. Specifically, the research aims to determine the relationship of the independent variables of ICT access, usage and appropriation on dependent variables of personal well-being, measured by the factors of employability (economic well-being) and empowerment (non-economic well-being).

Selwyn's hierarchical approach. An evaluation of the possible digital divide models suggests that the most wide-ranging ones are often too complex, while the basic ones lean towards theoretical sameness or are too widely applicable to address social inequality (Dodel, 2014). Conversely, scholars such as Toyama (2015) have argued that ICT's positive effects are not guaranteed; and that they have the potential for provoking negligible or negative effects on several aspects of livelihood outcomes. Therefore, realistically, it is desirable to find evidence of situations where the effect of ICTs is not clearly positive, allowing for variation in the dependent variable.

Given these considerations, Selwyn (2004, 2010)'s digital divide model provides the most relevant model for this research paper. It encompasses the key hierarchical stages of ICTs, *access*, *usage*, and *appropriation*, on an individual's developmental outcomes. More importantly, Selwyn (2004, 2010) demonstrates that each gap, in every level of the divide, has consequences for the individual, in terms of the entire chain of livelihood outcomes. The analytical framework for this paper is thus based on Selwyn's digital divide model. The second research question will guide us in the specific explication of the impact of the individual's ICT effects on well-being:

BROADLY: Do ICTs have a positive or negative impact on the well-being of the individual? If yes, what is the association of ICTs on economic and psychological well-being?

SPECIFICALLY: Does access, usage and appropriation of ICTs have a positive or negative impact on employability and empowerment. If so, what are the ICT effects in each of the dimensions of access, usage and appropriation?

Figure 2: A visual representation of the two RQs in the proposed research framework

ICT access on Employability and Empowerment

As discovered in the factor analyses conducted in the previous Chapter, ICT access is a nuanced continuum of access based on the combination of home and mobile internet access, and the participants' expectations of benefits derived from the technology access (instrumental versus non-instrumental access). Such expectations actually determine how people anticipate positive changes that access would bring, for example, low expectations about positive outcomes, may lead to different forms of access (Chen et al., 2017), e.g. ICT access for leisure activities in lieu of learning activities. On the other hand, high expectations for positive outcomes from access to ICTs and the internet, can be for improving the individual's labour market participation and employment (Evangelista, Guerrieri, & Meliciani, 2014).

With that, the first research hypothesis is advanced:

H1.1EL: The individual's *access to ICTs outside of his or her home* will positively affect his or her self-perceived employability, while controlling for his or her demographic and socio-economic factors.

H1.2EL: The individual's *instrumental access to ICTs* will positively affect his or her self-perceived employability, while controlling for his or her demographic and socio-economic factors.

H1.3EL: The individual's *non-instrumental access to ICTs* will positively affect his or her self-perceived employability, while controlling for his or her demographic and socio-economic factors.

H1.1EW: The individual's *access to ICTs outside of his or her home* will positively affect his or her self-perceived empowerment, while controlling for his or her demographic and socio-economic factors.

H1.2EW: The individual's *non-instrumental access to ICTs* will positively affect his or her self-perceived empowerment, while controlling for his or her demographic and socio-economic factors.

H1.3EW: The individual's *non-instrumental access to ICTs* will positively affect his or her self-perceived empowerment, while controlling for his or her demographic and socio-economic factors.

ICT usage on Employability and Empowerment

ICT usage is not automatically correlated to a meaningful use of ICT, as shown in the by the explication of the usage factor in the previous Chapter. Much depends on the level of skills the individual possess – higher-order versus lower-order and the outcomes expected of the individual towards ICT usage –usage consumption usage versus production usage. In terms of personal outcomes, Gomez and Pather (2012) observed that most ICT project evaluations excluded intangible impacts like psychological empowerment, self-efficacy and social cohesion. In one of the rare examples of research that did this, Chib and Jiang (2014) examined how ICT usage increased the psychological empowerment of the individual concerned. A study by Gonçalves et al. (2014) also found that a community of public transport passengers reported an increase in self-worth when participating in a transport feedback mechanism through mobile phones. Through this, it can be argued that the *purpose* and *skills* dimensions are intertwined together when it comes to achieving outcomes intended by ICT usage. With that, the second set of hypotheses with regards to ICT usage and well-being outcomes are advanced:

H2.1EL: The individual's *higher-order usage of ICTs* will positively affect his or her self-perceived employability, while controlling for his or her demographic and socio-economic factors.

H2.2EL: The individual's *production usage of ICTs* will positively affect his or her self-perceived employability, while controlling for his or her demographic and socio-economic factors.

H2.3EL: The individual's *lower-order usage of ICTs* will positively affect his or her self-perceived employability, while controlling for his or her demographic and socio-economic factors.

H2.4EL: The individual's *consumption usage of ICTs* will positively affect his or her self-perceived employability, while controlling for his or her demographic and socio-economic factors.

H2.1EW: The individual's *higher-order usage of ICTs* will positively affect his or her self-perceived empowerment, while controlling for his or her demographic and socio-economic factors.

H2.2EW: The individual's *production usage of ICTs* will positively affect his or her self-perceived empowerment, while controlling for his or her demographic and socio-economic factors.

H2.3EW: The individual's *lower-order usage of ICTs* will positively affect his or her self-perceived empowerment, while controlling for his or her demographic and socio-economic factors.

H2.4EW: The individual's *consumption usage of ICTs* will positively affect his or her self-perceived empowerment, while controlling for his or her demographic and socio-economic factors.

ICT Appropriation on Employability and Empowerment

The factor analyses in the previous Chapter showed that the participants clearly distinguish ICT appropriation for formalised purposes such as one's access to employment opportunities, to more informal achievements such as sharing and enhancing one's social networks.

ICT appropriation for formal purposes. The participants attributed the usage of ICTs to job-seeking achievements, usage of job-seeking websites and utilising these portals to submit resumes and job applications. This is encouraging for the participants' economic well-being as Hargittai and Hinnant (2008) posit that users who engage in capital-enhancing activities on

the internet, e.g. seeking government information, financial and health services, or exploring career or job opportunities, are more likely to enjoy upward mobility.

ICT appropriation for informal purposes. In the factor analysis, participants acknowledge the utility of ICT usage to enhancing their own social capital by affirmative statements such as “learning how to use ICTs enables me to make more friends”, and keeping abreast of current general knowledge by statements such as “through information provided by ICTs, I understand more about what is happening in society”. This corroborates with existing research which found that Internet use is correlated to increased social capital for users (Hampton & Wellman, 2003; Steinfield et al., 2008), as well as a heightened general knowledge of his or her external environment (Tewksbury et al., 2001).

With that, the last set of hypotheses for the analytical framework is advanced below:

H3.1EL: The individual’s *ICT appropriation for informal purposes* will positively affect his or her self-perceived employability, while controlling for his or her demographic and socio-economic factors.

H3.2EL: The individual’s *ICT appropriation for formal purposes* will positively affect his or her self-perceived employability, while controlling for his or her demographic and socio-economic factors.

H3.1EW: The individual’s *ICT appropriation for informal purposes* will positively affect his or her self-perceived empowerment, while controlling for his or her demographic and socio-economic factors.

H3.2EW: The individual’s *ICT appropriation for formal purposes* will positively affect his or her self-perceived empowerment, while controlling for his or her demographic and socio-economic factors.

Chapter Summary

This Chapter presented the hypotheses to answer the research questions of whether ICTs have a positive or negative impact on the well-being of the individual and this association looks like? Specifically, we are interested to know if the access, usage and appropriation of ICTs have a positive or negative impact on employability and empowerment. If so, what are the ICT effects in each of the dimensions of access, usage and appropriation?

The illustration of the hypothesised relationships are presented in 3 (Employability) and Figure 4 (Empowerment), and the hierarchy of ICT *access*, *usage* and *appropriation* are also summarised in Table 18. The next chapter will explain the tests to determine if the

access, usage and appropriation of ICTs led to better results as employability and empowerment outcomes, for the participants.

Figure 3: Visual representation of the hypothesised relationships between ICT assets and outcomes of perceived employability

Figure 4: Visual representation of the hypothesised relationships between ICT assets and outcomes of perceived empowerment

Table 18: Summary of the definitions and hypotheses of the three levels of ICT assets

Sub-Factor	Definition	S/N	Hypothesis Statement
Access of ICTs outside of home	The individual's access of ICT devices as well as the internet outside of his or her home.	H1.1EL	The individual's <i>access to ICTs outside of his or her home</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.
		H1.2EW	The individual's <i>access to ICTs outside of his or her home</i> will positively affect his or her self-perceived <u>empowerment</u> , while controlling for his or her demographic and socio-economic factors.
Instrumental ICT Access	Access to ICTs for purposes of (but not limited to) income generation, access to employability resources, such as training, health, government information & services, and general personal productivity.	H1.2EL	The individual's <i>instrumental access to ICTs</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.
		H1.2EW	The individual's <i>non-instrumental access to ICTs</i> will positively affect his or her self-perceived <u>empowerment</u> , while controlling for his or her demographic and socio-economic factors.
Non-Instrumental ICT Access	Access to ICT devices for purposes of (but not limited to) the pursuit of non-productive activities.	H1.3EL	The individual's <i>non-instrumental access to ICTs</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.
		H1.3EW	The individual's <i>non-instrumental access to ICTs</i> will positively affect his or her self-perceived <u>empowerment</u> , while controlling for his or her demographic and socio-economic factors.
Higher-order ICT usage	ICT usage which requires higher capabilities and literacy of the individual, e.g. being able to creatively use digital media as well as engaging in ICT-mediated communication.	H2.1EL	The individual's <i>higher-order usage of ICTs</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.
		H2.1EW	The individual's <i>higher-order usage of ICTs</i> will positively affect his or her self-perceived <u>empowerment</u> , while controlling for his or her demographic and socio-economic factors.
Production ICT usage	ICT usage for achieving the individual's socio-economic, security goals, such as employment, education and training.	H2.2EL	The individual's <i>production usage of ICTs</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.
		H2.2EW	The individual's <i>production usage of ICTs</i> will positively affect his or her self-perceived <u>empowerment</u> , while controlling for his or her demographic and socio-economic factors.
Lower-order ICT usage	ICT usage which requires basic skills such as surfing the internet, reading or sending emails, reading online news, sending and receiving text messages and browsing social media	H2.3EL	The individual's <i>lower-order usage of ICTs</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.
		H2.3EW	The individual's <i>lower-order usage of ICTs</i> will positively affect his or her self-perceived <u>empowerment</u> , while controlling for his or her demographic and socio-economic factors.
Consumption ICT usage	ICT usage for the 'less-productive' utilities of	H2.4EL	The individual's <i>consumption usage of ICTs</i> will positively affect his or her self-perceived

Sub-Factor	Definition	S/N	Hypothesis Statement
	technology, where users deploy ICTs, often for passive leisure, non-serious activities such as playing games, listening to music and watching videos		<u>employability</u> , while controlling for his or her demographic and socio-economic factors.
		H2.4EW	The individual's <i>consumption usage of ICTs</i> will positively affect his or her self-perceived <u>empowerment</u> , while controlling for his or her demographic and socio-economic factors.
Informal ICT Appropriation	The attribution of the usage of ICTs to less formal tasks such as communicating and engaging in social interactions with friends, and relatives.	H3.1EL	The individual's <i>ICT appropriation for informal purposes</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.
		H3.1EW	The individual's <i>ICT appropriation for informal purposes</i> will positively affect his or her self-perceived <u>empowerment</u> , while controlling for his or her demographic and socio-economic factors.
Formal ICT Appropriation	The attribution of the usage of ICTs to formalised tasks or capital-enhancing activities, that are related to employability access, education, income or work-related reasons.	H3.2EL	The individual's <i>ICT appropriation for formal purposes</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.
		H3.2EW	The individual's <i>ICT appropriation for formal purposes</i> will positively affect his or her self-perceived <u>empowerment</u> , while controlling for his or her demographic and socio-economic factors.

CHAPTER SEVEN REGRESSION ANALYSES

This Chapter details the results of the tests that are designed to uncover whether access, usage and appropriation of ICTs for vulnerable workers in developed economies, leads to improved employability and empowerment, while controlling for individual demographic and socio-economic variables. Firstly, this Chapter deploys the stepwise multiple regression method to determine the individual predictors for self-perceived employability and empowerment, to answer the specific research questions: does access, usage and appropriation of ICTs have a positive or negative impact on employability and empowerment. If so, what are the ICT effects on each of the dimensions of access, usage and appropriation? Secondly, the nested (or hierarchical) regression analysis is used to answer the broader research question: do ICTs have a positive or negative impact on the well-being of the individual? If yes, what is the association of ICTs on economic and psychological well-being? To do this, the relative influence of the predictors, ICT access, usage and appropriation, on the dependent variables of self-perceived employability and empowerment, were entered in a stepwise manner, and at the same time contextual individual variables were considered.

Multiple Regression – ICT access, usage and appropriation on Self-Perceived Employability

Effects of ICT access on employability

Table 19 shows that individual demographic and socio-economic factors, as well as the participants' access to ICTs, explain for 24.64% of the variance in the participants' perception of his or her employability. This joint effect is statistically significant; the Model $R^2 = .2464$, $F(24, 277) = 3.77$, $p < .001$. Both *ICT access outside of home* and *Instrumental ICT access* were shown to positively affect a participant's perceived employability.

Table 19: Regression of ICT access on Self-Perceived Employability, over individual factors

Number of obs = 302					
Source	SS	df	MS	F(24, 277)	
Model	18.87	24	.79	Prob > F	= 0.0000
Residual	57.71	277	.21	R-squared	= 0.2464
Total	76.58	301	.25	Adj R-squared	= 0.1811
Root MSE				= .45644	

DV: Employability	Coef.	Std. Err.	t	P>t	Beta
Sex: male	0.02	0.05	0.48	0.63	0.03
Race: Others	0.41	0.11	3.64	0.00	0.20
Race: Indian	0.24	0.09	2.78	0.01	0.16
Race: Malay	0.25	0.08	3.11	0.00	0.18
Age: 65above	0.04	0.10	0.40	0.69	0.02
Age: 55-64	0.09	0.08	1.11	0.27	0.07
Age: 35-44	-0.08	0.08	-0.99	0.32	-0.06
Age: 25-34	0.08	0.09	0.81	0.42	0.05
Age: 18-24	-0.26	0.16	-1.59	0.11	-0.09
Educ: Lower Primary	-0.01	0.21	-0.04	0.97	-0.00
Educ: Primary School	-0.08	0.12	-0.68	0.50	-0.04
Educ: Post-Secondary	-0.00	0.11	-0.03	0.98	-0.00
Educ: Polytechnic Diploma	-0.04	0.08	-0.46	0.64	-0.03
Educ: Bachelor Degree	0.06	0.08	0.74	0.46	0.05
Educ: Post-Graduate Degree	0.35	0.14	2.55	0.01	0.16
Income: \$3k - 5,999	0.11	0.06	1.71	0.09	0.10
Income: \$6k - 8,999	0.04	0.10	0.41	0.68	0.02
Income: \$9k - 11,999	-0.26	0.14	-1.82	0.07	-0.10
Income: \$12k - 14,999	0.06	0.18	0.33	0.74	0.02
Income: \$15k - 19,999	0.03	0.17	0.19	0.85	0.01
Income: \$20k & above	0.11	0.33	0.35	0.73	0.02
ICT Access: Outside of home	0.07	0.04	1.96	0.05	0.12
ICT Access: Instrumental	0.10	0.03	3.50	0.00	0.23
ICT Access: Non-Instrumental	-0.01	0.03	-0.21	0.84	-0.01
_cons	2.72	0.12	22.15	0.00	.

ICT access on Employability. When the three ICT **access** factors were added to the model, both *ICT outside of home* and *Instrumental ICT device access* are shown to significantly affect a participant's employability. Its coefficients of .12 (for *ICT access outside of the home*) and .23 (for *Instrumental ICT access*) indicate that the effects of both ICT access are positive towards the participant's self-perceived employability, while controlling for his or her demographic and socio-economic factors. As such both the hypotheses **H1.1EL** and **H1.2EL** are supported - the *Access to ICTs outside of home* and

Instrumental ICT access – are positively correlated to an individual's self-perceived employability, while controlling for his or her demographic and socio-economic factors.

The factor of *Non-Instrumental ICT access*, is not significant in its contribution to employability. This also reflects the low average access scores for *Non-Instrumental ICT device access* found earlier. This shows that the Singapore participants accessed ICTs mainly for reasons of livelihood. The standardised coefficient, $\beta = .27$, reveals that the strength of the effect of *Instrumental ICT device access* was the highest over *ICT access outside of home* ($\beta=.12$) as well as the other significant socioeconomic and demographic variables. After controlling for an individual's demographic and socio-economic factors, being able to access instrumental ICT devices such as laptops and smartphones, as well as the availability of ICTs outside of one's home, are more likely to contribute positively to the participant's sense of employability. As explained by Chen et al. (2017), the availability of ICT resources can enable communities to expect positive impacts that such digital inclusion efforts can bring to these vulnerable constituents. Chen et al. (2017)'s hypothesis appears to relate to the Singapore sample also.

Effects of ICT usage on self-perceived employability

When the sub factors of ICT usage are added over demographic and socio-economic individual factors and ICT Access to the model (Table 20) – the ICT usage sub-factors explain for 33.37% of the variance in the participants' self-perceived employability. The model is statistically significant; Model $R^2 = .3337$ $F(28, 273) = 4.88, p < .001$. Specifically, the *Higher-Order ICT usage*, $t(301) = 3.77, p < .001, b = .15$, as well as *Production ICT usage*, $t(301) = 2.06, p < .05, b = .09$, are strongly correlated with employability, supporting Hypotheses **H2.1EL**, **H2.2EL** and **H2.3EL**.

Table 20: Regression of ICT Usage sub-factors on Self-perceived Employability, over individual factors

				Number of obs = 302	
Source	SS	df	MS	F(28, 273)	= 5.51
Model	25.48	25	1.02	Prob > F	= 0.0000
Residual	51.10	276	.19	R-squared	= 0.3327
Total	76.58	301	.25	Adj R-squared	= 0.2723
				Root MSE	= .43028

DV: Employability	Coef.	Std. Err.	t	P>t	Beta
Sex: male	0.05	0.05	1.01	0.31	0.05
Race: Others	0.48	0.11	4.51	0.00	0.24
Race: Indian	0.24	0.08	2.95	0.00	0.16
Race: Malay	0.24	0.08	3.06	0.00	0.17
Age: 65above	0.10	0.10	1.05	0.29	0.06
Age: 55-64	0.11	0.08	1.44	0.15	0.08
Age: 35-44	-0.07	0.07	-1.01	0.31	-0.06
Age: 25-34	0.10	0.09	1.05	0.29	0.06
Age: 18-24	-0.24	0.16	-1.48	0.14	-0.08
Educ: Lower Primary	-0.04	0.20	-0.17	0.86	-0.01
Educ: Primary School	-0.07	0.11	-0.59	0.56	-0.03
Educ: Post-Secondary	-0.07	0.11	-0.62	0.53	-0.03
Educ: Polytechnic Diploma	-0.10	0.08	-1.19	0.23	-0.07
Educ: Bachelor Degree	-0.01	0.08	-0.11	0.91	-0.01
Educ: Post-Graduate Degree	0.11	0.13	0.85	0.39	0.05
Income: \$3k - 5,999	0.14	0.06	2.35	0.02	0.13
Income: \$6k - 8,999	0.04	0.09	0.49	0.62	0.03
Income: \$9k - 11,999	-0.23	0.14	-1.71	0.09	-0.09
Income: \$12k - 14,999	0.00	0.17	0.03	0.98	0.00
Income: \$15k - 19,999	0.04	0.16	0.27	0.79	0.01
Income: \$20k & above	0.01	0.31	0.04	0.97	0.00
ICT Usage: Higher-Order	0.15	0.04	4.05	0.00	0.31
ICT Usage: Production	0.08	0.04	2.08	0.04	0.13
ICT Usage: Lower-Order	0.08	0.03	2.61	0.01	0.18
ICT Usage: Consumption	-0.05	0.03	-1.91	0.06	-0.12
_cons	2.57	0.12	21.00	0.00	.

ICT Usage's effect on employability. While ICT Usage contributes positively to employability outcomes in the overall model, there are differences in the types of usage which are correlated with employability. For example, *Higher-Order ICT usage*, where participants indicate activities such as research and report-writing etc., has a more significant effect on the participant's perceptions of their employment prospects, $t(301) = 4.05, p < .001, b = .15, \beta = .31$. Similarly, *Production ICT usage*, such as creating films or videos, is also significantly correlated with the participant's economic well-being, $t(301) = 2.08, p <$

.05, $b = .08$, $\beta = .18$, so is *Lower-order ICT usage*. *Consumption ICT usage*, such as watching videos, is not associated with self-perceived employability. The standardised beta coefficients show that the participants believe that *Higher-order usage*, which demands higher skill level, has a greater effect on their employability than *Lower-Order ICT usage* and *Production ICT usage*. This appears to support the idea that while the lower-educated Singaporean participants recognise the specific usefulness of ICT's usage for livelihoods; their workplaces probably do not require such high level of ICT skills; thus, they feel that such usage would have lower utility towards their livelihood outcomes.

Effects of ICT appropriation on self-perceived employability

In the third model, Table 21, ICT appropriation sub-factors are positively correlated to one's perception of employability, explaining for 31.73% of the variance in employability. Therefore, hypotheses **H3.1EL** and **H3.2EL** are validated -- the appropriation of technology positively affects employability, while controlling for individual control factors. *Informal ICT appropriation*, $t(301) = 5.09$, $p < .001$, $b = .18$, $\beta = .33$, where the participants attribute the meaningful usage of ICTs to enhancing one's social networks and maintaining contacts with friends and relatives, appears to be stronger in its association to self-perceived employability than *Formal ICT appropriation*, $t(301) = 2.79$, $p < .05$, $b = .13$, $\beta = .16$. This is somewhat surprising as per the literature review, the expectation is for *Formal ICT appropriation*, which is signified by statements such as "having ICTs can help me get a job" to enhance one's confidence in employability. It is also possible that *Informal ICT Appropriation*, as shown in the survey statements such as "knowing ICTs helps me understand what is happening in society", enables the participants to have a greater awareness of their labour environments and hence the market state of their employability.

Table 21: Regression of ICT Appropriation sub-factors on Employability

Source	SS	df	MS	Number of obs	=	302
				F(23, 278)	=	5.62
Model	24.30	23	1.06	Prob > F	=	0.0000
Residual	52.28	278	.19	R-squared	=	0.3173
				Adj R-squared	=	0.2608
Total	76.58	301	.25	Root MSE	=	.43366

DV: Employability	Coef.	Std. Err.	t	P>t	Beta
Sex: male	0.01	0.05	0.19	0.85	0.01
Race: Others	0.33	0.11	3.09	0.00	0.16
Race: Indian	0.27	0.08	3.30	0.00	0.18
Race: Malay	0.20	0.08	2.52	0.01	0.14
Age: 65above	0.13	0.10	1.30	0.19	0.08
Age: 55-64	0.03	0.08	0.44	0.66	0.03
Age: 35-44	-0.09	0.07	-1.19	0.24	-0.07
Age: 25-34	0.07	0.09	0.81	0.42	0.05
Age: 18-24	-0.16	0.15	-1.01	0.31	-0.05
Educ: Lower Primary	-0.11	0.20	-0.56	0.57	-0.03
Educ: Primary School	-0.13	0.11	-1.14	0.26	-0.06
Educ: Post-Secondary	-0.06	0.11	-0.52	0.60	-0.03
Educ: Polytechnic Diploma	-0.06	0.08	-0.70	0.49	-0.04
Educ: Bachelor Degree	0.01	0.08	0.10	0.92	0.01
Educ: Post-Graduate Degree	0.28	0.13	2.16	0.03	0.12
Income: \$3k - 5,999	0.11	0.06	1.88	0.06	0.10
Income: \$6k - 8,999	0.00	0.09	0.02	0.99	0.00
Income: \$9k – 11,999	-0.29	0.14	-2.13	0.03	-0.11
Income: \$12k – 14,999	0.03	0.17	0.15	0.88	0.01
Income: \$15k – 19,999	-0.00	0.16	-0.01	0.99	-0.00
Income: \$20k & above	0.13	0.31	0.42	0.67	0.02
ICT Appropriation: Informal	0.18	0.04	5.09	0.00	0.33
ICT Appropriation: Formal	0.13	0.05	2.79	0.01	0.16
_cons	2.12	0.17	12.62	0.00	.

Summary – ICT Access, Usage and Appropriation on Self-perceived Employability

The individual multiple regression analyses have tried to address the research question of whether gaps in access, usage and appropriation will solve social inequality in terms of the participants' economic well-being. With the increasing diffusion of ICTs, some scholars are saying that measures of the digital divide across a range of attributes (region, age, gender, race, etc.) are less important (Valadez & Durán, 2007). Instead, the debate should extend beyond disparities in ICT access to their effective use and purposes of use (Attewell, 2001). From the individual multiple regressions, the Singapore participants believe that having access to technology contributes to his or her gains in economic well-being, this is

particularly evident in the regression results for *Instrumental ICT access*, with its strong correlation to general personal productivity. The same cognition amongst the participants, is also observed for ICT usage – where *Consumption ICT usage*, defined as usage for passive leisure or less serious activities like enjoying games and videos, are deemed inconsequential to enhancing one’s employability. The appropriation of ICT features most strongly towards one’s sense of employability, this is where the participants’ attribution of the deployment of technology is closely correlated to economic well-being. A summary of the hypotheses validations is presented in Table 22.

Table 22: Summary - Hypotheses Validations of each ICT assets on self-perceived Employability

Sub-Factor	Definition	S/N	Hypothesis Statement	Hypothesis Validation
Access of ICTs outside of home	The individual’s access of ICT devices as well as the internet outside of his or her home.	H1.1EL	The individual’s <i>access to ICTs outside of his or her home</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Supported
Instrumental ICT Access	Access to ICTs for purposes of (but not limited to) income generation, access to employability resources, such as training, health, government information & services, and general personal productivity.	H1.2EL	The individual’s <i>instrumental access to ICTs</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Supported
Non-Instrumental ICT Access	Access to ICT devices for purposes of (but not limited to) the pursuit of non-productive activities.	H1.3EL	The individual’s <i>non-instrumental access to ICTs</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Not supported
Higher-order ICT usage	ICT usage which requires higher capabilities and literacy of the individual, e.g. being able to creatively use digital media as well as engaging in ICT-mediated communication.	H2.1EL	The individual’s <i>higher-order usage of ICTs</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Supported
Production ICT usage	ICT usage for achieving the individual’s socio-economic, security goals, such as employment, education and training.	H2.2EL	The individual’s <i>production usage of ICTs</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Supported
Lower-order ICT usage	ICT usage which requires basic skills such as surfing the internet, reading or sending emails, reading online news, sending and receiving text messages and browsing social media	H2.3EL	The individual’s <i>lower-order usage of ICTs</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Supported

Sub-Factor	Definition	S/N	Hypothesis Statement	Hypothesis Validation
Consumption ICT usage	ICT usage for the ‘less-productive’ utilities of technology, where users deploy ICTs, often for passive leisure, non-serious activities such as playing games, listening to music and watching videos	H2.4EL	The individual’s <i>consumption usage of ICTs</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Not Supported
Informal ICT Appropriation	The attribution of the usage of ICTs to less formal tasks such as communicating and engaging in social interactions with friends, and relatives.	H3.1EL	The individual’s <i>ICT appropriation for informal purposes</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Supported
Formal ICT Appropriation	The attribution of the usage of ICTs to formalised tasks or capital-enhancing activities, that are related to employability access, education, income or work-related reasons.	H3.2EL	The individual’s <i>ICT appropriation for formal purposes</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Supported

Hierarchical regression results – Self-perceived Employability outcome

The separate multiple regression analyses, done in the previous section, allow us to examine each ICT asset’s correlation to the dependent variable of self-perceived employability. Per Selwyn (2004) however, each ICT asset do not exist in silo, as ICT access usually leads to usage and eventually appropriation. How does the overall effects of ICT access, usage and appropriation impact one’s perception of employability when considered holistically? What is the association of ICTs on economic well-being? A multiple regression was entered with all the ICT assets variables as dependent variables, on top of the individual socio-economic and demographic factors to determine how the three levels of digital divide correlates to self-perceived employability. Table 23 shows the final model in the hierarchical regression analysis for ICT access, usage and appropriation on self-perceived employability, while the earlier Block 1 and Block 2 can be found in the Appendix E, Table 69 and Table 70.

Table 23: Block 3 - Regression of demographic, socio-economic factors, ICT access, ICT usage and ICT appropriation on Self-Perceived Employability

Source	SS	df	MS	Number of obs	=	302
				F(30, 271)	=	5.43
Model	28.74	30	.96	Prob > F	=	0.0000
Residual	47.84	271	.18	R-squared	=	0.3753
				Adj R-squared	=	0.3062
Total	76.58	301	.25	Root MSE	=	.42015

DV: Employability	Coef.	Std. Err.	t	P>t	Beta
Sex: male	0.02	0.05	0.45	0.65	0.02
Race: Others	0.41	0.11	3.87	0.00	0.20
Race: Indian	0.25	0.08	3.20	0.00	0.17
Race: Malay	0.20	0.08	2.59	0.01	0.14
Age: 65above	0.12	0.10	1.24	0.22	0.07
Age: 55-64	0.07	0.08	0.96	0.34	0.06
Age: 35-44	-0.08	0.07	-1.13	0.26	-0.07
Age: 25-34	0.08	0.09	0.92	0.36	0.05
Age: 18-24	-0.17	0.16	-1.08	0.28	-0.06
Educ: Lower Primary	-0.11	0.20	-0.53	0.60	-0.03
Educ: Primary School	-0.08	0.11	-0.71	0.48	-0.04
Educ: Post-Secondary	-0.09	0.11	-0.84	0.40	-0.04
Educ: Polytechnic Diploma	-0.10	0.08	-1.26	0.21	-0.07
Educ: Bachelor Degree	-0.04	0.08	-0.50	0.62	-0.03
Educ: Post-Graduate Degree	0.11	0.13	0.85	0.39	0.05
Income: \$3k - 5,999	0.13	0.06	2.07	0.04	0.12
Income: \$6k - 8,999	-0.00	0.09	-0.03	0.97	-0.00
Income: \$9k - 11,999	-0.26	0.13	-1.93	0.05	-0.10
Income: \$12k - 14,999	-0.01	0.17	-0.08	0.94	-0.00
Income: \$15k - 19,999	-0.02	0.16	-0.13	0.89	-0.01
Income: \$20k & above	0.07	0.31	0.24	0.81	0.01
ICT Access: Outside of home	0.01	0.04	0.30	0.77	0.02
ICT Access: Instrumental	0.01	0.04	0.23	0.81	0.02
ICT Access: Non-Instrumental	0.00	0.03	0.07	0.95	0.00
ICT Usage: Higher-Order	0.11	0.04	2.74	0.01	0.22
ICT Usage: Production	0.07	0.04	1.69	0.09	0.11
ICT Usage: Lower-Order	0.02	0.04	0.53	0.59	0.05
ICT Usage: Consumption	-0.04	0.03	-1.65	0.10	-0.10
ICT Appropriation: Informal	0.12	0.04	2.94	0.00	0.21
ICT Appropriation: Formal	0.10	0.05	2.18	0.03	0.12
_cons	2.08	0.18	11.88	0.00	.

Table 24: R-square for each model and F-test of the change in the R-square, ICT assets on Self-Perceived Employability

Block	F	Block df	Residual df	Pr > F	R2	Change in R2
1 – ICT Access	3.77	24	277	0.0000	0.2464	
2 – ICT Access, Usage	8.94	4	273	0.0000	0.3337	0.0873
3 – ICT Access, Usage & Appropriation	9.02	2	271	0.0002	0.3753	0.0416

All the ICT factors are submitted into the regression table in a sequence, with each step of ICT access, usage and appropriation being an additional block. The final block is shown in Table 24, where the model's R-square increased by .0412, making the final R-square to be .3753, $F(30, 371) = 5.43$, $p < .0001$.

ICT access is no longer significantly associated with the dependent variable. It is at this final stage of the hierarchical accumulation of ICT's assets, that meaningful usage becomes noticeable, for *Higher Order ICT usage* retains its significant contributions to self-perceived employability, $t(301) = 2.74, p < .05, b = .11, \beta = .22$. As does both *Formal* and *Informal ICT appropriation* although there are different effects between them, for *Informal ICT Appropriation* provides a stronger effect on employability. In terms of its standardised beta coefficients, *Informal ICT Appropriation* ($\beta = .21$), is greater than *Formal ICT Appropriation* ($\beta = .12$), which is signified by statements such as “having ICTs can help me get a job”. Clearly, *Informal ICT Appropriation* provides validation to the participants of their external environment, signified by statements such as using ICTs enables the participant to know “what is happening in society” and therefore the market state of their employability. Given that the standardised coefficient for *Higher-Order ICT usage* is slightly stronger, $\beta = .22$ than the two appropriation factors; this suggests that *Higher-Order ICT usage* sets the precedence for the individual's subsequent appropriation of technology. Nonetheless, both usage and appropriation are equally crucial to the participant's perceived improvements in his livelihoods outcomes.

When considered together, the total effects of the sequential regression of ICT access, usage to appropriation, shows that usage transcend access, with participants recognising that ICT's usage enhances future employment prospects (Faulkner, 2004). Interestingly, ethnicity and income effects appear to be significantly correlated to one's sense of economic well-being, while one's gender, age and educational level are not significant in their association to one's self-perceptions of employability.

Ethnicity effects on self-perceived employability. The effect of race on employability, is shown in Others, $t(301) = 3.87, p < .01, b = .41, \beta = .20$, Indian, $t(301) = 3.20, p < .01, b = .25, \beta = .17$, Malay, $t(301) = 2.59, p < .05, b = .20, \beta = .14$. Given that Chinese is the reference indicator in this statistical analysis, the positive coefficients indicate that minority-race participants in Singapore, who identified as Malay, Indian and Others ethnicities, feel more employable than the Chinese participants. Perhaps the majority race residents are more anxious of the future amidst the economic inequality.

Income effects on self-perceived employability. A participant in the household income category of SGD\$3,000 – SGD\$5,999 (which is just slightly above the national poverty line of SGD\$3,000), $t(301) = 2.10, p < .05, b = .13, \beta = .12$, reports a higher self-perceived employability than a participant in the income category: SGD\$1,000 – SGD\$2,999, which is

also the reference category in this regression statistics. This reference category of *SGD\$1,000 – SGD\$2,999* also appears to be a psychological threshold as participants in the higher household income bracket of *SGD\$9,000 – SGD\$11,000* reported negative association with their self-perceived employability, $t(301) = -1.93, p < .05, b = -.26, \beta = -.10$. The out-of-job participants from the higher income category may have worked in middle-class jobs previously, which paid higher salaries. Such jobs are harder to come by, given the hallowing out of middle class jobs due to technology advancement (Smith & Anderson, 2014). It is therefore interesting to observe that for this group of Singaporean participants from the training institute, the statistical reference category of *SGD\$3,000-SGD\$5,999* appears to be the ‘sweet spot’ for positively self-perceived employability.

ICT Appropriation’s effect on employability, vis-à-vis other factors. It is at this final stage of the hierarchical accumulation of ICT’s assets, that meaningful usage becomes noticeable. The participants attribute the meaningful usage of ICTs to formal outcomes as well as informal purposes. There are however, different effects between formal and informal appropriation -- *Informal ICT Appropriation* provides stronger effects on employability. In terms of its standardised beta coefficients, *Informal ICT Appropriation* ($\beta = .21$), is greater than *Formal ICT Appropriation* ($\beta = .12$), the latter which is signified by statements such as “having ICTs can help me get a job”. It is possible that *Informal ICT Appropriation* helps the participants make sense of “what is happening in society” and the market state of their employability. Given that the standardised coefficient for *Higher-Order ICT usage* is slightly stronger ($\beta = .22$) than the two Appropriation factors; this suggests that *Higher-Order ICT usage* sets the precedence for the individual’s subsequent appropriation of technology. Nonetheless, both usage and appropriation are equally crucial to the participants’ perception of improvements to their livelihoods outcomes.

Figure 5: The Final Hierarchical Regression Model for Perceived Employability as the Dependent Variable

Multiple Regression Results – Empowerment outcome

Effects of ICT access on self-perceived empowerment

The three sub-factors of ICT access were entered as predictors, on top of the individual's demographic and socio-economic factors (Table 25). The participants' access to ICTs and individual control factors explain for 17.35% of the variance in empowerment. This joint effect is statistically significant; the Model $R^2 = .1735$, $F(24, 277) = 2.42$, $p < .001$. Of the three ICT access sub-factors, only *Instrumental ICT device access* was found to be significantly correlated to the participants' sense of empowerment – the association is a positive relationship, $t(301) = 5.19$, $p < .001$, $b = .36$. From this results, neither being able to access *ICTs outside of one's home*, nor *Non-Instrumental ICT devices access* has a significant effect on empowerment. As such, only hypothesis **H1.2EW** is supported. Where access to *Instrumental devices* such as laptops and smartphones are generally for purposes of income generation and personal productivity, it has a positive effect on the individual's self-perceived empowerment, while controlling for his or her demographic and socio-economic factors.

Table 25: Regression of ICT access on Empowerment, over individual demographic and socio-economic factors

Source	SS	df	MS	Number of obs	=	302
				F(24, 277)	=	2.42
Model	11.36	24	.47	Prob > F	=	0.0003
Residual	54.13	277	.20	R-squared	=	0.1735
				Adj R-squared	=	0.1019
Total	65.49	301	.22	Root MSE	=	.44204

DV: Empowerment	Coef.	Std. Err.	t	P>t	Beta
Sex: male	-0.02	0.05	-0.41	0.68	-0.02
Race: Others	0.19	0.11	1.71	0.09	0.10
Race: Indian	0.06	0.08	0.67	0.50	0.04
Race: Malay	0.12	0.08	1.50	0.14	0.09
Age: 65above	0.19	0.10	1.99	0.05	0.13
Age: 55-64	0.00	0.08	0.05	0.96	0.00
Age: 35-44	-0.15	0.07	-1.97	0.05	-0.13
Age: 25-34	-0.09	0.09	-1.01	0.31	-0.06
Age: 18-24	-0.13	0.16	-0.81	0.42	-0.05
Educ: Lower Primary	0.26	0.21	1.23	0.22	0.07
Educ: Primary School	0.05	0.12	0.46	0.65	0.03
Educ: Post-Secondary	0.11	0.11	0.97	0.33	0.06
Educ: Polytechnic Diploma	-0.06	0.08	-0.78	0.43	-0.05
Educ: Bachelor Degree	0.06	0.08	0.75	0.45	0.05
Educ: Post-Graduate Degree	0.11	0.13	0.82	0.42	0.05
Income: \$3k - 5,999	0.09	0.06	1.45	0.15	0.09
Income: \$6k - 8,999	0.05	0.09	0.55	0.59	0.03
Income: \$9k - 11,999	-0.03	0.14	-0.25	0.81	-0.01
Income: \$12k - 14,999	0.28	0.17	1.61	0.11	0.10
Income: \$15k - 19,999	0.01	0.16	0.05	0.96	0.00
Income: \$20k & above	0.21	0.32	0.65	0.51	0.04
ICT Access: Outside of home	-0.04	0.04	-1.16	0.25	-0.08
ICT Access: Instrumental	0.15	0.03	5.19	0.00	0.36
ICT Access: Non-Instrumental	-0.00	0.03	-0.01	0.99	-0.00
_cons	3.43	0.12	28.89	0.00	.

Effects of ICT usage on self-perceived empowerment

In Table 26, the individual's demographic and socio-economic factors, his or her level of ICT usage explain for 24.05% of the variance in empowerment, where the joint effect is statistically significant, for the Model $R^2 = .2405$ $F(25, 276) = 3.50$, $p < .001$. The usage of ICTs positively predicts employability, while controlling for demographic, socio-economic factors and ICT access. Specifically, *Higher-Order ICT usage*, $t(301) = 2.75$, $p < .05$, $b = .10$. $\beta = .22$, and *Lower-Order ICT Usage*, $t(301) = 4.67$, $p < .001$, $b = .14$, $\beta = .34$, are

both strongly correlated with empowerment, supporting hypotheses **H2.1EW** and **H2.3EW**. Both *Production ICT usage* and *Consumption ICT usage* have no significant correlation to the participants' sense of self-efficacy and community activism. While the participants report higher frequency in their Consumption ICT usage, where the usage are generally for leisure activities, such as consuming videos, music and games -- such ICT usage however, does not cause the participants to feel more empowered in their daily lives. Instead it is usage activities such as online research (Higher-Order usage) and accessing online news (Lower-Order usage) that may contribute to improving the participants' sense of self-efficacy and community involvement.

Table 26: Regression of ICT usage on Self-Perceived Empowerment, over individual demographic and socio-economic factors

Source	SS	df	MS	Number of obs	=	302
				F(25, 276)	=	3.50
Model	15.75	25	.63	Prob > F	=	0.0000
Residual	49.74	276	.18	R-squared	=	0.2405
				Adj R-squared	=	0.1717
Total	65.49	301	.22	Root MSE	=	.42451

DV: Empowerment	Coef.	Std. Err.	t	P>t	Beta
Sex: male	-0.01	0.04	-0.20	0.84	-0.01
Race: Others	0.22	0.10	2.15	0.03	0.12
Race: Indian	0.05	0.08	0.64	0.52	0.04
Race: Malay	0.12	0.08	1.61	0.11	0.10
Age: 65above	0.28	0.09	2.98	0.00	0.18
Age: 55-64	0.04	0.08	0.58	0.56	0.04
Age: 35-44	-0.14	0.07	-1.92	0.06	-0.12
Age: 25-34	-0.07	0.09	-0.82	0.41	-0.05
Age: 18-24	-0.09	0.16	-0.57	0.57	-0.03
Educ: Lower Primary	0.26	0.20	1.29	0.20	0.07
Educ: Primary School	0.04	0.11	0.37	0.71	0.02
Educ: Post-Secondary	0.01	0.11	0.12	0.90	0.01
Educ: Polytechnic Diploma	-0.11	0.08	-1.36	0.17	-0.09
Educ: Bachelor Degree	0.04	0.08	0.46	0.64	0.03
Educ: Post-Graduate Degree	-0.04	0.13	-0.30	0.77	-0.02
Income: \$3k - 5,999	0.10	0.06	1.70	0.09	0.10
Income: \$6k - 8,999	0.07	0.09	0.83	0.41	0.05
Income: \$9k - 11,999	-0.04	0.13	-0.31	0.76	-0.02
Income: \$12k - 14,999	0.20	0.17	1.19	0.23	0.07
Income: \$15k - 19,999	0.03	0.16	0.21	0.83	0.01
Income: \$20k &above	0.09	0.31	0.28	0.78	0.01
ICT Usage: Higher-Order	0.10	0.04	2.75	0.01	0.22
ICT Usage: Production	-0.00	0.04	-0.02	0.98	-0.00
ICT Usage: Lower-Order	0.14	0.03	4.67	0.00	0.34
ICT Usage: Consumption	-0.05	0.02	-1.88	0.06	-0.12
_cons	3.26	0.12	26.96	0.00	.

Effects of ICT appropriation on self-perceived empowerment

In Table 29, demographic, socio-economic individual factors and ICT appropriation explain 36.83% of the variance in empowerment, where the joint effects are significantly correlated to one's sense of empowerment. Therefore, hypotheses **H3.1EW** and **H3.2EW** are validated, the appropriation of technology positively affected self-perceived empowerment, while controlling for individual control factors. Both the sub-factors of *Formal ICT Appropriation*, $t(301) = 6.24, p < .001, b = .26, \beta = .35$, and *Informal ICT Appropriation*, $t(301) = 4.69, p < .001, b = .15, \beta = .30$, are strongly correlated with empowerment. While both *Formal ICT appropriation* and *Informal ICT appropriation* are found to have significant effects on empowerment, the standardised beta shows that *Formal ICT appropriation* ($\beta=.35$) has a stronger positive effect than *Informal ICT appropriation* ($\beta=.30$) on a participant's sense of empowerment. In revisiting the factor analysis conducted earlier, *Formal ICT appropriation* statements used in the survey questionnaire are geared towards job-seeking activities while *Informal ICT appropriation* tends towards expanding a participant's social network and connections through ICT usage. Perhaps for the Singapore participants, the attribution of meaningful usage towards work productivity outcomes has a stronger importance than usage attributed to less formal tasks as communicating and interacting with friends and relatives.

Table 27: Regression of ICT appropriation on Self-Perceived Empowerment, over individual demographic and socio-economic factors

Source	SS	df	MS	Number of obs	=	302
				F(23, 278)	=	6.17
Model	22.12	23	.96	Prob > F	=	0.0000
Residual	43.37	278	.16	R-squared	=	0.3378
				Adj R-squared	=	0.2830
Total	65.49	301	.22	Root MSE	=	.39497

DV: Employability	Coef.	Std. Err.	t	P>t	Beta
Sex: male	-0.03	0.04	-0.77	0.44	-0.04
Race: Others	0.10	0.10	1.00	0.32	0.05
Race: Indian	0.08	0.07	1.14	0.25	0.06
Race: Malay	0.05	0.07	0.64	0.52	0.04
Age: 65above	0.26	0.09	2.91	0.00	0.17
Age: 55-64	-0.05	0.07	-0.69	0.49	-0.04
Age: 35-44	-0.15	0.07	-2.30	0.02	-0.14
Age: 25-34	-0.12	0.08	-1.46	0.15	-0.08
Age: 18-24	-0.01	0.14	-0.07	0.95	-0.00
Educ: Lower Primary	0.02	0.18	0.11	0.91	0.01
Educ: Primary School	-0.06	0.10	-0.61	0.54	-0.03
Educ: Post-Secondary	0.03	0.10	0.28	0.78	0.02
Educ: Polytechnic Diploma	-0.05	0.07	-0.72	0.47	-0.04
Educ: Bachelor Degree	0.06	0.07	0.78	0.44	0.05
Educ: Post-Graduate Degree	0.02	0.12	0.20	0.84	0.01
Income: \$3k - 5,999	0.08	0.06	1.37	0.17	0.08
Income: \$6k - 8,999	0.01	0.08	0.14	0.89	0.01
Income: \$9k - 11,999	-0.06	0.12	-0.50	0.62	-0.03
Income: \$12k - 14,999	0.16	0.15	1.04	0.30	0.06
Income: \$15k - 19,999	-0.06	0.15	-0.43	0.66	-0.02
Income: \$20k & above	0.23	0.29	0.81	0.42	0.04
ICT Appropriation: Informal	0.15	0.03	4.69	0.00	0.30
ICT Appropriation: Formal	0.26	0.04	6.24	0.00	0.35
_cons	2.43	0.15	15.85	0.00	.

Section Summary – ICT assets on Self-Perceived Empowerment

When it comes to individual outcomes of non-economic well-being as self-assessed empowerment, the ICT sub-factors of Instrumental *ICT access*, *Higher-Order* and *Lower-Order ICT usage*, *Formal* and *Informal ICT Appropriation* are positively correlated to higher self-perceived empowerment. In these dimensions, purposeful ICT access, usage and appropriation are associated with one's sense of psychological well-being.

Where ICT access to *Instrumental devices* such as laptops and smartphones are mainly for purposes of income generation and personal productivity, it has a positive

correlation on the individual's self-perceived empowerment, while controlling for his or her demographic and socio-economic factors. Similarly, ICT usage activities such as online research (Higher-Order usage) and accessing online news (Lower-Order usage) are positively correlated to the participants' sense of self-efficacy. So is the participants' attribution of meaningful ICT usage towards productivity outcomes has a stronger effect on his psychological empowerment than ICT appropriation for less formal tasks such as communicating and interacting with friends and relatives. Based on the separate effects of the ICT assets on the person's psychological well-being – it appears that to achieve the solution of improving one's sense of empowerment, it will do well to enhance her ICT efficacy for both higher and lower usage through skills training and development.

Table 28: Summary - Hypotheses Validations of each ICT assets on self-perceived Empowerment

Sub-Factor	Definition	S/N	Hypothesis Statement	Hypothesis Validation
Access of ICTs outside of home	The individual's access of ICT devices as well as the internet outside of his or her home.	H1.1EW	The individual's <i>access to ICTs outside of his or her home</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Not supported
Instrumental ICT Access	Access to ICTs for purposes of (but not limited to) income generation, access to employability resources, such as training, health, government information & services, and general personal productivity.	H1.2EW	The individual's <i>instrumental access to ICTs</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Supported
Non-Instrumental ICT Access	Access to ICT devices for purposes of (but not limited to) the pursuit of non-productive activities.	H1.3EW	The individual's <i>non-instrumental access to ICTs</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Not supported
Higher-order ICT usage	ICT usage which requires higher capabilities and literacy of the individual, e.g. being able to creatively use digital media as well as engaging in ICT-mediated communication.	H2.1EW	The individual's <i>higher-order usage of ICTs</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Supported
Production ICT usage	ICT usage for achieving the individual's socio-economic, security goals, such as employment, education and training.	H2.2EW	The individual's <i>production usage of ICTs</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Not Supported
Lower-order ICT usage	ICT usage which requires basic skills such as surfing the internet, reading or sending emails, reading online news, sending and receiving text messages and browsing social media	H2.3EW	The individual's <i>lower-order usage of ICTs</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Supported

Sub-Factor	Definition	S/N	Hypothesis Statement	Hypothesis Validation
Consumption ICT usage	ICT usage for the 'less-productive' utilities of technology, where users deploy ICTs, often for passive leisure, non-serious activities such as playing games, listening to music and watching videos	H2.4EW	The individual's <i>consumption usage of ICTs</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Not Supported
Informal ICT Appropriation	The attribution of the usage of ICTs to less formal tasks such as communicating and engaging in social interactions with friends, and relatives.	H3.1EW	The individual's <i>ICT appropriation for informal purposes</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Supported
Formal ICT Appropriation	The attribution of the usage of ICTs to formalised tasks or capital-enhancing activities, that are related to employability access, education, income or work-related reasons.	H3.2EW	The individual's <i>ICT appropriation for formal purposes</i> will positively affect his or her self-perceived <u>employability</u> , while controlling for his or her demographic and socio-economic factors.	Supported

Hierarchical Regression of ICT assets on Self-Perceived Empowerment

As with the hierarchical regression of ICT assets on self-perceived employability, we are also interested in understanding -- how does the overall effects of ICT access, usage and appropriation impact one's perception of *empowerment*, the latter which is a measure of psychological well-being? A hierarchical regression was also conducted for the dependent variable of self-perceived empowerment, to understand how the three levels of digital divide correlates to one's psychological well-being. Table 29 shows the final model in the hierarchical regression analysis for ICT access, usage and appropriation on self-perceived employability, while tables for Block 1 (IV: *ICT Access* only) and Block 2 (IVs: *ICT Access* and *ICT Usage*) can be found in the Appendix E, Table 69 and Table 70.

The joint effect of ICT access, usage and appropriation over individual factors on the person's sense of empowerment is significant; with the Model $R^2 = .3689$, $F(30, 271) = 5.28$, $p < .001$. After ICT appropriation is finally added to the hierarchical regression model, the change in R-square is significant, $\Delta R^2 = .1146$, $p < .001$. This means that an additional 11.46% of the variance of the self-perceived empowerment, is contributed by having the ICT access, usage and appropriation regression equation predictors, versus having only ICT access in the equation. At this point, when ICT appropriation is taken into consideration, both ICT access and ICT Usage become non-significant to the dependent variable.

Table 29: Block 3 -- Final model for the hierarchical regression of ICT access, usage and appropriation on self-perceived empowerment, over individual factors.

Source	SS	df	MS	Number of obs	=	302
				F(30, 271)	=	5.28
Model	24.16	30	.81	Prob > F	=	0.0000
Residual	41.33	271	.15	R-squared	=	0.3689
				Adj R-squared	=	0.2991
Total	65.49	301	.22	Root MSE	=	.39051

DV: Empowerment	Coef.	Std. Err.	t	P>t	Beta
Sex: male	-0.02	0.04	-0.45	0.66	-0.02
Race: Others	0.14	0.10	1.45	0.15	0.08
Race: Indian	0.09	0.07	1.22	0.22	0.07
Race: Malay	0.06	0.07	0.79	0.43	0.04
Age: 65above	0.26	0.09	2.93	0.00	0.17
Age: 55-64	-0.04	0.07	-0.50	0.62	-0.03
Age: 35-44	-0.14	0.07	-2.06	0.04	-0.12
Age: 25-34	-0.08	0.08	-1.00	0.32	-0.06
Age: 18-24	0.01	0.15	0.07	0.95	0.00
Educ: Lower Primary	0.13	0.19	0.67	0.50	0.03
Educ: Primary School	-0.00	0.10	-0.02	0.98	-0.00
Educ: Post-Secondary	0.01	0.10	0.08	0.94	0.00
Educ: Polytechnic Diploma	-0.11	0.07	-1.45	0.15	-0.08
Educ: Bachelor Degree	0.00	0.07	0.03	0.97	0.00
Educ: Post-Graduate Degree	-0.09	0.12	-0.71	0.48	-0.04
Income: \$3k - 5,999	0.08	0.06	1.42	0.16	0.08
Income: \$6k - 8,999	-0.00	0.08	-0.00	1.00	-0.00
Income: \$9k - 11,999	-0.09	0.12	-0.74	0.46	-0.04
Income: \$12k - 14,999	0.15	0.16	0.96	0.34	0.05
Income: \$15k - 19,999	-0.06	0.14	-0.41	0.68	-0.02
Income: \$20k & above	0.18	0.28	0.64	0.52	0.03
ICT Access: Outside of home	-0.07	0.04	-1.78	0.08	-0.12
ICT Access: Instrumental	0.02	0.03	0.66	0.51	0.06
ICT Access: Non-Instrumental	0.01	0.02	0.58	0.56	0.03
ICT Usage: Higher-Order	0.06	0.04	1.68	0.09	0.14
ICT Usage: Production	0.01	0.04	0.37	0.71	0.02
ICT Usage: Lower-Order	0.05	0.03	1.58	0.12	0.14
ICT Usage: Consumption	-0.03	0.02	-1.43	0.15	-0.09
ICT Appropriation: Informal	0.10	0.04	2.58	0.01	0.19
ICT Appropriation: Formal	0.24	0.04	5.61	0.00	0.32
_cons	2.45	0.16	15.04	0.00	.

Block	F	Block df	Residual df	Pr > F	R-square	Change in R-square
1 – ICT Access	2.42	24	277	0.0003	0.1735	
2 – ICT Access, Usage	7.40	4	273	0.0000	0.2544	0.0809

3 – ICT Access, Usage & Appropriation	24.60	2	271	0.0000	0.3689	0.1146
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Age effects on ICT Appropriation (empowerment). Across all three regression models, the age effects are the most consistent for all the three levels of ICT assets. Using the age group *aged 45-54* as the reference indicator, the positive coefficients for elderly participants *age 65 and above* indicates that a participant above 65 years old, who is probably a retiree, feels more empowered than a 45-54 years' old participant, when ICT Appropriation is included. This is counter indicative of traditional ageist assumptions made about senior people (Nelson, 2004). It is possible that the older participants, in this survey, having retired after 65 years old, have fewer worries and less stress than their younger colleagues. They would also have their analogue community and social support taken care of in their retirement years, and would therefore have a lower need for ICT Usage and ICT Appropriation, compared to a relatively younger (45-54-year-old) who needs to use technology in their everyday life.

Conversely, younger participants, aged between 35-44 years old, report feeling less empowered than the reference group of *45-54-year-olds*. Martins, Simard, Provost, and Monchi (2012) showed that older adults know how to use their life experiences, gained through living through changing circumstances, better than the younger adults. It is possible that in an uncertain economic climate, the older (and more experienced) participant is more confident about allocating their ICT resources and usage to cope with the increasing insecurity.

Figure 6: The Final Hierarchical Regression Model for Perceived Empowerment as the Dependent Variable

A Note about Multicollinearity

In regression analyses, it is important to look at the correlations between the independent variables (Thompson, Kim, Aloe, & Becker, 2017). To ensure that the earlier regression models include multiple factors that are not overly correlated to one another, a post-hoc Variance Inflation Factor (VIF) was ran on STATA, to assess whether multicollinearity is a problem for each independent variable. The results of the VIF is shown in Table 30 below. The VIF is greater than 1.5 for most of the factors, except for *Consumption ICT usage, Formal ICT Appropriation and Non-Instrumental ICT Access*, which indicated some correlation, but not enough to be overly concerned about (Thompson et al., 2017). A VIF between 5.0 and 10.0 indicate high correlation which may be problematic. None of the VIF readings for the independent variables used in this study is above 5.0, which indicates that multicollinearity is not a problem in the regression models.

Table 30: Results of the Variance Inflation Factor (VIF) on all independent variables, to test for Multicollinearity

Variable	VIF	1/VIF
ICT Usage: Lower-Order	2.82	0.35
ICT Access: Instrumental	2.64	0.38
ICT Usage: Higher-Order	2.37	0.42
ICT Appropriation: Informal	1.92	0.52
ICT Access: Outside of home	1.78	0.56
ICT Usage: Production	1.78	0.56
ICT Usage: Consumption	1.27	0.79
ICT Appropriation: Formal	1.23	0.81
ICT Access: Non-Instrumental	1.23	0.82
Mean VIF	1.89	

Calculating the total effects of individual factors and ICT assets on both self-perceived employability and empowerment

The earlier sequential regression models estimated the total effects of each independent variable on the outcomes of self-perceived employability and empowerment. For an individual worker, however, well-being outcomes do not occur in isolation. We now come to the question, when examined together, which ICT asset can address both the economic and non-economic well-being of the individual better? Another method of examining total effects is needed, to understand the complete impact of individual factors, as well as the three ICT

assets, on the individual's well-being. A structural equation model was run, to develop the path analysis for the explanatory analysis of total effects (Keith, 2006), using the data from this thesis.

Structural equation modelling with the measured variables

Figure 7 shows the correlation matrix for the four predictors of individual control factors: individual control factors (SES), *ICT access* (ICT_Acc), *ICT usage* (ICT_Use) and *ICT appropriation* (ICT_App), on both self-perceived *employability* (EmpLty) and *empowerment* (EmpWr), in graphic form. The model is non-recursive, i.e. the causal directions are in the same direction: from the predictors (SES, access, usage and appropriation) on the endogenous variables (presumed effects) of employability and empowerment. There are 0 degrees of freedom, so there was no test of significance for the overall model, hence there are also no modification indices to be reported.

Figure 7: Estimated final model, path diagram for ICT Access, Usage and Appropriation on Employability and Empowerment

ICT assets' effects on outcomes. ICT appropriation influence on employability is the strongest ($\beta=.31$, $p<.001$), followed by ICT usage ($\beta=.23$, $p<.001$). ICT access and the individual control factors have no significant effect on employability (see Table 31). ICT

appropriation was significantly associated with empowerment ($\beta=.49$, $p<.001$). From the standardised coefficients readings, ICT appropriation influenced empowerment ($\beta=.49$, $p<.001$) more than employability ($\beta=.31$, $p<.001$), which is consistent with the results of the hierarchical regression, displayed earlier.

Table 31: Structural Equation Model for the endogenous variables – self-perceived employability and empowerment, exogenous variables being individual control factors, ICT access, usage and appropriation.

Standardised	Coef.	OIM Std.Err.	z	P> z	95% Conf. Interval	
STRUCTURAL						
Employability <-						
ICT Appropriation	0.31	0.06	5.43	0.00	0.20	0.42
ICT Usage	0.23	0.07	3.04	0.00	0.08	0.37
ICT Access	0.05	0.07	0.72	0.47	-0.08	0.17
Individual Control Factors (SES)	-0.03	0.05	-0.60	0.55	-0.14	0.07
_cons	4.04	0.45	9.06	0.00	3.16	4.91
Empowerment <-						
ICT Appropriation	0.49	0.05	9.51	0.00	0.39	0.59
ICT Usage	0.08	0.07	1.06	0.29	-0.07	0.22
ICT Access	-0.02	0.06	-0.25	0.50	-0.14	0.11
Individual Control Factors (SES)	-0.00	0.05	-0.09	0.93	-0.11	0.10
_cons	5.42	0.49	11.04	0.00	4.46	6.83
Mean (ICT Appropriation)	6.13	0.26	23.95	0.00	5.63	6.63
Mean (ICT Usage)	3.45	0.15	22.74	0.00	3.15	3.74
Mean (ICT Access)	3.29	0.15	22.57	0.00	3.00	3.57
Mean (SES)	3.29	0.15	22.57	0.00	3.00	3.57
var(e.Employability)	0.77	0.04			0.69	0.85
var(e.Empowerment)	0.73	0.04			0.65	0.82
var(ICT Appropriation)	1.00	-			-	-
var(ICT Usage)	1.00	-			-	-
var(ICT Access)	1.00	-			-	-
var(SES)	1.00	-			-	-
cov(e.Employability, e.Empowerment)	0.43	0.05	9.28	0.00	0.34	0.53
cov(ICT Appropriation, ICT Usage)	0.50	0.04	11.53	0.00	0.41	0.58
cov(ICT Appropriation, ICT Access)	0.26	0.05	4.83	0.00	0.15	0.36
cov(ICT Appropriation, SES)	0.22	0.05	3.94	0.00	0.11	0.32
cov(ICT Usage, ICT Access)	0.64	0.03	19.06	0.00	0.58	0.71
cov(ICT Usage, SES)	0.35	0.05	6.92	0.00	0.25	0.45
cov(ICT Access, SES)	0.20	0.06	3.56	0.00	0.09	0.31

LR test of model vs. saturated: $\chi^2(0) = 0.00$, Prob > $\chi^2 = .$

Equation-level goodness of fit

depvars	Variance fitted	Variance predicted	Variance residual	R-squared	mc	mc2
observed						
Employability	.25	.059	.19	.23	.48	.23
Empowerment	.22	.059	.16	.27	.52	.27
overall			.35			

mc = correlation between depvar and its prediction

mc2 = mc^2 is the Bentler-Raykov squared multiple correlation coefficient

Correlations between well-being outcomes. The correlation between employability and empowerment is significant and the high loading suggests that the participants view both

economic well-being of self-perceived employability and the non-economic well-being of self-perceived empowerment as connected to each other ($\beta=.43$, $p<.001$).

Correlations between ICT predictors. ICT access bears the strongest correlation to ICT usage ($\beta=.64$, $p<.001$), followed by ICT usage's association with ICT appropriation ($\beta=.50$, $p<.001$). This makes sense, under the logic of the hierarchy of ICT assets accumulation, because having access to devices and the internet serves as the basis for subsequent usage and appropriation. Individual control factors such as a participant's social-economic achievements has a more significant association with ICT usage ($\beta=.35$, $p<.001$) than ICT access ($\beta=.20$, $p<.001$). This shows that individual factors are closely associated with each of the different ICT's asset hierarchy, not just limited to ICT access. Conversely, a participant's social achievements may also affect ICT access, usage and appropriation simultaneously, and not just in a stepwise manner.

The path diagram (Figure 7) is a result of the structural equation modelling. It offers clues to make inferences about cause and effect (Keith, 2006). Path analysis is useful for focusing on both direct and indirect effects and those indirect effects could be useful in explaining how an effect works, especially in cases such as the non-experimental research used in this thesis.

Following the extensive range of regression results presented in this chapter, the next chapter will provide the final conclusions and discussion of this thesis.

CHAPTER EIGHT CONCLUSION & DISCUSSION

This thesis aimed to expand the current discussion on inclusive economic growth in three ways. Firstly, it highlighted how we need to rethink inequality and well-being, given the current disruption of technology, globalisation and the rise of the winner-takes-all economy where only the top one percent of elite rich people succeed (Atkinson, 2014).

Secondly, it expanded Sen (1999a)'s capability approach by adding a dimension of how ICTs impact an individual's non-economic well-being, as psychological empowerment, in addition to one's economic well-being. Thirdly, using Selwyn (2004, 2010)'s digital divide impact assessment framework, it offers new granular methods of looking at ICT measures, to determine how ICTs can enhance a person's developmental outcomes.

It is hoped that this thesis can be a starting point for more open discussions about the connections between ICTs and outcomes of well-being, how to re-balance the financial insecurity and hopelessness of the people on the negative side of the social divide, how can we as global citizens to all, enhance opportunities for these constituents through ICT access, usage and appropriation.

Rethinking Inequality and Well-being

According to the International Labour Organisation's estimates, over 300 million poor people today, can be found in the world's *developed* economies (Hartogs, 2016) and this number will only increase as the gap between rich and poor in developed places continues to grow (Fraser, Gutierrez, & Pena-Casas, 2011; Tan, 2012). As per Zheng et al. (2017)'s assessment, the negative consequences of poverty are similar for affected people, whether they live in a developing or a developed country, e.g. mental health problems, homelessness, food insecurity and alcoholism (ECLAC, 2009; Glass et al., 2017).

Rethinking inequality and its constituents

Brown, Tan, and Ye (2011) highlight that policy and practice in skills learning, on a personal micro-level, requires evidence-based practice research if it is to address the difficulties of current labour markets and economic uncertainty. In practice however, developers who design ICT training programmes can do better in understanding the expectations of the working-class, given the latter's life circumstances (Tufekci, 2012). For example, merely placing a computer or technology hardware in the hands of the unemployed person will not work, for he needs the job credentialing to be able to use the equipment for

productive means (Hargittai & Hinnant, 2008). It is important that the ICT skills required receives the endorsement of employers who are the ones hiring the individual, for there is no utility for training if there are no jobs needing such skills.

Rethinking well-being

This thesis employs different streams of concepts to support non-economic well-being constructs, such as empowerment, self-efficacy and community activism. It does this to emphasis the personal agency of the ICT users, by highlighting the instrumental needs (employability) as well as aspirations (empowerment) of people who are affected by technology.

A common challenge facing similar employability and empowerment studies is the paucity of research involving real working adults. This is because most of the participants in such studies are students in higher education. For example, see Gbadamosi, Evans, Richardson, and Ridolfo (2015)'s empowerment and employability research on students in the United Kingdom. As such, the first key contribution of this thesis is that the research was carried out amongst adults who are either unemployed or under-employed, not students, as which most empowerment and employability studies are based on. Secondly, amongst the unemployed and under-employed adults in the Singapore sample, psychological empowerment is found to be significantly associated with the participant's employability (refer to Figure 7 on p. 143). This corroborates with practitioners' call for employment intervention programmes to focus on the participants' empowerment process first, because empowerment provides them with the tools and competences to handle the insecurity, complexity and speed of today's labour markets (Svensson & Mastropirro, 2017). With regards to programmes which deploys technology skills training to enhance employment outcomes, this study suggests that both socio-economic outcomes – *employability*, and a non-economic measure - *empowerment*, are viable development measures of ICTs' impact on its users. It is hoped that the findings will help future researchers consider more non-economic outcomes, given that ICTs are "multi-purpose technologies which could empower individuals to attain development outcomes of their own choice" (Kleine, 2010, p.675). Future well-being studies may also consider examining the evidence of why and how a higher level of self-perceived empowerment can enhance the participants' sense of employability.

Rethinking the Digital Divide and its dimensions

Witte and Mannon (2010) hypothesise that individuals who have already been sidelined by digital technology will find themselves even more left out of the technical skills, social position and content structures that are fast becoming the key institutional features of the internet age. The phenomenon of social-inequality in developed cities (Piketty & Goldhammer, 2014, 2015) will probably feature highly in future digital divide research, as scholars continue to debate technology's role in reducing inequality in the uncertain socio-political future. Specifically, digital divide researchers are beginning to understand the dimensions of the layers of technology utilisation and how it relates to personal outcomes.

Factor analysis, in digital divide research such as the one done by Hinostroza et al. (2015), helps researchers find similarities between any variables in the survey and categorises them into meaningful segments. In this thesis, this technique was tremendously useful in determining how vulnerable low-waged, low-educated workers distinguish their ICT assets in terms of access, usage and appropriation. Specifically, the clear separation of the access factors from the usage factors, helped distinguish the difference between the effects of access and usage and thereby led to a greater understanding of the different level of effects on the outcomes of employability and empowerment. To re-cap, Table 32 below summarises the new definitions of the ICT access, usage and appropriation factors derived from this study.

Through the decomposition of the ICT variables, a more sophisticated picture of access divide was gleaned. For example, ICT access is re-considered based on the participant's distinction of location access, for example, home access (or outside of home), and the purposes of access, for example, *Instrumental* and *Non-instrumental ICT access*. The factor analyses in this thesis also provide a more updated definition of ICT usage, considering the effectiveness of new usage factors, such as participation in online courses. The theme of purposes or outcomes seem to follow through to the ICT usage stage, for example, *Consumption ICT usage* reflects the less-productive purposes of using technology, even though the Singapore users devote a significant amount of time to passive leisure ICT usage, such as playing games and listening to music. At this second level of digital inequalities, the skills level correlation to the functions of usage becomes relevant, as per people's capabilities to use the technology. For example, items grouped under the *Higher-order ICT usage* category are report-writing on the ICT devices, researching for business development and creating digital images. These are all uses that require a higher level of technical skills than activities such as text-messaging (which are *Lower-order ICT usage*).

At the third level of the digital divide, the appropriation factors indicate the positive changes people expect that access and usage will contribute to their personal well-being. The attempt to operationally define ICT appropriation in this paper further contributes to the field's understanding of a user's anticipation of the purpose of ICT access and usage into social purposes, as indicated in the factors which group together in *Informal ICT appropriation* and instrumental purposes (*Formal ICT appropriation*).

Purposes evolve through the three divides. In the field of Information Behaviour, conversion factors such as the work role of the participants as well as their associated tasks, were found to influence the individual's information seeking behaviour (Landry, 2006). The type of role-related tasks dictates the participants' choices of ICT usage and engagement with the technology (Landry, 2006). In other words, one's ICT usage and engagement with the technology are directed by tasks, which are in turn driven by the participants' role in the organisation.

In this thesis, however, the perceived outcomes of advancing through the three levels of ICT assets feature most consistently throughout the three stages of assets accumulation -- from instrumental access, to production usage, and to formal/informal appropriation. This supports Selwyn (2004) and Wei et al (2011)'s theories on how the individual's expectations of outcomes dictate one's transcendence of digital inequalities. This contrasts with the information science literature where roles were found to be the conversion factors for how individuals use and engage with information technology. This could also be because the Singapore sample comprises mainly of unemployed and under-employed participants, which nullifies the differentiation of work roles as a crucial conversion factor for their information behaviour, as suggested by Landry (2006).

When we examining how the independent variables are decomposed at each level of the divide, it seems that the theme of *purposes* transcends over each level for the Singapore sample. Envisioning a possible pathway would be this -- one's affordability and motivation to acquire the instrumental ICT stems from productive expectations of its usage (Production Usage), which leads to positive experiences of using the technology (Formal/Informal Appropriation) at the workplace (perceived Employability). On the other hand, the participant can have expectations of better livelihoods from *Instrumental ICT access*, having affordability to better devices such as laptops and computers but the expectations of better outcomes may be stuck at the access level and result only in *Consumption ICT usage*, if the individual is limited by his or her own skills to use the device. In other words, there is little utility in owning a state-of-the-art latest Apple iMac where the software helps the most

talented freelance illustrator to churn out beautiful artwork which can be sold, if the user is only able to use it to check emails. As the technology of the devices evolve, future researchers need to consider how the different sub-factors of access connects to different usage and appropriation, and eventually to well-being outcomes.

Limitations of the definitions. The answers we get only comes from asking the questions we ask. Some of the access and usage scales deployed in this questionnaire are outdated as we speak now due to the rapid advancement of innovations for devices. For example, before the Apple Pencil debuted with the iPad Pro in 2015, the popular tablets were commonly used without a stylus (Galan, 2015), but the re-introduction of an electronic writing implement has enabled a variety of uses that have been previously difficult without it (Freml, 2017).

One can also argue that the statements used in the appropriation scale are worded with the fusion of purposes-of-use and types-of-usage in mind. This could also be the reason why the result of this section is strongly affirmative, since agreeing with the statements for ICT appropriation factors, e.g. “learning to use ICT enables me to ...” would influence the participants to attribute her ICT usage to well-being and agency outcomes. As mentioned in Chapter 5 (Factor Analyses), the evolution of ICT appropriation polysemy is still in its infant stage and appropriation factors need to be discussed in depth to consider elements as meta-communication or symbols, as used in Karnowski (2009); Wirth, Karnowski, and von Pape (2006, 2007)’s study on their appropriation models.

It is hoped that future researchers will update the measurement scales for both the independent and dependent variables, as factors often evolve and adapt when the participants are under examination. Future studies can also adopt a more advanced, confirmatory factor analysis techniques (Jöreskog, 1969), to validate the relationship between the observed variables of *ICT access*, *usage* and *appropriation*, by considering their respective underlying latent constructs.

Table 32: Re-cap -- explication and definitions of ICT access, usage and appropriation sub-factors derived in this thesis

Main Factor	Sub-Factor	Definition
ICT Access	Access of ICTs outside of home	The individual’s access of ICT devices as well as the internet outside of his or her home.
	Instrumental ICT Access	Access to ICTs for purposes of (but not limited to) income generation, access to employability resources, such as training, health, government information & services, and general personal productivity.

Main Factor	Sub-Factor	Definition
	Non-Instrumental ICT Access	Access to ICT devices for purposes of (but not limited to) the pursuit of non-productive activities.
ICT Usage	Higher-order ICT usage	ICT usage which requires higher capabilities and literacy of the individual, e.g. being able to creatively use digital media as well as engaging in ICT-mediated communication.
	Production ICT usage	ICT usage for achieving the individual's socio-economic, security goals, such as employment, education and training.
	Lower-order ICT usage	ICT usage which requires basic skills such as surfing the internet, reading or sending emails, reading online news, sending and receiving text messages and browsing social media
	Consumption ICT usage	ICT usage for the 'less-productive' utilities of technology, where users deploy ICTs, often for passive leisure, non-serious activities such as playing games, listening to music and watching videos
ICT Appropriation	Informal ICT Appropriation	The attribution of the usage of ICTs to less formal tasks such as communicating and engaging in social interactions with friends, and relatives.
	Formal ICT Appropriation	The attribution of the usage of ICTs to formalised tasks or capital-enhancing activities, that are related to employability access, education, income or work-related reasons.

Enhancing Personal Well-Being by Addressing the Digital Divide

The Research Questions Revisited

The purpose of this study is to examine the impact of ICT's access, usage and appropriation on vulnerable, unemployed and under-employed working adults in a developed economy. All of them are affected by rising inequality in Singapore, an economy confronting a high GINI coefficient (The World Bank, 2017). This research is based on Selwyn (2004, 2010)'s digital divide framework, by presenting an analytical framework that links ICT assets to individual economic and non-economic well-being. In doing so, a digital divide model that assess ICT's assets as predictors of non-ICT dependent variables is created. The specific research question that steered the direction of the findings is recapitulated below:

SPECIFIC RESEARCH QUESTION: Does access, usage and appropriation of ICTs have a positive or negative impact on employability and empowerment. If so, what are the ICT effects in each of the dimensions of access, usage and appropriation?

Given the significant associations of all the regression results - the access, usage and appropriation of ICTs were strongly correlated to the worker's sense of employability and empowerment. The underlying control variables of demographic and socio-economic variables showed different correlations of how one's age, race and income levels affected the dependent variables, while considering the effects of ICT access, usage and appropriation. The significance of each ICT hierarchy towards the two development outcomes will be discussed in the following section. To re-cap, Table 33 below summarises the hypotheses validation of the correlation of the independent variables -- ICT access, usage and appropriation, on the two dependent variables.

Table 33: Re-cap -- Hypotheses Validation of the ICT assets independent variables on the dependent variables of self-perceived employability & empowerment

Independent Variable -> ICT Sub-Factor	Definition of Independent Variable -> ICT Sub-Factor	Hypothesis	Dependent Variable	Hypothesis Validation
Access of ICTs outside of home	The individual's access of ICT devices as well as the internet outside of his or her home.	H1.1EL	Self-perceived Employability	Supported
		H1.1EW	Self-perceived Empowerment	Not Supported
Instrumental ICT Access	Access to ICTs for purposes of (but not limited to) income generation, access to employability resources, such as training, health, government information & services, and general personal productivity.	H1.2EL	Self-perceived Employability	Supported
		H1.2EW	Self-perceived Empowerment	Supported
Non-Instrumental ICT Access	Access to ICT devices for purposes of (but not limited to) the pursuit of non-productive activities.	H1.3EL	Self-perceived Employability	Not supported
		H1.3EW	Self-perceived Empowerment	Not supported
Higher-order ICT usage	ICT usage which requires higher capabilities and literacy of the individual, e.g. being able to creatively use digital media as well as engaging in ICT-mediated communication.	H2.1EL	Self-perceived Employability	Supported
		H2.1EW	Self-perceived Empowerment	Supported
Production ICT usage	ICT usage for achieving the individual's socio-economic, security goals, such as employment, education and training.	H2.2EL	Self-perceived Employability	Supported
		H2.2EW	Self-perceived Empowerment	Not supported
Lower-order ICT usage	ICT usage which requires basic skills such as surfing the internet, reading or sending emails, reading online news, sending and receiving text messages and browsing social media	H2.3EL	Self-perceived Employability	Supported
		H2.3EW	Self-perceived Empowerment	Not supported
Consumption ICT usage	ICT usage for the 'less-productive' utilities of technology, where users deploy ICTs, often for passive leisure, non-serious activities such as playing games, listening to music and watching videos	H2.4EL	Self-perceived Employability	Not Supported
		H2.4EW	Self-perceived Empowerment	Not supported
Informal ICT Appropriation	The attribution of the usage of ICTs to less formal tasks such as communicating and engaging in social interactions with friends, and relatives.	H3.1EL	Self-perceived Employability	Supported
		H3.1EW	Self-perceived Empowerment	Supported
Formal ICT Appropriation	The attribution of the usage of ICTs to formalised tasks or capital-enhancing activities, that are related to employability access, education, income or work-related reasons.	H3.2EL	Self-perceived Employability	Supported
		H3.2EW	Self-perceived Empowerment	Supported

ICT access' correlation with self-perceived Employability and Empowerment

The exploratory factor analysis showed how ICT access as a main factor; was further subdivided into physical devices access (*Non-Instrumental ICT access*) and access to devices which were deemed important to daily lives (*Instrumental ICT access*). Following the findings of the literature review, it was expected for *Instrumental ICT access* to be correlated to self-perceived employability and *Non-Instrumental ICT access* to be aligned with self-perceived empowerment. However, the survey's results showed that *Instrumental ICT access* was strongly associated with both self-perceived employability (H1.2EL) and empowerment (H1.2EW). The Singapore sample being studied consists of low-wage, low-educated workers,

who probably could not afford the items, such as Nintendo, PlayStation or Kindle devices, which were grouped into *Non-Instrumental ICT access* by the factor analysis. Conversely, *Instrumental ICT access* devices, such as smartphones and laptops, were found to be important to workers, to provide social mobility and psychological empowerment.

Policy contributions. Not all residents in Singapore are equally affected by access to devices, because of the country's high degree of income inequality. Improving *Instrumental ICT device access* for lower-income households, by way of economic subsidies or cash transfers, may help these members of Singaporean society achieve positive benefits from device access. As an example: the Infocomm Media Development Authority of Singapore (IMDA) initiated a series of funding schemes to provide targeted assistance⁶, to help 6,000 school-age children from low-income families. They were given new computers, as were senior citizens and the disabled community so that they can experience high-speed internet access at home (Infocomm Media Development Authority Singapore, 2016). However, this opportunity to access ICT, came with pre-requisite conditions attached; for example, household income ceiling (Infocomm Media Development Authority Singapore, 2016). As one forum writer, Tay (2014) found, the qualifying monthly household criteria which was set at S\$2,700 to S\$3,000 (US\$2,147), is too low to reach most of the vulnerable participants. Tay's point is a valid one as half of the respondents of study in this thesis reported household incomes which were 50 percent lower than the national average monthly wage of S\$8,666 (US\$6,370). Clearly, a lot of children from households which are hovering just beyond the income ceiling, would miss out on this programme! Policy-makers can do better to use more than just income criteria when providing the cash transfers to help households gain access to ICTs.

ICT usage's correlation with self-perceived Employability and Empowerment

The results also show divergence when it comes to ICT usage's correlation on both the dependent variables; employability and empowerment. Previous research findings from the literature had created an expectation that both *Higher-Order ICT usage* and *Production ICT usage* will be positively associated with self-perceived employability and that, conversely, the more informal usage variables such as *Lower-Order ICT usage* and *Consumption ICT usage* will be tied to self-perceived empowerment. Instead, *Higher-Order ICT usage* is significantly correlated with both the participant's employability and

⁶ The S\$8million (US\$5.7m) Digital Inclusion (DI) Fund.

empowerment. The utility of the sub-factor, *Consumption ICT usage*, was conspicuously absent from both models, especially so when self-perceived empowerment is the dependent variable. From the initial descriptive statistics, its higher frequency usage, had hinted that playing games and listening to music on their devices might influence the participants' sense of self-efficacy. One interpretation might be that the Singapore participants recognise the ineffectualness of *Consumption ICT usage* for realising more productive lives, even though they use it frequently as a leisure tool/pastime. This phenomenon agrees with Arora and Rangaswamy (2013)'s comments, when considering the individual's current new media practices, we need to also examine the implications and impacts of ICTs as leisure tools for the participants. As in the case before ICTs became widely accepted useful tools, devices were often learnt and explored through leisure, as was the case for analogue radio and television in its early days (Arora & Rangaswamy, 2013, p.900). In this study, at this second stage of the digital inequality, the *working poor* could still be in the process of grasping the utility of *Consumption ICT usage* before eventually associating its value with more productive outcomes such as employability.

ICT appropriation's correlation with self-perceived Employability and Empowerment

The results in the regression models for ICT appropriation is also not completely expected, given the literature review on the digital divide. ICT appropriation is the highest level in the hierarchy of the individual's digital assets, and it was expected that the *Formal ICT appropriation*, which statements were worded for job-seeking related activities, would correlate positively with self-perceived employability, while *Informal ICT appropriation* statements which are designed to describe social networking and connections, were expected to validate the participant's accreditation of psychological empowerment to ICT usage. However, the findings revealed that both *Formal* and *Informal ICT appropriation* were correlated with both self-perceived employability and empowerment. This indicates that the participant's attribution of their uses of ICT, are for the purposes of both economic and non-economic well-being. The results support statements by scholars such as Humphreys, Von Pape, and Karnowski (2013) that one's appropriation of ICTs, in everyday life, transcends mere physical access and usage of the ICT devices, and they differentiate between owning the technology and using it. Furthermore, the usage of ICTs for strengthening social networks validates Selwyn (2004)'s observation that the "success of many people's engagement with ICT is also highly influenced by their social capital" (p.353). In other words, social capital influences an individual's capability in using ICTs (DiMaggio & Hargittai, 2001).

The Digital Divide Paradigm – evolution from Device to User-focused

Inequality will continue to be a defining feature of digital divide research in years to come, especially in developed countries. This investigation offers evidence that how the working poor in a developed country access, use and appropriate technology, may be correlated to their personal well-being. To re-cap, a visual graphical summary of the hierarchical regression of ICT access, usage and appropriation sub-factors on the individual's self-perceived empowerment is presented in Figure 8 (DV: Employability) and Figure 6 (DV: Empowerment) below. As highlighted in the previous section on the summary of the regression analyses, the key to overcoming inequalities is to focus on ICT usage and appropriation, rather than ICT access. As ICT innovations advance rapidly, the way to examine the different patterns of ICT usage and appropriation needs to evolve quickly too, from the more common device-specific studies, to patterns of usage and appropriation (Lee et al., 2016). In this study, we found how the different categories of technology, e.g. Instrumental ICT device access to computers or Higher-Order ICT usage such as online banking, can point to different personal outcomes, where the choice of the technological access or usage can close or widen the divide (Hilbert, 2011). For example, to enhance one's sense of personal employability, it is more effective to roll out ICT skills training which enables the individual to develop Higher-Order ICT usage, which is found to positively correlate to self-perceived employability in this thesis. If non-economic well-being is the desired personal outcome, then enhancing computer or mobile device self-efficacy could be the better strategy, as seen in the hierarchical regression model for the self-perceived empowerment outcomes. Interventions to smooth out digital inequality need to also consider the constituent's personal demographic and socio-economic factors. According to Wirth et al. (2008)'s Mobile Phone Appropriation model, the individual's behaviours influence the usage of the ICT. And ICT behaviours are shaped by one's demographic and socio-economic factors (Hsieh, Rai, & Keil, 2008). When entered as an individual control variables, certain key personal factors are found to be associated with the Singapore participants' sense of well-being (see Table 23 and Table 29 on p.108 and p.119, Chapter 7 – Regression Analyses).

Racial inequality and jobs anxiety. Freeman, Penner, Saperstein, Scheutz, and Ambady (2011) posit that an improvement in one's class situation, e.g. having more money or status, affects one's racial segregation, suggesting that social and contextual factors guide racial discrimination and hence, racial inequality. In some circumstances, the social standing of a group can change, and all members of that group may advance to greater (or less) power,

status, or money. In the Singapore context, during the 19th century, Chinese immigrants often faced abuse and discrimination from their colonial British rulers (Lee, 1991). Today, the Singaporean descendants of those Chinese immigrants are the dominant ethnic group, and as such, experience little, if any, racial discrimination now. The findings show that the Chinese participant's anxieties about jobs are consistently higher than other races, across ICT access, usage and appropriation.

In Vanhercke et al. (2014)'s paper, the scholars explain that one's perceived employability is affected by the individual's perception of employment opportunities also, for example, the number of available and good quality jobs. As the dominant ethnic group, the Singaporean Chinese have higher expectations of better quality jobs in the labour market, what scholars term as the 'Chinese privilege' (Tan, 2017). In this sense, a lower perceived employability by the Chinese Singaporean could be due to his or her subjective perception of shrinking higher or middle-income good jobs.

Policy-makers in developed democracies will need to recognise and continually address the ethnic majority's insecurities about diminishing middle-class jobs (Williams, 2016), in order to prevent a backlash of class anger during crucial national political events (Ramakrishnan, 2016).

Income inequality and skill-biased technological change. The income effect on employability was evident at the higher levels of *ICT usage* and *appropriation*, where respondents in the higher income bracket reported lower perceived employability. This contrasts with the Mathew Effect (Rigney, 2010) of personal cumulative advantage -- where we expect that individuals who already have a larger amount of resources at their disposal will be able to benefit the most from the capacities and opportunities of these digital media (van Dijk, 2017). For the Singapore sample, respondents in the higher income brackets, despite having better financial means to obtain higher-order ICT assets, reported lower self-perceived employability. As explained by van Dijk (2017), the gap exists due to unequal practices and applications at the ICT Usage level, where knowledge of the applications transcends the initial access gap. Advanced ICT applications, for example, may be difficult for the higher-income users but possessing only average skills (van Dijk, 2017). Hence, it is possible that automation, which requires higher-order skillsets, may have forced many middle-income workers who do not have the required skills capital, to take up lower-paying roles (Holzer, 2011), thus amplifying their job insecurity.

Age inequality and psychological empowerment. When ICT appropriation was entered in the hierarchical regression model for the dependent variable of self-perceived

empowerment, the correlation of age on self-perceived empowerment was significant. The younger workers feel less empowered than their older colleagues, despite previous studies of age discrimination against older workers (Green et al., 2013) indicating that it should be the contrary. Tunstall, Lupton, Green, Watmough, and Bates (2012) highlight that older people, who have more developed social contacts, may have more effective life coping strategies than their younger counterparts. This suggests that Granovetter (1983)'s thesis of interpersonal ties still bears relevance within the context of ICT usage and empowerment in urban cities. Future research can expand this hypothesis, by investigating the intersection of higher-order ICT digital divides on empowerment and social capital.

Perceived deprivation as compared to effectual vulnerabilities. The focus for this thesis, is based on the individual level of self-perception, in accordance to the psychological approach to employability. As contended by Fugate et al. (2004), a higher perceived employability does not automatically mean that the individual will have better jobs, even though studies such as the one done by Caricati et al. (2016) showed that perceived employability is positively associated with employment rate. At the individual-level, objective measures such as employment status are deemed more robust as key indicators for social outcome (Vanhercke et al., 2014). In their study, which examined a sample of 2,087 students in an Italian university, Caricati et al (2016) found that the participants' own view of their level of employability is proportional to their eventual placement in the job market after graduation.

Psychologists, on the other hand, have found that self-perceptions are important, as individuals tend to act based on their perception, rather than on objective reality (Roskies & Louis-Guerin, 1990). This is also in line with Sen (1999)'s notion of agency, where the individual, instead of the employer, holds the most responsibility over his or her career (Garrido et al., 2009). In this vein, this thesis deals with agency and not so much as effectual opportunities, which also suggests a key limitation of using Sen's capability approach as an overarching theoretical frame. The capability approach to equality is framed in terms of individual freedom, but not the individual's affiliation to society (Dean, 2009). The focus, as such, is on individual liberty, not social solidarity – where the individual is objectively distanced from the relations of power which opportunities are offered to her. For example, employment opportunities are also dependent on the labour market, or the “space of commodities” (Dean, 2009, p.5), where good and services transact. The capability approach, as Dean (2009) argues, neglects the dependency of the society or market, where such spaces contribute to the effectual opportunities for the individual to enjoy liberty.

In this thesis, the participants' actual job placement in the labour market is unlikely to be quantitatively captured given the limitations of the self-reported survey methodology used in this study. To address this limitation, the findings would be stronger if it can be combined with qualitative data, i.e. in-depth interviews which could provide better insights to describe the livelihood outcomes of the individuals.

Future research may deploy more objective measurement of opportunities. For example, to measure the quantity and quality of employment, in addition to self-perceived employability, or actual participation in community activism, instead of self-perceived empowerment (Green, 2014). By doing so, it can connect the strength of their associations with personal outcomes better.

Addressing skill-biased technological change in the AI world

The future of work. Based on the above findings (of the correlations between the individual control factors and ICT access, usage and appropriation), possible policy recommendations are needed to address residents' anxieties, by constantly sharpening their digital literacies to sustain their employability and to keep pace with technological changes.

There is good reason for constituents to express pessimism about AI taking away jobs, as what the Luddites textile workers had protested against factory mills in the 1800s (Hill, 2014). On the other hand, history has shown that there is cause for optimism -- technological change had created more jobs than it destroyed (McClelland, 2016). For example, jobs such as "home tutors, travel agents, tax preparers, office and home assistants, health coaches, chauffeurs and general physicians" are predicted to be replaced by robots and AI within the next five years (Krishna, 2017, p.4). Economists also believe that some of the jobs that robots can replace are not good jobs in the first place, espousing that AI and automation can free us to pursue careers that give us a greater sense of meaning and well-being (Kessler, 2016).

The premise for such arguments, however, lies in whether we can weather the painful transition and be re-skilled for high-skilled jobs which require higher levels of training and education (McClelland, 2016). These will be the jobs which are related to programming, robotics and engineering, which are needed to improve and maintain the AI, for example in areas like "user experience, cloud-native development and industrial IoT (Internet of Things), Big Data, Analytics and Automation" (Krishna, 2017, p.4). Making huge changes to our pre-employment education system and providing means for adult workers to re-skill can help mitigate the pain of transition (McClelland, 2016). Governments will need to set the

framework by overhauling the entire pre-employment education system and in-employment adult skills training (McClelland, 2016). Companies also have the obligations to re-qualify current workers through re-skilling as cited by Joe Kaeser, the Siemens chief executive who approves US\$600million annually to reskill Siemen's employees (Goh, 2018).

The other side of the painful transition is whether people can accept the low-skill jobs which will be retained because there is less incentive for employers to robotize these tasks given that there are still a lot of humans willing to do these jobs for low wages (Manjoo, 2011). These are jobs which are physically demanding and require face-to-face interactions with other humans, e.g. food service, janitorial work, gardening, home-nursing aides, and childcare (Manjoo, 2011).

Some economists are arguing for a universal basic income to cater for the impending technological unemployment (or under-employment), but its predicted emancipatory effects are still being debated (Nieswandt, 2016). Should such universal basic income indeed become a reality, future digital divide research will need to examine how such a system pans out under the guidance of Sen's capability approach.

The future of skills. While core skills such as critical thinking, reading and writing will still be important, individuals with only such skills will not be adequately equipped for the digital future (Deloitte, 2017). Individuals will need to acquire more advanced competencies such as creativity, and social intelligence, to have an advantage over machines, for human creativity can solve complex problems that require non-standard solutions (Deloitte, 2017). While algorithms and robots can reproduce certain aspects of human interaction, they are not well equipped to identify human emotions and react appropriately (Deloitte, 2017). Social intelligence will still be needed.

On top of these skills, individuals will need to upgrade their IT competencies, from simply learning how to use digital devices to understanding the ways in which digital technology works and the organisation and structuring of data, to foster competencies in systems analysis, systems evaluation and programming (Deloitte, 2017).

Employees will need to train for more than one occupation in their lifetime of work, as automation will involve the loss of jobs that comprise mainly routine tasks (Deloitte, 2017). Businesses will need to train their workforce to equip employees with highly specialised skills (Wilson et al., 2017). IT business solutions provider such as India's Infosys is also designing programmes to help middle-level managers keep pace with the technological change and move towards a highly collaborative business environment (Krishna, 2017). For the policymakers, enhancing basic education and vocational education to

include advanced IT skills will be a key step (Deloitte, 2017). Besides employers and policymakers, there are also opportunities for private learning institutions to move to the supply side of higher-order ICT skills, beyond traditional institutions such as schools and universities. Private training schools, such as General Assembly, which started in mid-town Manhattan in 2011 (General Assembly, 2016), demonstrates that the marketplace of private training providers is a viable method of filling existing skills gaps more quickly. In this context and in line with Sen's agency approach -- middle-level managers who are used to earning a comfortable middle-income, also need to take on personal agency to seek out continuous learning opportunities, acquire the new skills fast, as their roles come under increasing pressures (Krishna, 2017). Some of the technologies that such managers should reskill for are "Machine Learning, Natural Language Processing (NLP), Python, Java, open source technologies and Computer Generated Imagery (CGI)" (Krishna, 2017, p.7). In terms of promoting personal agency, the CEO of ZohoCorp in Chennai, advised that "employees should keep in mind that if they are working for a CEO or a corporation that does not believe in reskilling them, they must quit before they are sacked!" (Krishna, 2017, p.7).

Technology inventions had often, optimistically predicted the betterment of human well-being. Two major technological revolutions of the industrial age – the Gutenberg printing press in 1440 and the invention of a more efficient Steam engine by James Watt in 1775 suggested that literacy and manufacturing would be the future.

However, centuries after these innovations, large sections of this world remain illiterate and/or engaged in low-productivity subsistence living. The same predictions may be true of the advent of AI (Surowiecki, 2017). Based on the Singapore sample, just by enabling some marginal IT skills training will **not** be able to address the precarious conditions of the vulnerable-unemployed or under-employed in the AI-based economy. For the majority, however, on-going technological innovations remain at best at the periphery of their daily lives (Surowiecki, 2017). Nonetheless, we should still try to prepare the majority, as what Alexander (2018) said, to "turn our lives into one long hustle to keep our heads above the incoming tide and whatever it might wash in" (p.7). This is because morally, it is better than sitting around and not doing anything.

Governments can affect social justice by enabling more of such speed-to-market training and solution providers, through subsidies or tax incentives. This will patch skills gaps caused by quickly-evolving skill-biased technological change. Everyone, including governments, educational institutions and employers, needs to support lifelong learning for workers to adapt.

The changing meaning of work. While Sen emphasises practical functional capabilities, such as the ability to engage in meaningful and fulfilling work (Sen, 1999), having a job fulfils many of our key drivers of well-being such as social status, social relations, daily structure and self-actualisation (Schneider, 2009). When a worker loses her job, her mental health can suffer, not only from the stress of needing to pay for basic needs (Mittag & Schwarzer, 1993), but the loss of a career identity can affect her mental well-being as well (McArdle et al., 2007).

As jobs are lost and replaced by new jobs due to AI, the concern of “fear” is due to its short-term impact, and focusing on re-skilling and technological education can help workers stay relevant and find fulfilling work (Krishna, 2017, p.5). Corporations, which have been around for two centuries, and had been known as the primary creator of jobs will run out of skilled workers and yet fail to produce enough jobs to provide those who want to work within the traditional definition of jobs (Goings, 2016). Without the strict hierarchies, corporations are just a collection of people engaged in collaborative efforts, and it is this collaboration, without the confined structure of corporations, that encourages entrepreneurship (Goings, 2016). Industry observers also posit that AI will free the worker from menial and repetitive tasks, thereby finding greater self-efficacy in other more fulfilling jobs (qz.com, 2017).

Governments, businesses and the individual workers themselves need to spot the opportunities created by the technological disruption and thrive beyond jobs and beyond corporations, while in the process, achieving personal functionings and agency. Perhaps workers can find personal self-efficacy by becoming micro-entrepreneurs (Goings, 2016).

This being said, the advent of AI had occurred after Sen’s capability approach and the current literature is therefore lacking theoretical discussions on how the concept of agency, functionings and finding fulfilling work will be impacted in the future of work. It is expected that future research will yield greater insights into these significant tension points.

Figure 8: Re-cap on the Hierarchical Regression model of ICT access, usage and appropriation on the individual's self-perceived *employability*

Figure 9: Re-cap graphical representation of the Hierarchical Regression model of ICT access, usage and appropriation on the individual's self-perceived *empowerment*

Theoretical contributions – ICTs' hierarchy of effects

ICT is not a silver bullet to fix the inequality problem. Even though the results of this study appear to show a strong correlation to the outcomes of personal well-being, when ICT appropriation is positively associated with employability and empowerment. Scholars such as Millard (2015) caution against a one-size-fits-all approach. ICT solutions to address

inequality will depend largely on the context and the level of an individual's digital achievements. The broad research question is recapitulated below:

BROAD RQ: Do ICTs have a positive or negative impact on the well-being of the individual? If yes, what is the association of ICTs on economic and psychological well-being?

From ICT access to usage

The possession of technological assets, i.e. *Instrumental* and *Non-Instrumental ICT access*, helps people to become empowered with the creation and possibly dissemination of their own informal media innovations (Bivens, 2014). This idea alleviates the individual from being a passive media consumer, who was previously just viewing or enjoying the creative paraphernalia of others (Jaw & Chen, 2007). In the simple regression, when the ICT access factors was first inserted into the model for both dependent variables of perceived employability and empowerment, *Instrumentality of ICT device access* was positively correlated to self-perceived empowerment and employability, over individual control factors such as ethnicity, age or income. As highlighted in Chapter Five (Factor Analyses), *Instrumental devices* for the Singapore sample refers to access to devices such as laptops and smartphones. These are ICTs which are generally for purposes of income generation and personal productivity. Here, we find that one's purposes towards ICT access may be positively associated with eventual personal well-being.

This is in agreement with Kolko and Racadio (2014)'s study where researchers found that their participants, who used ICT largely for non-instrumental purposes, were similarly capable to those who utilised technology for instrumental purposes. Future policy decisions in Singapore need to consider *what* types of emerging ICTs should be made available as well as *where* and *how* people access communication technologies. This is because current policies that concerns software and tool-centred definitions of devices does not always correspond to "*serious*" or "*worthwhile*" uses of technology (Kolko & Racadio, 2014, p.47).

From ICT usage to appropriation

What Kolko and Racadio (2014) termed serious or worthwhile usage is also akin to the *Higher-order* and *Production ICT Usage* factors derived in this study. Participants who receive formal or informal training for *Higher-order ICT usage* activities, for example, creating spreadsheets and documents, are generally done through structured training and formal appropriation. On the other hand, *Lower-order* ICT usage, such as watching videos and listening to music, are primarily learned through informal training or from friends

(Bivens, 2014). This is also the case in Singapore where workers seek formal training to gain *Higher-order ICT* skills, that offers higher perceived payoffs for improving their occupational specialisations or income level.

Policy contributions. While formal ICT appropriation may improve the self-perceived employability and empowerment of workers, it has a limited benefit in situations, in this new post-industrial work world, where training becomes obsolete quickly. It is therefore important to address the technological disruption in the work environment, when developing national-level ICT training. Policy makers will do well to look out for a more granular level of categorisation for the skills required to use technology. These detailed bite-sized, stackable ICT skills are what Niederman and Ferratt (2006) consider sustainable skills for workers in the post-industrial society.

The Digital Divide and Future Research

Given the recent socio-political changes in the developed world, the phenomenon of social-inequality in developed cities is bound to surface in future digital divide research. Given this trajectory, technology's role in reducing inequality is still open for discussion; as scholars begin to better appreciate the appropriation of technology in the digital divide field.

Limitations of current research

Notwithstanding, in the quest for information robustness, it is possible to over-rely on numbers only. Future research may employ an iterative mixed methods research process that includes in-depth, or semi-structured interviews. The inclusion of qualitative methods which could provide better insights to explain the correlation of some of the variables. For example, the sub-factors of ICT usage offer a rich plethora of research direction on understanding why the usage of ICTs are split into four categories.

The thesis also does not examine the correlations between ICT usage, social capital and self-perceived employability and empowerment. This is because one's social networks has been posited to be a crucial conversion factor for ICT impacts on well-being, having been extensively discussed in the literature (Hampton & Wellman, 2003). The concept would be clearly linked to Informal ICT appropriation and consumption ICT usage (Gaved & Anderson, 2006), as alluded in the hierarchical regression results. In addition, the Singapore sample consists of unemployed and under-employed participants, which suggests that Informal ICT appropriation may be more easily available to this sub-group. On the other hand, gainfully employed participants would be engaging in more Formal ICT appropriation

at their workplace (Dey et al., 2011). This is an important reflection and limits the generalisability of the research to employed populations. Future research should include a comparison against employed participants to enhance the utility of the findings.

ICT's impact on outcomes as a recursive loop. This study considers the direction of causality of ICT access, usage and appropriation on the individual's perceived employability and empowerment, based on the signpost from the current scholarship on digital divide frameworks, such as Selwyn (2004)'s model. It does not however, consider the reverse trajectory, for example, whether the current level of the individual's perceived employability and empowerment, which are largely situated in socio-economic contexts, may have influenced ICT access, usage and appropriation. Future scholarship may consider the examination of how well-being drives ICT practices, thus generating an even stronger contribution to the field.

In summary, this thesis offers alternative socio-economic outcomes, using self-perceived employability and empowerment variables, as viable non-economic measures of ICTs' impact on personal well-being. The examination of the relationships between workers, self-efficacy, individual demographic differences and capabilities in ICT access, usage and appropriation, reveal that ICT assets and usage are valuable for personal well-being outcomes. It is hoped that these findings and their implications will extend the field's knowledge of the complexities and intricacies of the digital divide. The thesis' findings may also lead to policy recommendations to improve the capabilities of the marginalised sections of society, by addressing material access, skills and higher-order appropriation simultaneously.

APPENDICES

Appendix A

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25 September 2015

Associate Professor Arul Indrasen Chib

Wee Kim Wee School of Communication and Information

NTU INSTITUTIONAL REVIEW BOARD APPROVAL

Project Title: ICTs for employability and empowerment: An analytical framework for addressing the digital divide in urban livelihoods

I refer to your application for ethics approval with respect to the above project.

The Board has deliberated on your application and noted from your application that your research involves collecting behavioural data from participants through survey and interviews.

You have also confirmed that informed consent will be obtained from the participants and you have guaranteed the confidentiality of your participants' biodata obtained from them.

The documents reviewed are:

- a) NTU IRB application form dated 01 September 2015
- b) Participant information sheet and consent form: version 1 dated 01 September 2015
- c) Data collection form: version 1 dated 01 September 2015

The Board is therefore satisfied with the bioethical consideration for the project and approves the ethics application under Expedited review. The approval period is from 25 September 2015 to 24 September 2016. The NTU IRB reference number for this study is IRB-2015-09-004. Please use this reference number for all future correspondence.

The following protocol and compliances are to be observed upon NTU IRB approval

1. All research involving procedures greater than minimal risk on minors (individuals who are less than the legal age of 21 years old) requires IRB approved written Parental Consent and assent from the participant to be obtained before any research protocols can be administered. Minimal risk refers to an anticipated level of

harm and discomfort that is no greater than that ordinarily encountered in daily life, or during the performance of routine educational, physical, or psychological examination.

2. Only the approved Participants Information Sheet and Consent Form should be used. It must be signed by each subject prior to initiation of any protocol procedures. In addition, each subject should be given a copy of the signed consent form.
3. Consent forms are important documents therefore they should be stored in the strictest arrangement. Loss of consent form would result in disciplinary action.
4. No deviation from, or changes of, the protocol should be initiated without prior written NTU IRB approval of an appropriate amendment.
5. The Principal Investigator should report promptly to NTU IRB regarding:
 - a. Deviation from, or changes to the protocol.
 - b. Changes increasing the risk to the subjects and/or affecting significantly the conduct of the trial
 - c. Any serious adverse events (SAEs) which are both serious and unexpected.
 - d. New information that may affect adversely the safety of the subjects of the conduct of the trial.
 - e. Completion of the study.
6. Continuing Review Request/ Notice of Study completion form should be submitted to NTU IRB for the following:
 - a. Annual review: Status of the study should be reported to the NTU IRB at least annually using the Continuing Review Request/ Notice of Study completion form.
 - b. Study completion or termination: Continuing Review Request/ Notice of Study completion form is to be submitted within 4 to 6 weeks of study completion or termination.
7. All Principal Investigators should comply with existing legislation that would have an impact on the domain of their research.

Professor Lee Sing Kong,
Chair, NTU Institutional Review Board

cc Chair, Wee Kim Wee School of Communication and Information
Members, NTIJ Institutional Review Board

Appendix B

PARTICIPANT'S CONSENT FORM																					
<p>Study Title: ICTs for employability and empowerment: An analytical framework for addressing the digital divide in urban livelihoods</p>																					
<p><i>Risk</i></p> <ul style="list-style-type: none"> In this study, there is no risk beyond that encountered in daily life. <p><i>Benefit</i></p> <ul style="list-style-type: none"> There will be no direct benefit to you from participating in this study. However, the information that you provide will help our researchers understand how best to improve ICT access and usage for employability and empowerment enhancement. <p><i>Confidentiality</i></p> <ul style="list-style-type: none"> The information you provided in the survey questionnaire today will remain completely confidential: your name will not be used nor any other information that could be used to identify you. <p><i>Contact</i></p> <ul style="list-style-type: none"> If you have further questions regarding this study, please contact the Supervisor (Principal Investigator), Associate Professor Arul Indrasen Chib, of Wee Kim Wee School of Communication and Information, College of Humanities, Arts, & Social Sciences, Nanyang Technological University, at Tel: 65148390, Email: arulchib@ntu.edu.sg or the Student (Co-Investigator), Ms. Yvonne Loh at Tel: 97980766, Email: yvon0013@e.ntu.edu.sg. If you have concerns or questions about the research ethics of this study, please contact the NTU IRB secretariat at IRB@ntu.edu.sg. <p><i>Right to refuse or withdraw</i></p> <ul style="list-style-type: none"> It is your right to refuse to take part in the survey questionnaire today and that if you choose to refuse you do not have to give a reason, and that it will not prejudice the training and employment intervention/s from e2i that you can expect to receive now, or in the future. <p><i>Participant's Declaration</i></p> <p style="text-align: right;">Please circle response:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 75%; padding: 5px;">I agree to take part in the above study.</td> <td style="width: 12.5%; text-align: center; padding: 5px;">Yes</td> <td style="width: 12.5%; text-align: center; padding: 5px;">No</td> </tr> <tr> <td style="padding: 5px;">I have been advised that the data/content of the survey questionnaire will be used for research purposes only.</td> <td style="text-align: center; padding: 5px;">Yes</td> <td style="text-align: center; padding: 5px;">No</td> </tr> <tr> <td style="padding: 5px;">I consent to the publication of the survey results, so long as they are presented in a manner that does not identify me.</td> <td style="text-align: center; padding: 5px;">Yes</td> <td style="text-align: center; padding: 5px;">No</td> </tr> <tr> <td style="padding: 5px;">I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason and without penalty.</td> <td style="text-align: center; padding: 5px;">Yes</td> <td style="text-align: center; padding: 5px;">o</td> </tr> </table> <p><i>Signature of participant</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 33%; text-align: center; padding: 5px;">NAME (in capital letters)</th> <th style="width: 33%; text-align: center; padding: 5px;">SIGNATURE</th> <th style="width: 33%; text-align: center; padding: 5px;">DATE OF SIGNATURE (in DD/MM/YYYY)</th> </tr> <tr> <td style="height: 40px;"></td> <td></td> <td></td> </tr> </table>				I agree to take part in the above study.	Yes	No	I have been advised that the data/content of the survey questionnaire will be used for research purposes only.	Yes	No	I consent to the publication of the survey results, so long as they are presented in a manner that does not identify me.	Yes	No	I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason and without penalty.	Yes	o	NAME (in capital letters)	SIGNATURE	DATE OF SIGNATURE (in DD/MM/YYYY)			
I agree to take part in the above study.	Yes	No																			
I have been advised that the data/content of the survey questionnaire will be used for research purposes only.	Yes	No																			
I consent to the publication of the survey results, so long as they are presented in a manner that does not identify me.	Yes	No																			
I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason and without penalty.	Yes	o																			
NAME (in capital letters)	SIGNATURE	DATE OF SIGNATURE (in DD/MM/YYYY)																			

Appendix C

The 2016 pilot study. Besides helping the researcher to anticipate logistical challenges for the main study in e2i, the initial (n=78) pilot study also provided suggestions for improving the scale validity of the ICT scales. The 2016 pilot study on a group of Nanyang Technological University students (n = 194), held 22 February to 23 March 2016 had more scales for ICT access, usage and appropriation. Students from Nanyang Technological University were invited to participate in the survey for extra credit. The researcher posted the ad on the school's portal. In total, 194 surveys were completed and turned in for factor analysis. The participants' age range from 21 –54 years old (mean = 21-24 years old). 89.46% were female. All the participants were students, with the average education years the participants received was 13 years. A confirmatory factor analysis (Jöreskog, 1969) of the ICT access, usage and appropriation scales used in the 2016 pilot study were derived using structural equation modelling techniques (Acock, 2013).

Results of the CFA. The final 8-factors CFA model for the ICT assets of Access, Usage and Appropriation helped to specify the number of factors required for each measurement and which measured variable was related to which latent variable, e.g. Production ICT usage was correlated to Formal ICT Appropriation (see Table C 34).

Table C 34: Model Fit Summary. For the ICT assets of ICT Access, Usage and Appropriation

Fit Indices	Model	Recommended cut-off
Root mean squared error of approximation (RMSEA)	.055	<.05 to .08
Comparative Fit Index (CFI)	.875	.90
Root mean squared residual (RMSR)	.111	<.08

RMSEA. The RMSEA of .055 indicated that the ICT Access, Usage and Appropriation measurement model derived from the 2016 pilot study is of a good fit, which means that there is no unnecessary added complexity or correlated errors.

CFI. The CFI compared this model with a baseline model that assumes there is no relationship among the observed indicator variables. The CFI .875 indicated that this model does 87.5% better than a null model in which the items are assumed to be unrelated to each other.

SRMR. On average, the model came within .111 of reproducing each correlation among the nine indicators. Even though the RMSR is higher than the recommended cut of

point of .08 by Hu and Bentler (1999), the higher SRMR is not a serious measurement issue which will impede the model's optimal performance (p.11, Hu & Bentler, 1999). Table C 35 and Table C 36 below briefly surmise the model fit summaries of the Employability Model as well as the Empowerment Model. Both models are considered of good fit, by the following key goodness of fit indices displayed below:

Table C 35: Model Fit Summary. For the 5-factors Employability Model

Fit Indices	Model	Recommended cut-off	Remarks about Employability Model
Root mean squared error of approximation (RMSEA)	.046	<.05 to .08	Very good fit.
Comparative Fit Index (CFI)	.948	.90	Good fit
Root mean squared residual (RMSR)	.093	<.08	Higher than recommended cut-off point.

chi2(363) = 512.67, Prob > chi2 = 0.0000

Table C 36: Model Fit Summary. For the 3-factor Empowerment Model

Fit Indices	Model	Recommended cut-off	Remarks about Empowerment Model
Root mean squared error of approximation (RMSEA)	.068	<.05 to .08	Good fit.
Comparative Fit Index (CFI)	.930	.90	Good fit
Root mean squared residual (RMSR)	.084	<.08	Slightly higher than recommended cut-off point.

chi2(96) = 183.20, Prob > chi2 = 0.0000

In all, the 2016 pilot study was a major intellectual exercise that helped confirm the measurement framework and provided confidence for the researcher to proceed to the main study in e2i, to be held April – May 2016.

Appendix D

Survey on Information and Communication Technology (ICT) Access, Usage & Appropriation for Employability and Empowerment

RESPONDENT INFORMATION

Racial or Ethnic Group

☐ Chinese	☐ Indian
☐ Malay	☐ Others

Nationality

☐ Singapore citizen	☐ Singapore permanent resident (PR)	☐ Non-residents, e.g. work permit, employment-pass, S-pass holders, student visa holders etc.

Gender

☐ Female	☐ Male

Age

- ☐ 21 – 24 years old
- ☐ 25 – 34 years old
- ☐ 35 – 44 years old
- ☐ 45 – 54 years old
- ☐ 55 – 64 years old
- ☐ 65 years or older

What is your highest attained education level?

- ☐ Lower Primary Education
- ☐ Primary Qualification, e.g. PSLE or equivalent
- ☐ Secondary Qualification, e.g. GCE "N" or "O" Levels or equivalent
- ☐ Post-Secondary Qualification, e.g. GCE "Advanced" ("A") Levels, or ITE Nitec or Higher Nitec, or equivalent.
- ☐ Polytechnic Diploma
- ☐ Bachelor degree from a University
- ☐ Postgraduate degree from a University, e.g. Masters or Doctoral degree.

What is your family's average monthly household income from work?

- ☐ \$1,000-\$2,999
- ☐ \$3,000-\$5,999
- ☐ \$6,000-\$8,999
- ☐ \$9,000-\$11,999
- ☐ \$12,000-\$14,999
- ☐ \$15,000-\$20,000 & above

ENGLISH LANGUAGE PROFICIENCY

Circle the number that best fits your judgment of your English language proficiency		Poor	Fair	Good	Very good	Excellent
1.	Reading proficiency	1	2	3	4	5
2.	Writing proficiency	1	2	3	4	5

EMPLOYABILITY (Ia)						
Circle the number that best fits to which degree have you engaged in the following activities in the last 3 months ?		Never	At least once a month	At least twice a month	At least 3 times a month	At least 4 times a month
3.	Went to various career orientation programmes?	1	2	3	4	5
4.	Obtained information on specific jobs or companies?	1	2	3	4	5
5.	Initiated conversations with knowledgeable individuals in my career area?	1	2	3	4	5
6.	Obtained information on the labour market and general job opportunities in my career area?	1	2	3	4	5
7.	Sought information on specific areas of career interest?	1	2	3	4	5

EMPLOYABILITY (Ib)						
Circle the number that best fits your personal agreement		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
8.	My career objectives are not clear *	1	2	3	4	5
9.	I have a plan for my career	1	2	3	4	5
10.	I have a strategy for achieving my career goals.	1	2	3	4	5
11.	I know what I need to do to reach my career goals.	1	2	3	4	5
12.	I change my career objectives frequently *	1	2	3	4	5

EMPLOYABILITY (II)						
Circle the number that best fits your personal involvement for the following		Not at all	A little	Some	A lot	Very much
13.	I am good at making friends	1	2	3	4	5
14.	I help other people	1	2	3	4	5
15.	I ask others if I can be of help	1	2	3	4	5
16.	I do nice things for people	1	2	3	4	5

EMPLOYABILITY (III)						
Circle the number that best fits your personal agreement regarding your <u>skills and qualifications</u>		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
19.	My level of education is sufficient for getting a job in my area of work	1	2	3	4	5
20.	My skills for doing the type of work I want to do are up-to-date	1	2	3	4	5
21.	I have a good work history	1	2	3	4	5
22.	An employer would be impressed with my qualifications	1	2	3	4	5
23.	I have good job reference	1	2	3	4	5
24.	My work qualifications are not very good *	1	2	3	4	5
25.	I need more training or education *	1	2	3	4	5

EMPLOYABILITY (IV)

Here are some statements which people have made about work and working, in general. Without limiting yourself to your present or previous job, would you indicate on this scale how strongly you agree or disagree with each comment in turn?		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
26.	Even if I win a great deal of money at 4D or ToTo, I would continue to work somewhere	1	2	3	4	5
27.	Having a job is very important to me	1	2	3	4	5
28.	I would hate to be on welfare, e.g. long-term Comcare etc.	1	2	3	4	5
29.	I would soon get very bored if I have no work to do	1	2	3	4	5
30.	The most important things that happen to me involve work	1	2	3	4	5
31.	If welfare benefits were really high, I would still prefer to work	1	2	3	4	5

EMPOWERMENT SCALE (I)

Circle the number that best fits your personal agreement regarding your <u>personal empowerment</u>		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
32.	I generally accomplish what I set out to do	1	2	3	4	5
33.	I have a positive attitude about myself	1	2	3	4	5
34.	When I make plans, I am certain to make them work	1	2	3	4	5
35.	I am confident about the decisions I make	1	2	3	4	5
36.	I am able to overcome barriers	1	2	3	4	5
37.	I feel I am a person of worth, at least on an equal basis with others	1	2	3	4	5
38.	I do not see myself as a capable person*	1	2	3	4	5
39.	I am able to do things as well as most other people	1	2	3	4	5
40.	I feel I have a number of good qualities	1	2	3	4	5

EMPOWERMENT SCALE (II)						
Circle the number that best fits your personal agreement regarding your <u>personal empowerment</u>		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
41	I feel powerless most of the time*	1	2	3	4	5
42	You can't fight the government*	1	2	3	4	5

EMPOWERMENT SCALE (III)						
Circle the number that best fits your personal agreement regarding your <u>personal empowerment</u>		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
43	People have a right to make their own decisions, even if they are bad ones	1	2	3	4	5
44	People should try to live their lives the way they want to	1	2	3	4	5
45	People working together can have an effect on their community	1	2	3	4	5
46	People have more power if they join together as a group	1	2	3	4	5
47	Working with others in my community can help to change things for the better	1	2	3	4	5

EMPOWERMENT SCALE (IV)						
Circle the number that best fits your personal agreement regarding your <u>personal empowerment</u>		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
48.	People are limited only by what they think possible	1	2	3	4	5
49.	I can pretty much determine what will happen in my life	1	2	3	4	5
50.	I am generally pessimistic about the future*	1	2	3	4	5
51.	Very often a problem can be solved by taking action	1	2	3	4	5

EMPOWERMENT SCALE (V)						
Circle the number that best fits your personal agreement regarding your <u>personal empowerment</u>		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
52	Getting angry about something is often the first step toward changing it	1	2	3	4	5
53	People should not get angry just because they don't like something	1	2	3	4	5
54	Getting angry about something never helps	1	2	3	4	5
55	Disturbing the status-quo never gets you anywhere*	1	2	3	4	5

ICT ACCESS (I)						
Circle the number that best fits your personal agreement regarding your types of Information and Communication Technology (ICT) device access since January this year		No Access	1 day per week	Between 2-3 days per week	Between 4-6 days per week	Every Day of the week
56	☐ Desktop personal computer (PC)	1	2	3	4	5

57	☐ Mobile computer, e.g. laptop, netbook	1	2	3	4	5
58	☐ Tablet / iPad	1	2	3	4	5
59	☐ Digital reader device, e.g. Kindle	1	2	3	4	5
60	☐ Gaming device, e.g. Xbox, Nintendo, PlayStation	1	2	3	4	5
61	☐ Television with internet access, e.g. Smart TV	1	2	3	4	5
62	☐ Smartphone with internet access, e.g. iPhone, Blackberry etc.	1	2	3	4	5
63	☐ Mobile phone without internet access, e.g. Nokia 100, 130 etc.	1	2	3	4	5

ICT ACCESS (II)						
Check the box (☐) that best fits your personal agreement regarding your place of internet access since January this year		No Access	1 day per week	Between n 2-3 days per week	Between n 4-6 days per week	Every Day of the week
64	☐ My own home	1	2	3	4	5
65	☐ Cyber café or Internet Café	1	2	3	4	5
66	☐ A relative's home	1	2	3	4	5
67	☐ A friend's home	1	2	3	4	5
68	☐ My workplace / place of study	1	2	3	4	5
69	☐ Community Clubs / Community Centres	1	2	3	4	5
70	☐ Public libraries	1	2	3	4	5

ICT USAGE (I)						
How often do you use your Information and Communication Technology (ICT) device/s to...		No Usage	1 day per week	Between 2-3 days per week	Between 4-6 days per week	Every Day of the week
75	Surf the Internet?	1	2	3	4	5
76	Send/read emails?	1	2	3	4	5
77	Access online news?	1	2	3	4	5
78	Send text messages?	1	2	3	4	5
79	Access social media, e.g. Facebook, Twitter?	1	2	3	4	5
80	Perform online-banking transactions?	1	2	3	4	5
81	Access online gamble sites, e.g. <i>singaporepools.com.sg</i> , to place bets?	1	2	3	4	5
82	Buy goods and services on-line?	1	2	3	4	5
83	Browse/surf the worldwide web for no specific purpose?	1	2	3	4	5
84	Play games?	1	2	3	4	5
85	Listen to music?	1	2	3	4	5
86	Watch videos?	1	2	3	4	5

ICT USAGE (II)						
How often do you use your Information and Communication Technology (ICT) device/s to...		No Usage	1 day per week	Between 2-3 days per week	Between 4-6 days per week	Every Day of the week
87	Write and edit letters, reports and other documents?	1	2	3	4	5
88	Look for products and services/gathering product information online?	1	2	3	4	5
89	Fiddle around on your ICT device/explore different parts of the device to develop your own knowledge?	1	2	3	4	5
90	Look for information related to work/business/study on the worldwide web?	1	2	3	4	5
91	Organise the ICT device's files/memory?	1	2	3	4	5
92	Create and manipulate images, e.g. photographs?	1	2	3	4	5
93	Download software, music, films or images from the Internet?	1	2	3	4	5
94	Create music?	1	2	3	4	5
95	Create films or animations or videos?	1	2	3	4	5
96	Participate in educational courses/lessons, e.g. <i>Coursera</i> , on the World Wide Web?	1	2	3	4	5
97	Make / maintain your own website product information?	1	2	3	4	5

ICT Appropriation (I)						
Circle the number that best fits your personal agreement regarding your Information and Communication Technology (ICT) usage		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
98.	Using ICTs will help me in my job search	1	2	3	4	5
99.	Having access to ICTs can help me get a job	1	2	3	4	5
100.	Obtaining ICT skills will not help me get a better job*	1	2	3	4	5
101.	I know how to subscribe to websites to find jobs	1	2	3	4	5
102.	I have filled out job applications online	1	2	3	4	5
103.	I have used ICTs to submit my resume/job application	1	2	3	4	5
104.	I do not know how to take online classes through ICTs *	1	2	3	4	5

ICT Appropriation (II)						
Circle the number that best fits your personal agreement regarding your Information and Communication Technology (ICT) usage		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
105.	Knowing about ICTs makes me feel as though I am "at the cutting edge"	1	2	3	4	5
106.	I am not confident in handling general problems around daily ICT applications*	1	2	3	4	5
107.	Through information provided by ICTs, I understand more about what is happening in society	1	2	3	4	5
108.	I feel that I am quite smart because I have learnt to use ICTs	1	2	3	4	5

ICT Appropriation (III)						
Circle the number that best fits your personal agreement regarding your Information and Communication Technology (ICT) usage		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
109.	Learning how to use ICTs creates more topics for me to communicate with others	1	2	3	4	5
110.	Learning how to use ICTs enables me to make more friends	1	2	3	4	5
111.	Learning how to use ICTs provides me with more ways to connect with overseas relatives and friends	1	2	3	4	5
112.	If I do not know about ICTs, I may become an outcast in society	1	2	3	4	5
113.	If I do not learn how to use ICTs, I may experience more inconvenience in my life	1	2	3	4	5

Appendix E – Additional Tables

Table 37: Item Statistics for the 15-items ICT Access scale

Variable	Label	Obs	Mean	Std. Dev.	Min	Max
AC_M1	Desktop personal computer (PC)	302	3.360927	1.599064	1	5
AC_M2	Mobile computer, e.g. laptop, netbook	302	3.741722	1.557166	1	5
AC_M3	Tablet e.g. Apple iPad, Samsung Galaxy Tab etc.	302	2.960265	1.71327	1	5
AC_M4	Digital reader device, e.g. Kindle	302	1.68543	1.256367	1	5
AC_M5	Gaming device, e.g. Xbox, Nintendo, PlayStation	302	1.403974	.9553404	1	5
AC_M6	Smartphone e.g. iPhone, Samsung, Blackberry etc. with internet connection.	302	4.139073	1.428424	1	5
AC_M7	Smartphone e.g. iPhone, Blackberry, Samsung etc. without internet connection.	302	2.377483	1.749197	1	5
AC_M8	Feature mobile phone e.g. Nokia 100, 130 etc., with internet connection	302	1.857616	1.506219	1	5
AC_M9	Feature mobile phone e.g. Nokia 100, 130 etc., without internet connection	302	1.483444	1.134504	1	5
AC_IN1	My own home	302	4.178808	1.364408	1	5
AC_IN2	Cyber cafe or Internet Café	302	1.5	.9975052	1	5
AC_IN3	A relative's home	302	1.668874	1.14539	1	5
AC_IN4	A friend's home	302	1.619205	1.137124	1	5
AC_IN5	My workplace	302	2.672185	1.750696	1	5
AC_IN6	My place of study	302	1.97351	1.529106	1	5
AC_IN7	Community Clubs / Community Centres	302	1.615894	1.143294	1	5
AC_IN8	Public libraries	302	1.728477	1.19486	1	5

Table 38: Principal-component factors analysis for ICT Access scale item (unrotated)

Factor analysis/correlation	Number of obs	=	302
Method: principal-component factors	Retained factors	=	4
Rotation: (unrotated)	Number of parameters	=	62

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	5.15932	2.58794	0.3035	0.3035
Factor2	2.57138	0.88669	0.1513	0.4547
Factor3	1.68470	0.63993	0.0991	0.5538
Factor4	1.04477	0.15428	0.0615	0.6153
Factor5	0.89049	0.03362	0.0524	0.6677
Factor6	0.85687	0.12470	0.0504	0.7181
Factor7	0.73216	0.10806	0.0431	0.7612
Factor8	0.62410	0.06339	0.0367	0.7979
Factor9	0.56071	0.01818	0.0330	0.8309
Factor10	0.54253	0.07936	0.0319	0.8628
Factor11	0.46317	0.03092	0.0272	0.8900
Factor12	0.43225	0.03788	0.0254	0.9154
Factor13	0.39437	0.03430	0.0232	0.9386
Factor14	0.36007	0.06286	0.0212	0.9598
Factor15	0.29720	0.08167	0.0175	0.9773
Factor16	0.21554	0.04516	0.0127	0.9900
Factor17	0.17037	.	0.0100	1.0000

Table 39: Rotated Factor Matrix from the Factor Analysis for ICT Access

Variable		Factor1	Factor2	Factor3	Factor4	Uniqueness
AC_M1	Desktop personal computer (PC)		0.5987			0.5178
AC_M2	Mobile computer, e.g. laptop, netbook		0.6999			0.3811
AC_M3	Tablet e.g. Apple iPad, Samsung Galaxy Tab etc.	0.4167				0.3539
AC_M4	Digital reader device, e.g. Kindle	0.5856				0.4608
AC_M5	Gaming device, e.g. Xbox, Nintendo, PlayStation	0.5552		0.4459		0.4887
AC_M6	Smartphone e.g. iPhone, Samsung, Blackberry etc. with internet connection.		0.7265			0.3978
AC_M7	Smartphone e.g. iPhone, Blackberry, Samsung etc. without internet connection.			0.4612		0.6275
AC_M8	Feature mobile phone e.g. Nokia 100, 130 etc., with internet connection			0.5482		0.3872
AC_M9	Feature mobile phone e.g. Nokia 100, 130 etc., without internet connection	0.4561		0.5901		0.2738
AC_IN1	My own home		0.7018			0.3972
AC_IN2	Cyber cafe or Internet Café	0.7036				0.4236
AC_IN3	A relative's home	0.7430				0.2796
AC_IN4	A friend's home	0.7808				0.2193
AC_IN5	My workplace	0.5169			0.4335	0.3877
AC_IN6	My place of study	0.6300			0.4055	0.3943
AC_IN7	Community Clubs / Community Centres	0.7716				0.2539
AC_IN8	Public libraries	0.7476				0.2955

Table 40: Alpha Reliability for the ICT Access Factor 1 - ICT Access Outside of Home

Items	S	it-cor	ir-cor	ii-cor	alpha	label
AC_M3	+	0.430	0.295	0.415	0.865	Tablet e.g. Apple iPad, Samsung Galaxy Tab etc.
AC_M4	+	0.589	0.477	0.386	0.850	Digital reader device, e.g. Kindle
AC_M5	+	0.549	0.429	0.393	0.854	Gaming device, e.g. Xbox, Nintendo, PlayStation
AC_IN2	+	0.714	0.626	0.363	0.837	Cyber cafe or Internet Cafe
AC_IN3	+	0.773	0.700	0.352	0.830	A relative's home
AC_IN4	+	0.807	0.743	0.346	0.826	A friend's home
AC_IN5	+	0.524	0.400	0.398	0.856	My workplace
AC_IN6	+	0.645	0.542	0.376	0.844	My place of study
AC_IN7	+	0.796	0.729	0.348	0.828	Community Clubs / Community Centres
AC_IN8	+	0.772	0.699	0.352	0.830	Public libraries
		Test scale	0.373	0.856	mean (standardized items)	

Variable	Obs	Mean	Std. Dev.	Min	Max
ICT Access Outside	302	1.882781	.8295427	1	5

Table 41: Alpha Reliability for the ICT Access Factor 2 - Instrumental ICT Access

Items	S	it-cor	ir-cor	ii-cor	alpha	label
AC_M1	+	0.717	0.491	0.514	0.760	Desktop personal computer (PC)
AC_M2	+	0.796	0.614	0.433	0.696	Mobile computer, e.g. laptop, netbook
AC_M6	+	0.771	0.574	0.458	0.717	Smartphone e.g. iPhone, Samsung, Blackberry etc. with internet connection
AC_IN1	+	0.799	0.619	0.430	0.693	My own home
Test scale				0.459	0.772	mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
Instrumental ICT Access	302	3.855132	1.144972	1	5

Table 42: Alpha Reliability for the ICT Access Factor 3 - Non-Instrumental Access

Items	S	it-cor	ir-cor	ii-cor	alpha	label
AC_M7	+	0.664	0.279	0.515	0.680	Smartphone e.g. iPhone, Blackberry, Samsung etc. without internet connection.
AC_M8	+	0.742	0.402	0.341	0.509	Feature mobile phone e.g. Nokia 100, 130 etc., with internet connection.
AC_M9	+	0.830	0.566	0.144	0.252	Feature mobile phone e.g. Nokia 100, 130 etc., without internet connection.
		Test scale	0.333	0.600	mean (standardized items)	

Variable	Obs	Mean	Std. Dev.	Min	Max
Non-Instrumental ICT Access	302	1.906181	1.079538	1	5

Table 43: Alpha Reliability for the full ICT Access Factor

Items	S	it-cor	ir-cor	ii-cor	alpha	label
AC_M3	+	0.484	0.393	0.244	0.838	Tablet e.g. Apple iPad, Samsung Galaxy Tab etc.
AC_M4	+	0.594	0.515	0.236	0.832	Digital reader device, e.g. Kindle
AC_M5	+	0.564	0.481	0.238	0.834	Gaming device, e.g. Xbox, Nintendo, PlayStation
AC_IN2	+	0.630	0.556	0.233	0.830	Cyber cafe or Internet Café
AC_IN3	+	0.648	0.577	0.232	0.829	A relative's home
AC_IN4	+	0.687	0.622	0.229	0.826	A friend's home
AC_IN5	+	0.544	0.460	0.240	0.835	My workplace
AC_IN6	+	0.599	0.521	0.236	0.831	My place of study
AC_IN7	+	0.676	0.609	0.230	0.827	Community Clubs / Community Centres
AC_IN8	+	0.659	0.589	0.231	0.828	Public libraries
AC_M1	+	0.453	0.359	0.247	0.840	Desktop personal computer (PC)
AC_M2	+	0.468	0.375	0.246	0.839	Mobile computer, e.g. laptop, netbook
AC_M6	+	0.386	0.286	0.252	0.843	Smartphone e.g. iPhone, Samsung, Blackberry etc. with internet connection.
AC_IN1	+	0.419	0.322	0.249	0.842	My own home
AC_M7	+	0.388	0.289	0.252	0.843	Smartphone e.g. iPhone, Blackberry, Samsung etc. without internet connection.
AC_M8	+	0.428	0.332	0.249	0.841	Feature mobile phone e.g. Nokia 100, 130 etc., with internet connection.
AC_M9	+	0.453	0.359	0.247	0.840	Feature mobile phone e.g. Nokia 100, 130 etc., without internet connection.
Test scale				0.241	0.843	mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
ICT Access	302	2.350993	.7161303	1	5

Table 44: Principal Component Factors Rotation for the ICT Usage Factor

Factor analysis/correlation	Number of obs =	302
Method: principal-component factors	Retained factors =	5
Rotation: (unrotated)	Number of parameters =	105

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	7.80209	4.57606	0.3392	0.3392
Factor2	3.22603	1.53688	0.1403	0.4795
Factor3	1.68915	0.56565	0.0734	0.5529
Factor4	1.12350	0.04235	0.0488	0.6018
Factor5	1.08115	0.28249	0.0470	0.6488
Factor6	0.79866	0.04274	0.0347	0.6835
Factor7	0.75592	0.00650	0.0329	0.7164
Factor8	0.74942	0.12691	0.0326	0.7490
Factor9	0.62251	0.01542	0.0271	0.7760
Factor10	0.60709	0.07134	0.0264	0.8024
Factor11	0.53574	0.02828	0.0233	0.8257
Factor12	0.50747	0.05246	0.0221	0.8478
Factor13	0.45501	0.01917	0.0198	0.8676
Factor14	0.43584	0.02077	0.0189	0.8865
Factor15	0.41507	0.04488	0.0180	0.9046
Factor16	0.37019	0.01995	0.0161	0.9206
Factor17	0.35023	0.02449	0.0152	0.9359
Factor18	0.32575	0.02115	0.0142	0.9500
Factor19	0.30459	0.03621	0.0132	0.9633
Factor20	0.26838	0.04227	0.0117	0.9749
Factor21	0.22611	0.03621	0.0098	0.9848
Factor22	0.18990	0.02972	0.0083	0.9930
Factor23	0.16019	.	0.0070	1.0000

LR test: independent vs. saturated: $\chi^2(253) = 3601.11$ Prob> $\chi^2 = 0.0000$

Table 45: Rotated Factor Matrix from the Factor Analysis of the ICT Usage Factor

Variable	Description	Factor1	Factor2	Factor3	Factor4	Factor5	Uniqueness
US_LS1	Surf the Internet?			0.8153			0.2265
US_LS2	Send/read emails?			0.7515			0.3096
US_LS3	Access online news?			0.7754			0.3538
US_LS4	Send text messages?			0.8095			0.3048
US_LS5	Access social media, e.g. Facebook, Twitter?			0.6639			0.4641
US_LS6	Perform online-banking transactions?	0.5435					0.4764
US_LS7	Access online gamble sites, e.g. <i>singaporepools.com.sg</i> , to place bets?		0.6211			0.4104	0.4427
US_LS8	Buy goods and services on-line?		0.4285			0.6385	0.3354
US_LS9	Browse/surf the worldwide web for no specific purpose?					0.5431	0.4376
US_LS10	Play games?				0.6273		0.4364
US_LS11	Listen to music?				0.7945		0.3064
US_LS12	Watch videos?				0.8014		0.2664
US_EM1	Write and edit letters, reports and other documents?	0.7417					0.3645
US_EM2	Look for products and services/gathering product information online?	0.7369					0.2256
US_EM3	Fiddle around on your ICT device/explore different parts of the device to develop your own knowledge?	0.6625					0.4030
US_EM4	Look for information related to work/business/study on the worldwide web?	0.6911					0.4114
US_EM5	Organise the ICT device's files/memory?	0.7471					0.2536
US_EM6	Create and manipulate images, e.g. photographs?	0.5736	0.4662				0.3061
US_EM7	Download software, music, films or images from the Internet?	0.4952			0.4043		0.4259
US_EM8	Create music?		0.7790				0.3454
US_EM9	Create films or animations or videos?		0.8789				0.1884
US_EM10	Participate in educational courses/lessons, e.g. <i>Coursera</i> , on the World Wide Web?		0.6616				0.4582
US_EM11	Make / maintain your own website product information?		0.7666				0.3357

Table 46: Alpha reliability for the ICT Usage Factor 1 - Higher-Order ICT usage

Items	S	it-cor	ir-cor	ii-cov	alpha	label
US_LS6	+	0.696	0.599	.96426	0.878	Perform online-banking transactions?
US_EM1	+	0.764	0.669	.89812	0.871	Write and edit letters, reports and other documents?
US_EM2	+	0.797	0.719	.89365	0.866	Look for products and services/gathering product information online?
US_EM3	+	0.737	0.641	.92639	0.874	Fiddle around on your ICT device/explore different parts of the device to develop your own knowledge?
US_EM4	+	0.740	0.646	.92744	0.873	Look for information related to your work/business/study on the worldwide web?
US_EM5	+	0.812	0.745	.90475	0.864	Organise the ICT device's files/memory?
US_EM6	+	0.731	0.644	.95143	0.874	Create and manipulate images, e.g. photographs?
US_EM7	+	0.696	0.596	.96016	0.878	Download software, music, films or images from the Internet?
Test scale				.92828	0.887	mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
US_LS6	302	2.168874	1.30726	1	5
US_EM1	302	2.649007	1.499496	1	5
US_EM2	302	2.81457	1.413762	1	5
US_EM3	302	2.711921	1.41414	1	5
US_EM4	302	3.049669	1.397975	1	5
US_EM5	302	2.34106	1.309143	1	5
US_EM6	302	2.215232	1.277209	1	5
US_EM7	302	2.288079	1.336849	1	5

Variable	Obs	Mean	Std. Dev.	Min	Max
Higher-Order ICT usage	302	2.529801	1.023368	1	5

Table 47: Alpha reliability for the ICT Usage Factor 2 - Production ICT usage

Items	S	it-cor	ir-cor	ii-cov	alpha	label
US_LS7	+	0.668	0.507	.57647	0.840	Access online gamble sites, e.g. singaporepools.com.sg, to place bets?
US_EM8	+	0.790	0.656	.48781	0.802	Create music?
US_EM9	+	0.879	0.799	.44195	0.763	Create films or animations or videos?
US_EM10	+	0.741	0.571	.5104	0.827	Participate in educational courses/lessons, e.g. Coursera, on the world-wide web
US_EM11	+	0.822	0.693	.45414	0.791	Make / maintain your own website product information?
Test scale				.49415	0.839	mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
US_LS10	302	2.231788	1.544226	1	5
US_LS11	302	3.109272	1.5524	1	5
US_LS12	302	2.940397	1.504067	1	5

Variable	Obs	Mean	Std. Dev.	Min	Max
Production ICT usage	302	1.470861	.7675382	1	5

Table 48: Alpha reliability for the ICT Usage Factor 3 - Lower-Order ICT usage

Items	S	it-cor	ir-cor	ii-cov	alpha	label
US_LS1	+	0.865	0.781	1.1185	0.811	Surf the Internet?
US_LS2	+	0.821	0.711	1.1662	0.828	Send/read emails?
US_LS3	+	0.802	0.666	1.1512	0.841	Access online news?
US_LS4	+	0.800	0.695	1.2471	0.834	Send text messages?
US_LS5	+	0.738	0.566	1.2459	0.865	Access social media, e.g. Facebook, Twitter, Instagram etc.?
Test scale				1.1858	0.865	mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
US_LS1	302	4.056291	1.397724	1	5
US_LS2	302	3.877483	1.435741	1	5
US_LS3	302	3.874172	1.581894	1	5
US_LS4	302	4.182119	1.282366	1	5
US_LS5	302	3.701987	1.610987	1	5

Variable	Obs	Mean	Std. Dev.	Min	Max
Lower-Order ICT usage	302	3.938411	1.174274	1	5

Table 49: Alpha Reliability for the ICT Usage Factor 4 - Consumption ICT usage

Items	S	it-cor	ir-cor	ii-cor	alpha	label
US_LS10	+	0.726	0.408	0.622	0.767	Play games?
US_LS11	+	0.835	0.604	0.359	0.529	Listen to music?
US_LS12	+	0.829	0.592	0.375	0.545	Watch videos?
Test scale				0.452	0.712	mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
US_LS10	302	2.231788	1.544226	1	5
US_LS11	302	3.109272	1.5524	1	5
US_LS12	302	2.940397	1.504067	1	5

Variable	Obs	Mean	Std. Dev.	Min	Max
Consumption ICT usage	302	2.760486	1.221361	1	5

Table 50: Alpha reliability for the full ICT Usage scale

Items	S	it-cor	ir-cor	ii-cor	alpha	label
US_LS6	+	0.640	0.587	0.293	0.892	Perform online-banking transactions?
US_EM1	+	0.653	0.602	0.292	0.892	Write and edit letters, reports and other
US_EM2	+	0.695	0.648	0.290	0.891	Look for products and services/gathering product information online?
US_EM3	+	0.670	0.620	0.291	0.892	Fiddle around on your ICT device/explore different parts of the device to develop
US_EM4	+	0.646	0.593	0.293	0.892	Look for information related to your work/business/study on the worldwide web?
US_EM5	+	0.719	0.676	0.288	0.890	Organise the ICT device's files/memory?
US_EM6	+	0.703	0.658	0.289	0.890	Create and manipulate images, e.g. photographs
US_EM7	+	0.686	0.638	0.290	0.891	Download software, music, films or images from the Internet?
US_LS7	+	0.390	0.317	0.309	0.899	Access online gamble sites, e.g. singaporepools.com.sg, to place bets?
US_EM8	+	0.479	0.411	0.303	0.897	Create music?
US_EM9	+	0.510	0.445	0.301	0.896	Create films or animations or videos?
US_EM10	+	0.531	0.467	0.300	0.896	Participate in educational courses/lessons, e.g. Coursera, on the World Wide Web
US_EM11	+	0.563	0.503	0.298	0.895	Make / maintain your own website product information
US_LS1	+	0.583	0.524	0.297	0.894	Surf the Internet?
US_LS2	+	0.594	0.536	0.296	0.894	Send/read emails?
US_LS3	+	0.546	0.484	0.299	0.895	Access online news?
US_LS4	+	0.517	0.453	0.301	0.896	Send text messages?
US_LS5	+	0.547	0.485	0.299	0.895	Access social media, e.g. Facebook, Twitter, Instagram etc.?
US_LS10	+	0.354	0.278	0.311	0.900	Play games?
US_LS11	+	0.501	0.435	0.302	0.896	Listen to music?
US_LS12	+	0.548	0.486	0.299	0.895	Watch videos?
Test scale				0.297	0.899	mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
ICT Usage	302	2.646011	.768786	1	5

Table 51: Principal-component factors analysis for the ICT Appropriation scale item (unrotated)

Factor analysis/correlation	Number of obs	=	302
Method: principal-component factors	Retained factors	=	3
Rotation: (unrotated)	Number of parameters	=	42

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	5.36689	3.24125	0.3578	0.3578
Factor2	2.12564	0.38666	0.1417	0.4995
Factor3	1.73898	0.79302	0.1159	0.6154
Factor4	0.94596	0.13471	0.0631	0.6785
Factor5	0.81125	0.11258	0.0541	0.7326
Factor6	0.69867	0.09162	0.0466	0.7792
Factor7	0.60704	0.06638	0.0405	0.8196
Factor8	0.54067	0.05955	0.0360	0.8557
Factor9	0.48111	0.08903	0.0321	0.8877
Factor10	0.39208	0.06377	0.0261	0.9139
Factor11	0.32831	0.02950	0.0219	0.9358
Factor12	0.29881	0.01656	0.0199	0.9557
Factor13	0.28225	0.06839	0.0188	0.9745
Factor14	0.21386	0.04538	0.0143	0.9888
Factor15	0.16848	.	0.0112	1.0000

LR test: independent vs. saturated: $\chi^2(105) = 2170.25$ Prob> $\chi^2 = 0.0000$

Table 52: Factor loadings of the ICT Appropriation Scale Items

Factor analysis/correlation	Number of obs	=	302
Method: principal-component factors	Retained factors	=	3
Rotation: orthogonal varimax (Kaiser off)	Number of parameters	=	42

Factor	Variance	Difference	Proportion	Cumulative
Factor1	4.15049	0.97377	0.2767	0.2767
Factor2	3.17672	1.27242	0.2118	0.4885
Factor3	1.90430	.	0.1270	0.6154

Variable	Factor1	Factor2	Factor3	Uniqueness
AP_EM1			0.7888	0.3616
AP_EM2		0.6368		0.5111
AP_EM3			0.8021	0.3236
AP_EM4		0.8313		0.2768
AP_EM5		0.8732		0.2185
AP_EM6		0.8671		0.2372
AP_EM7			0.6882	0.4995
AP_SE1	0.6001			0.5543
AP_SE2	0.6856			0.3917
AP_SE3	0.5638			0.5299
AP_SL1	0.7913			0.2850
AP_SL2	0.7736			0.3623
AP_SL3	0.7406			0.3000
AP_SL4	0.6939			0.4921
AP_SL5	0.7558			0.4250

Table 53: Alpha reliability for the ICT Appropriation Factor 1 - Informal ICT Appropriation

Items	S	it-cor	ir-cor	ii-cov	alpha	label
AP_SE1	+	0.658	0.536	.36124	0.867	Knowing about ICTs makes me feel as though I am 'at the cutting edge'
AP_SE2	+	0.758	0.679	.35216	0.852	Through information provided by ICTs, I understand more about what is happening in society
AP_SE3	+	0.664	0.539	.35853	0.866	I feel that I am quite smart because I have learnt to use ICTs
AP_SL1	+	0.827	0.765	.33822	0.842	Learning how to use ICTs creates more topics for me to communicate with others
AP_SL2	+	0.776	0.697	.34522	0.850	Learning how to use ICTs enables me to make more friends
AP_SL3	+	0.781	0.708	.34769	0.848	Learning how to use ICTs provides me with more ways to connect with overseas relatives and friends
AP_SL4	+	0.638	0.494	.35941	0.872	If I do not know about ICTs, I may become an outcast in society
AP_SL5	+	0.716	0.603	.34492	0.891	If I do not learn how to use ICTs, I may experience more inconvenience in my life
Test scale				.35093	0.873	Mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
AP_SE1	302	3.52649	.9209415	1	5
AP_SE2	302	3.917219	.79226	1	5
AP_SE3	302	3.410596	.9419815	1	5
AP_SL1	302	3.870861	.7985942	1	5
AP_SL2	302	3.821192	.8239448	1	5
AP_SL3	302	3.990066	.7923433	1	5
AP_SL4	302	3.592715	1.022836	1	5
AP_SL5	302	3.811258	.9614526	1	5

Variable	Obs	Mean	Std. Dev.	Min	Max
Informal ICT Appropriation	302	3.783113	.911661	1	5

Table 54: Alpha reliability for the ICT Appropriation Factor 2 - Formal ICT Appropriation

Items	S	it-cor	ir-cor	ii-cov	alpha	label
AP_EM2	+	0.708	0.545	.91987	0.878	Having access to ICTs can help me get a job
AP_EM4	+	0.852	0.742	.72768	0.807	I know how to subscribe to websites, e.g. JobStreet.com, National Jobs Bank etc.,
AP_EM5	+	0.903	0.800	.59064	0.776	I have filled out job applications online
AP_EM6	+	0.881	0.756	.6152	0.799	I have used ICTs to submit my resume/job application
Test scale				.71335	0.858	Mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
AP_EM2	302	3.850993	.9082397	1	5
AP_EM4	302	3.943709	.9917317	1	5
AP_EM5	302	3.662252	1.19738	1	5
AP_EM6	302	3.675497	1.222979	1	5

Variable	Obs	Mean	Std. Dev.	Min	Max
Formal ICT Appropriation	302	3.74255	.6365187	1	5

Table 55: Alpha reliability for the full ICT Appropriation scale

Items	S	it-cor	ir-cor	ii-cor	alpha	label
AP_SE1	+	0.612	0.523	0.382	0.872	Knowing about ICTs makes me feel as though I am “at the cutting edge”
AP_SE2	+	0.758	0.695	0.361	0.862	Through information provided by ICTs, I understand more about what is happening
AP_SE3	+	0.650	0.566	0.377	0.869	I feel that I am quite smart because I have learnt to use ICTs
AP_SL1	+	0.792	0.736	0.357	0.859	Learning how to use ICTs creates more topics for me to communicate with others
AP_SL2	+	0.705	0.631	0.369	0.865	Learning how to use ICTs enables me to make more friends
AP_SL3	+	0.775	0.715	0.359	0.860	Learning how to use ICTs provides me with more ways to connect with overseas relatives and friends.
AP_SL4	+	0.488	0.382	0.400	0.880	If I do not know about ICTs, I may become an outcast in society
AP_SL5	+	0.591	0.499	0.385	0.873	If I do not learn how to use ICTs, I may experience more inconvenience in my life
AP_EM2	+	0.612	0.522	0.382	0.872	Having access to ICTs can help me get a job
AP_EM4	+	0.639	0.554	0.378	0.870	I know how to subscribe to websites, e.g. JobStreet.com, National Jobs Bank etc.,
AP_EM5	+	0.634	0.548	0.379	0.870	I have filled out job applications online
AP_EM6	+	0.596	0.504	0.384	0.873	I have used ICTs to submit my resume/job application
Test scale				0.376	0.879	mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
ICT Appropriation	302	3.756071	.6140729	1	5

Table 56: Principal component factor analysis of the Self-Perceived Employability scale

Factor analysis/correlation	Number of obs	=	301
Method: principal-component factors	Retained factors	=	6
Rotation: (unrotated)	Number of parameters	=	153

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	6.75630	3.58782	0.2413	0.2413
Factor2	3.16848	0.49070	0.1132	0.3545
Factor3	2.67778	0.61996	0.0956	0.4501
Factor4	2.05782	0.39839	0.0735	0.5236
Factor5	1.65943	0.11924	0.0593	0.5829
Factor6	1.54019	0.63211	0.0550	0.6379

LR test: independent vs. saturated: $\chi^2(378) = 4087.62$ Prob> $\chi^2 = 0.0000$

Factor loadings (pattern matrix) and unique variances

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Uniqueness
E1_CE1	0.4573	-0.6062	0.0739	0.1158	-0.0206	0.0740	0.3985
E1_CE2	0.4239	-0.5533	0.0824	-0.0894	-0.0561	-0.0056	0.4962
E1_CE3	0.4977	-0.7157	-0.0232	0.1291	0.0409	0.1150	0.2079
E1_CE4	0.6178	-0.4865	0.0492	0.1112	0.0469	0.0172	0.3644
E1_CE5	0.5970	-0.6373	0.0788	0.0819	0.0627	0.0774	0.2146
E1_CE6	0.5906	-0.6168	0.0195	0.0952	0.1363	0.0593	0.2393
E1_CP1r	0.2806	0.2403	0.4601	0.2227	0.4140	-0.1964	0.3923
E1_CP2	0.6276	0.0945	0.2798	-0.0285	-0.2397	-0.4643	0.2451
E1_CP3	0.5755	0.1911	0.3656	-0.0239	-0.2521	-0.5082	0.1762
E1_CP4	0.5737	0.1701	0.3376	0.0200	-0.2754	-0.4084	0.2849
E1_CP5r	0.4341	0.1935	0.4989	0.2743	0.3827	-0.1204	0.2889
E1_CP6r	0.2337	0.3108	0.2390	0.3130	0.5922	0.0559	0.3399
E1_SC1	0.5180	0.1608	-0.2389	-0.4633	0.2199	-0.0916	0.3773
E1_SC2	0.5993	0.1269	-0.2854	-0.5130	0.3117	-0.0448	0.1810
E1_SC3	0.5590	0.0578	-0.3283	-0.5120	0.2407	-0.0734	0.2510
E1_SC4	0.5830	0.1503	-0.2851	-0.4821	0.2727	-0.0344	0.2482
E1_HC1	0.4564	0.1688	0.2362	-0.0930	-0.2914	0.3167	0.5135
E1_HC2	0.4219	0.0986	0.1131	-0.0772	-0.2567	0.2887	0.6442
E1_HC3	0.5250	0.3192	0.1266	-0.0595	-0.1472	0.3975	0.4234
E1_HC4	0.5187	0.2232	0.2522	-0.1632	-0.2783	0.3471	0.3929
E1_HC5	0.5527	0.3553	0.1310	-0.1151	-0.2439	0.3303	0.3693
E1_HC6r	0.2503	0.2820	0.4471	0.1729	0.2347	0.3626	0.4414
E1_C11	0.4005	0.2224	-0.2008	0.3417	0.0659	0.1087	0.6169
E1_C12	0.4815	0.0991	-0.4602	0.3138	-0.2020	-0.1526	0.3840
E1_C13	0.3028	0.1843	-0.4778	0.3755	0.1377	0.1584	0.4610
E1_C14	0.3049	0.1765	-0.5616	0.3777	-0.0548	-0.0642	0.4108
E1_C15	0.4756	0.1867	-0.4025	0.2774	-0.2338	-0.1707	0.4162
E1_C16	0.5242	0.2651	-0.4019	0.3617	0.0009	0.0411	0.3608

Table 57: Factor loadings (rotated) of the Self-Perceived Employability scale

Factor analysis/correlation	Number of obs	=	301
Method: principal-component factors	Retained factors	=	6
Rotation: orthogonal varimax (Kaiser off)	Number of parameters	=	153

Factor	Variance	Difference	Proportion	Cumulative
Factor1	4.05684	0.95891	0.1449	0.1449
Factor2	3.09793	0.07855	0.1106	0.2555
Factor3	3.01938	0.28005	0.1078	0.3634
Factor4	2.73933	0.08869	0.0978	0.4612
Factor5	2.65064	0.35474	0.0947	0.5559
Factor6	2.29590	.	0.0820	0.6379

LR test: independent vs. saturated: $\chi^2(378) = 4087.62$ Prob> $\chi^2 = 0.0000$

Rotated factor loadings (pattern matrix) and unique variances

Variable	Employability Statements	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6
E1_CE1	CareerExplore: Investigated career possibilities?	0.7685					
E1_CE2	CareerExplore: Went to various career orientation programs?	0.6659					
E1_CE3	CareerExplore: Obtained information on specific jobs or companies?	0.8848					
E1_CE4	CareerExplore: Initiated conversations with knowledgeable individuals	0.7462					
E1_CE5	CareerExplore: Obtained information on the labour market	0.8672					
E1_CE6	CareerExplore: Sought information on specific areas of career interest?	0.8473					
E1_CP1r	CareerPlan: I have not really decided what my career objectives should be						0.7146
E1_CP2	CareerPlan: I have a plan for my career				0.8117		
E1_CP3	CareerPlan: I have a strategy for achieving my career goals.				0.8731		
E1_CP4	CareerPlan: I know what I need to do to reach my career goals.				0.7971		
E1_CP5r	CareerPlan: My career objectives are not clear *						0.7517
E1_CP6r	CareerPlan: I change my career objectives frequently *						0.7960
E1_SC1	SocCap: I am good at making friends		0.7622				
E1_SC2	SocCap: I help other people		0.8776				
E1_SC3	SocCap: I ask others if I can be of help		0.8374				
E1_SC4	SocCap: I do nice things for people		0.8361				
E1_HC1	HumanCap: My level of education is sufficient for getting a job in my area of work					0.6498	
E1_HC2	HumanCap: My skills for doing the type of work I want to do are up-to-date					0.5449	
E1_HC3	HumanCap: I have a good work history					0.6906	
E1_HC4	HumanCap: An employer would be impressed with my qualifications					0.7211	
E1_HC5	HumanCap: I have good job reference					0.7128	
E1_HC6r	HumanCap: My work qualifications are not very good *					0.4506	0.5893
E1_CI1	Identity: Even if I win a great deal of money at 4D or ToTo, I would continue to work somewhere			0.5282			
E1_CI2	Identity: Having a job is very important to me			0.7175			
E1_CI3	Identity: I would hate to be on welfare, e.g. long-term Comcare etc.			0.6757			
E1_CI4	Identity: I would soon get very bored if I have no work to do			0.7592			
E1_CI5	Identity: The most important things that happen to me involve work			0.6829			
E1_CI6	Identity: If welfare benefits were really high, I would still prefer to work			0.7381			

Table 58: Alpha Reliability for the Self-Perceived Employability Factor 1 - Career Exploration

Items	S	it-cor	ir-cor	ii-cor	alpha	label
E1_CE1	+	0.770	0.663	0.610	0.887	CareerExplore: Investigated career possibilities?
E1_CE2	+	0.703	0.573	0.643	0.900	CareerExplore: Went to various career orientation programs?
E1_CE3	+	0.869	0.802	0.562	0.865	CareerExplore: Obtained information on specific jobs or companies?
E1_CE4	+	0.792	0.693	0.599	0.882	CareerExplore: Initiated conversations with knowledgeable individuals
E1_CE5	+	0.878	0.814	0.558	0.863	CareerExplore: Obtained information on the labour market
E1_CE6	+	0.856	0.783	0.568	0.868	CareerExplore: Sought information on specific areas of career interest?
Test scale				0.590	0.896	mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
E1_CE1	302	2.801325	1.462805	1	5
E1_CE2	302	1.937086	1.099388	1	5
E1_CE3	302	2.5	1.365814	1	5
E1_CE4	301	2.328904	1.217153	1	5
E1_CE5	302	2.453642	1.317971	1	5
E1_CE6	302	2.536424	1.310701	1	5

Variable	Obs	Mean	Std. Dev.	Min	Max
Career Exploration	302	2.426269	1.055241	1	5

Table 59: Alpha Reliability for the Self-Perceived Employability Factor 2 - Career Planning

Items	S	it-cor	ir-cor	ii-cor	alpha	label
E1_CP2	+	0.884	0.736	0.692	0.818	CareerPlan: I have a plan for my career
E1_CP3	+	0.916	0.802	0.607	0.756	CareerPlan: I have a strategy for achieving my career goals.
E1_CP4	+	0.863	0.695	0.747	0.855	CareerPlan: I know what I need to do to reach my career goals.
Test scale				0.682	0.866	mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
E1_CP2	302	3.701987	.8951304	1	5
E1_CP3	302	3.622517	.8251988	1	5
E1_CP4	302	3.728477	.7855318	1	5

Variable	Obs	Mean	Std. Dev.	Min	Max
Career Planning	302	3.684327	.741919	1	5

Table 60: Alpha Reliability for Self-Perceived Employability Factor 3 - Social Capital

Items	S	it-cor	ir-cor	ii-cor	alpha	label
E1_SC1	+	0.798	0.643	0.701	0.876	SocialCap: I am good at making friends
E1_SC2	+	0.898	0.810	0.587	0.810	SocialCap: I help other people
E1_SC3	+	0.856	0.737	0.636	0.840	SocialCap: I ask others if I can be of help
E1_SC4	+	0.862	0.746	0.629	0.836	SocialCap: I do nice things for people
Test scale				0.638	0.876	mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
E1_SC1	302	3.592715	.9486903	1	5
E1_SC2	302	3.761589	.8642675	2	5
E1_SC3	302	3.513245	.9600786	1	5
E1_SC4	302	3.764901	.8437929	2	5

Variable	Obs	Mean	Std. Dev.	Min	Max
Social Capital	302	3.658113	.7709157	2	5

Table 61: Alpha Reliability for the Self-Perceived Employability Factor 4 - Human Capital

Items	S	it-cor	ir-cor	ii-cor	alpha	label
E1_HC1	+	0.706	0.557	0.425	0.787	HumanCap: My level of education is sufficient for getting a job
E1_HC2	+	0.797	0.683	0.386	0.759	HumanCap: My skills for doing the type of work I want to do are up-to-date
E1_HC3	+	0.731	0.590	0.414	0.780	HumanCap: I have a good work history
E1_HC4	+	0.761	0.632	0.401	0.770	HumanCap: An employer would be impressed with my qualifications
E1_HC5	+	0.755	0.624	0.404	0.772	HumanCap: I have good job reference/s
E1_HC6r	+	0.561	0.370	0.488	0.826	HumanCap: *My work qualifications are not very good
Test scale				0.420	0.813	mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
E1_HC1	302	3.443709	.9445473	1	5
E1_HC2	302	3.5	.8920096	1	5
E1_HC3	302	3.864238	.7974914	1	5
E1_HC4	302	3.437086	.8860391	1	5
E1_HC5	302	3.619205	.8533861	1	5
E1_HC6r	302	3.291391	1.028429	1	5

Variable	Obs	Mean	Std. Dev.	Min	Max
Human Capital	302	3.525938	.6433983	1	5

Table 62: Alpha Reliability for the Self-Perceived Employability Factor 5 - Career Identity

Items	S	it-cor	ir-cor	ii-cor	alpha	label
E1_CII1	+	0.607	0.425	0.452	0.805	CareerIdent: Even if I win a great deal of money, I would continue to work
E1_CII2	+	0.748	0.612	0.392	0.763	CareerIdent: Having a job is very important to me
E1_CII3	+	0.667	0.503	0.427	0.788	CareerIdent: I would hate to be on welfare, e.g. long-term Comcare etc.
E1_CII4	+	0.729	0.586	0.400	0.770	CareerIdent: I would soon get very bored if I have no work to do
E1_CII5	+	0.727	0.583	0.401	0.770	CareerIdent: The most important things that happen to me involve work
E1_CII6	+	0.791	0.673	0.374	0.749	CareerIdent: If welfare benefits were really high, I would still prefer to work
Test scale				0.408	0.805	mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
E1_CII1	302	4.066225	.8979036	1	5
E1_CII2	302	4.225166	.753042	1	5
E1_CII3	302	3.738411	1.057067	1	5
E1_CII4	302	4.062914	.9073429	1	5
E1_CII5	302	3.824503	.8697551	1	5
E1_CII6	302	4.119205	.7052452	1	5

Variable	Obs	Mean	Std. Dev.	Min	Max
Career Identity	302	4.006071	.6120031	2	5

Table 63: Alpha Reliability for the full Self-Perceived Employability scale

Items	S	it-cor	ir-cor	ii-cor	alpha	label
E1_CE1	+	0.457	0.392	0.229	0.877	CareerExplore: Investigated career possibilities?
E1_CE2	+	0.415	0.347	0.231	0.878	CareerExplore: Went to various career orientation programs?
E1_CE3	+	0.495	0.432	0.227	0.876	CareerExplore: Obtained information on specific jobs or companies?
E1_CE4	+	0.606	0.553	0.222	0.872	CareerExplore: Initiated conversations with knowledgeable individuals
E1_CE5	+	0.575	0.519	0.223	0.873	CareerExplore: Obtained information on the labour market
E1_CE6	+	0.569	0.512	0.223	0.874	CareerExplore: Sought information on specific areas of career interest?
E1_CP2	+	0.578	0.522	0.223	0.873	CareerPlan: I have a plan for my career
E1_CP3	+	0.535	0.475	0.225	0.875	CareerPlan: I have a strategy for achieving my career goals.
E1_CP4	+	0.545	0.486	0.225	0.874	CareerPlan: I know what I need to do to reach my career goals.
E1_SC1	+	0.521	0.460	0.226	0.875	SocialCap: I am good at making friends
E1_SC2	+	0.584	0.529	0.223	0.873	SocialCap: I help other people
E1_SC3	+	0.553	0.495	0.224	0.874	SocialCap: I ask others if I can be of help
E1_SC4	+	0.564	0.507	0.224	0.874	SocialCap: I do nice things for people
E1_HC1	+	0.485	0.422	0.227	0.876	HumanCap: My level of education is sufficient for getting a job
E1_HC2	+	0.584	0.528	0.223	0.873	HumanCap: My skills for doing the type of work I want to do are up-to-date
E1_HC3	+	0.528	0.467	0.225	0.875	HumanCap: I have a good work history
E1_HC4	+	0.529	0.469	0.225	0.875	HumanCap: An employer would be impressed with my qualifications
E1_HC5	+	0.565	0.508	0.224	0.874	HumanCap: I have good job reference/s
E1_HC6r	+	0.260	0.184	0.238	0.882	HumanCap: *My work qualifications are not very good
E1_C11	+	0.428	0.360	0.230	0.878	CareerIdent: Even if I win a great deal of money, I would continue to work
E1_C12	+	0.521	0.460	0.226	0.875	CareerIdent: Having a job is very important to me
E1_C13	+	0.354	0.283	0.233	0.880	CareerIdent: I would hate to be on welfare, e.g. long-term Comcare etc.
E1_C14	+	0.361	0.290	0.233	0.879	CareerIdent: I would soon get very bored if I have no work to do
E1_C15	+	0.507	0.445	0.226	0.875	CareerIdent: The most important things that happen to me involve work
E1_C16	+	0.558	0.500	0.224	0.874	CareerIdent: If welfare benefits were really high, I would still prefer to work
Test scale				0.226	0.880	mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
Employability	302	3.408508	.5044021	2.041667	5

Table 64: Principal component factor analysis of the Self-Perceived Empowerment scale

Factor analysis/correlation	Number of obs	=	302
Method: principal-component factors	Retained factors	=	3
Rotation: (unrotated)	Number of parameters	=	51

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	6.98495	4.75652	0.3881	0.3881
Factor2	2.22844	0.90952	0.1238	0.5119
Factor3	1.31892	0.32881	0.0733	0.5851
Factor4	0.99011	0.07202	0.0550	0.6401
Factor5	0.91809	0.11256	0.0510	0.6911
Factor6	0.80552	0.12538	0.0448	0.7359
Factor7	0.68014	0.08224	0.0378	0.7737
Factor8	0.59790	0.05361	0.0332	0.8069
Factor9	0.54430	0.08449	0.0302	0.8371
Factor10	0.45981	0.03145	0.0255	0.8627
Factor11	0.42836	0.02395	0.0238	0.8865
Factor12	0.40441	0.03249	0.0225	0.9089
Factor13	0.37192	0.02968	0.0207	0.9296
Factor14	0.34224	0.04213	0.0190	0.9486
Factor15	0.30011	0.07090	0.0167	0.9653
Factor16	0.22922	0.02000	0.0127	0.9780
Factor17	0.20922	0.02288	0.0116	0.9896
Factor18	0.18634	.	0.0104	1.0000

LR test: independent vs. saturated: $\chi^2(153) = 2748.13$ Prob> $\chi^2 = 0.0000$

Factor loadings (pattern matrix) and unique variances

Variable	Factor1	Factor2	Factor3	Uniqueness
E2_SE1	0.7151	0.0151	-0.3335	0.3772
E2_SE2	0.8085	0.0144	-0.2254	0.2952
E2_SE3	0.7189	-0.0358	-0.3209	0.3789
E2_SE4	0.7802	0.0599	-0.3132	0.2895
E2_SE5	0.7648	0.0671	-0.2426	0.3517
E2_SE6	0.7587	0.0590	0.0165	0.4206
E2_SE7r	0.3428	0.5284	0.2364	0.5474
E2_SE8	0.7462	-0.0216	-0.0297	0.4418
E2_SE9	0.7783	0.0074	-0.0034	0.3942
E2_PW1r	0.3749	0.7086	0.1944	0.3196
E2_PW2r	0.2741	0.6734	0.0985	0.4616
E2_CA1	0.4309	-0.3988	0.4016	0.4940
E2_CA2	0.4120	-0.4920	0.3688	0.4523
E2_CA3	0.7059	-0.1770	0.3583	0.3420
E2_CA4	0.6949	-0.2277	0.3472	0.3447
E2_CA5	0.6896	-0.2417	0.2398	0.4085
E2_CO1	0.4227	-0.1759	-0.3205	0.6877
E2_CO2r	0.2169	0.6373	0.2932	0.4608

Table 65: Factor loadings (rotated) of the Self-Perceived Empowerment scale

Factor analysis/correlation	Number of obs	=	302
Method: principal-component factors	Retained factors	=	3
Rotation: orthogonal varimax (Kaiser off)	Number of parameters	=	51
LR test: independent vs. saturated: $\chi^2(153) = 2748.13$ Prob> $\chi^2 = 0.0000$			

Rotated factor loadings (pattern matrix) and unique variances

Variable	Empowerment Statement	Factor1	Factor2	Factor3	Uniqueness
E2_SE1	I generally accomplish what I set out to do	0.7744			0.3772
E2_SE2	I have a positive attitude about myself	0.7862			0.2952
E2_SE3	When I make plans, I am certain to make them work	0.7692			0.3789
E2_SE4	I am confident about the decisions I make	0.8159			0.2895
E2_SE5	I am able to overcome barriers	0.7619			0.3517
E2_SE6	I feel I am a person of worth, at least on an equal basis with others	0.6042			0.4206
E2_SE7r	<i>I do not see myself as a capable person*</i>			0.6468	0.5474
E2_SE8	I am able to do things as well as most other people	0.6199			0.4418
E2_SE9	I feel I have a number of good qualities	0.6308	0.4082		0.3942
E2_PW1r	<i>I feel powerless most of the time*</i>			0.7999	0.3196
E2_PW2r	<i>You can't fight the government*</i>			0.7071	0.4616
E2_CA1	People have a right to make their own decisions, even if they are bad ones		0.6970		0.4940
E2_CA2	People should try to live their lives the way they want to		0.7055		0.4523
E2_CA3	People working together can have an effect on their community		0.7121		0.3420
E2_CA4	People have more power if they join together as a group		0.7212		0.3447
E2_CA5	Working with others in my community can help to change things for the better	0.4116	0.6479		0.4085
E2_CO1	I can pretty much determine what will happen in my life	0.5272			0.6877
E2_CO2r	<i>I am generally pessimistic about the future*</i>			0.7333	0.4608

Factor rotation matrix

	Factor1	Factor2	Factor3
Factor1	0.8078	0.5320	0.2539
Factor2	0.0172	-0.4518	0.8920
Factor3	-0.5892	0.7161	0.3741

Table 66: Alpha Reliability for the Self-Perceived **Empowerment** Factor 1 - Self-Esteem - Self-Efficacy

Items	S	it-cor	ir-cor	ii-cor	alpha	label
E2_SE1	+	0.769	0.696	0.506	0.891	Self-Effic: I generally accomplish what I set out to do
E2_SE2	+	0.831	0.775	0.491	0.885	Self-Effic: I have a positive attitude about myself
E2_SE3	+	0.753	0.677	0.510	0.893	Self-Effic: When I make plans, I am almost certain to make them work
E2_SE4	+	0.818	0.759	0.495	0.887	Self-Effic: I am usually confident about the decisions I make
E2_SE5	+	0.797	0.733	0.499	0.889	Self-Effic: I am often able to overcome barriers
E2_SE6	+	0.753	0.677	0.510	0.893	Self-Effic: I feel I am a person of worth, at least on an equal basis with others
E2_SE8	+	0.755	0.680	0.510	0.893	Self-Effic: I am able to do things as well as most other people
E2_SE9	+	0.778	0.708	0.504	0.891	Self-Effic: I feel I have a number of good qualities
E2_CO1	+	0.511	0.389	0.569	0.913	Control: I can pretty much determine what will happen in my life
Test scale				0.511	0.904	mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
E2_SE1	302	3.976821	.6791576	2	5
E2_SE2	302	4.066225	.6836377	2	5
E2_SE3	302	4.036424	.6170322	2	5
E2_SE4	302	3.980132	.6669233	2	5
E2_SE5	302	3.884106	.6842891	2	5
E2_SE6	302	3.970199	.6690395	2	5
E2_SE8	302	3.966887	.6357795	2	5
E2_SE9	302	4.039735	.6559799	2	5
E2_CO1	302	3.612583	.7896174	1	5

Variable	Obs	Mean	Std. Dev.	Min	Max
Empowerment: Self Efficacy	302	3.948124	.5049758	2	5

Table 67: Alpha Reliability for the Self-Perceived Empowerment Factor 2 - Community Activism and Autonomy

Items	S	it-cor	ir-cor	ii-cor	alpha	label
E2_CA1	+	0.675	0.485	0.515	0.810	Autonom: People have a right to make their own decisions
E2_CA2	+	0.700	0.520	0.500	0.800	Autonom: People should try to live their lives the way they want to
E2_CA3	+	0.801	0.667	0.436	0.756	Autonom: People working together can have an effect on their community
E2_CA4	+	0.819	0.695	0.425	0.747	Autonom: People have more power if they join together as a group
E2_CA5	+	0.786	0.644	0.445	0.763	Autonom: Working with others in my community can help to change things
Test scale				0.464	0.812	mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
E2_CA1	302	3.824503	.7596526	1	5
E2_CA2	302	3.89404	.7166952	1	5
E2_CA3	302	4.082781	.7127935	1	5
E2_CA4	302	4.208609	.6961155	2	5
E2_CA5	302	4.281457	.6649161	2	5

Variable	Obs	Mean	Std. Dev.	Min	Max
Empowerment:	302	4.058278	.5355604	2	5
Community Activism & Autonomy					

Table 68: Alpha Reliability for the full Self-Perceived **Empowerment** scale

Items	S	it-cor	ir-cor	ii-cor	alpha	label
E2_SE1	+	0.708	0.650	0.422	0.905	Self-Effic: I generally accomplish what I set out to do
E2_SE2	+	0.795	0.751	0.412	0.901	Self-Effic: I have a positive attitude about myself
E2_SE3	+	0.713	0.655	0.422	0.905	Self-Effic: When I make plans, I am almost certain to make them work
E2_SE4	+	0.759	0.709	0.416	0.903	Self-Effic: I am usually confident about the decisions I make
E2_SE5	+	0.745	0.693	0.418	0.903	Self-Effic: I am often able to overcome barriers
E2_SE6	+	0.737	0.683	0.419	0.904	Self-Effic: I feel I am a person of worth, at least on an equal basis with others
E2_SE8	+	0.737	0.684	0.419	0.904	Self-Effic: I am able to do things as well as most other people
E2_SE9	+	0.760	0.710	0.416	0.903	Self-Effic: I feel I have a number of good qualities
E2_CO1	+	0.473	0.386	0.451	0.914	Control: I can pretty much determine what will happen in my life
E2_CA1	+	0.500	0.416	0.448	0.913	Autonom: People have a right to make their own decisions
E2_CA2	+	0.499	0.414	0.448	0.913	Autonom: People should try to live their lives the way they want to
E2_CA3	+	0.719	0.662	0.421	0.904	Autonom: People working together can have an effect on their community
E2_CA4	+	0.710	0.652	0.422	0.905	Autonom: People have more power if they join together as a group
E2_CA5	+	0.707	0.649	0.422	0.905	Autonom: Working with others in my community can help to change things
Test scale				0.425	0.912	mean (standardized items)

Variable	Obs	Mean	Std. Dev.	Min	Max
Empowerment	302	3.987465	.4664429	2	5

Table 69: Block 1 - Hierarchical Regression of ICT access on Self-Perceived Employability

Source	SS	df	MS	Number of obs	=	302
				F(24, 277)	=	3.77
Model	18.8720864	24	.786336935	Prob > F	=	0.0000
Residual	57.7087638	277	.208334887	R-squared	=	0.2464
				Adj R-squared	=	0.1811
Total	76.5808502	301	.254421429	Root MSE	=	.45644

DV: Employability	Coef.	Std. Err.	t	P>t	Beta
Sex: male	0.02	0.05	0.48	0.63	0.03
Race: Others	0.41	0.11	3.64	0.00	0.20
Race: Indian	0.24	0.09	2.78	0.01	0.16
Race: Malay	0.25	0.08	3.11	0.00	0.18
Age: 65above	0.04	0.10	0.40	0.69	0.02
Age: 55-64	0.09	0.08	1.11	0.27	0.07
Age: 35-44	-0.08	0.08	-0.99	0.32	-0.06
Age: 25-34	0.08	0.09	0.81	0.42	0.05
Age: 18-24	-0.26	0.16	-1.59	0.11	-0.09
Educ: Lower Primary	-0.01	0.21	-0.04	0.97	-0.00
Educ: Primary School	-0.08	0.12	-0.68	0.50	-0.04
Educ: Post-Secondary	-0.00	0.11	-0.03	0.98	-0.00
Educ: Polytechnic Diploma	-0.04	0.08	-0.46	0.64	-0.03
Educ: Bachelor Degree	0.06	0.08	0.74	0.46	0.05
Educ: Post-Graduate Degree	0.35	0.14	2.55	0.01	0.16
Income: \$3k - 5,999	0.11	0.06	1.71	0.09	0.10
Income: \$6k - 8,999	0.04	0.10	0.41	0.68	0.02
Income: \$9k – 11,999	-0.26	0.14	-1.82	0.07	-0.10
Income: \$12k – 14,999	0.06	0.18	0.33	0.74	0.02
Income: \$15k – 19,999	0.03	0.17	0.19	0.85	0.01
Income: \$20k &above	0.11	0.33	0.35	0.73	0.02
ICT Access: Outside of home	0.07	0.04	1.96	0.05	0.12
ICT Access: Instrumental	0.10	0.03	3.50	0.00	0.23
ICT Access: Non-Instrumental	-0.01	0.03	-0.21	0.84	-0.01
_cons	2.72	0.12	22.15	0.00	.

Table 70: Block 2 - Hierarchical Regression of ICT access and usage on Self-Perceived **Employability**

Source	SS	df	MS	Number of obs	=	302
				F(28, 273)	=	4.88
Model	25.5568703	28	.912745366	Prob > F	=	0.0000
Residual	51.02398	273	.186901026	R-squared	=	0.3337
				Adj R-squared	=	0.2654
Total	76.5808502	301	.254421429	Root MSE	=	.43232

DV: Employability	Coef.	Std. Err.	t	P>t	Beta
Sex: male	0.04	0.05	0.91	0.36	0.05
Race: Others	0.48	0.11	4.45	0.00	0.23
Race: Indian	0.24	0.08	2.91	0.00	0.16
Race: Malay	0.24	0.08	3.04	0.00	0.17
Age: 65above	0.10	0.10	1.01	0.31	0.06
Age: 55-64	0.11	0.08	1.39	0.17	0.08
Age: 35-44	-0.07	0.07	-1.02	0.31	-0.06
Age: 25-34	0.09	0.09	0.98	0.33	0.06
Age: 18-24	-0.24	0.16	-1.49	0.14	-0.08
Educ: Lower Primary	-0.03	0.20	-0.14	0.89	-0.01
Educ: Primary School	-0.05	0.11	-0.47	0.64	-0.03
Educ: Post-Secondary	-0.06	0.11	-0.55	0.58	-0.03
Educ: Polytechnic Diploma	-0.10	0.08	-1.25	0.21	-0.07
Educ: Bachelor Degree	-0.02	0.08	-0.21	0.83	-0.01
Educ: Post-Graduate Degree	0.11	0.14	0.81	0.42	0.05
Income: \$3k - 5,999	0.14	0.06	2.21	0.03	0.13
Income: \$6k - 8,999	0.04	0.09	0.39	0.70	0.02
Income: \$9k – 11,999	-0.24	0.14	-1.71	0.09	-0.09
Income: \$12k – 14,999	0.00	0.17	0.02	0.98	0.00
Income: \$15k – 19,999	0.03	0.16	0.20	0.84	0.01
Income: \$20k &above	0.02	0.31	0.06	0.95	0.00
ICT Access: Outside of home	-0.01	0.04	-0.17	0.86	-0.01
ICT Access: Instrumental	0.02	0.04	0.58	0.56	0.05
ICT Access: Non-Instrumental	-0.01	0.03	-0.26	0.80	-0.01
ICT Usage: Higher-Order	0.15	0.04	3.82	0.00	0.30
ICT Usage: Production	0.09	0.04	2.02	0.04	0.14
ICT Usage: Lower-Order	0.06	0.04	1.79	0.07	0.15
ICT Usage: Consumption	-0.05	0.03	-1.83	0.07	-0.11
_cons	2.56	0.13	19.92	0.00	.

Table 71: Block 1 - Hierarchical Regression of ICT access on Self-Perceived Empowerment

Source	SS	df	MS	Number of obs	=	302
				F(24, 277)	=	2.42
Model	11.3631035	24	.473462647	Prob > F	=	0.0003
Residual	54.1251548	277	.195397671	R-squared	=	0.1735
				Adj R-squared	=	0.1019
Total	65.4882583	301	.217568965	Root MSE	=	.4420

DV: Empowerment	Coef.	Std. Err.	t	P>t	Beta
Sex: male	-0.02	0.05	-0.41	0.68	-0.02
Race: Others	0.19	0.11	1.71	0.09	0.10
Race: Indian	0.06	0.08	0.67	0.50	0.04
Race: Malay	0.12	0.08	1.50	0.14	0.09
Age: 65above	0.19	0.10	1.99	0.05	0.13
Age: 55-64	0.00	0.08	0.05	0.96	0.00
Age: 35-44	-0.15	0.07	-1.97	0.05	-0.13
Age: 25-34	-0.09	0.09	-1.01	0.31	-0.06
Age: 18-24	-0.13	0.16	-0.81	0.42	-0.05
Educ: Lower Primary	0.26	0.21	1.23	0.22	0.07
Educ: Primary School	0.05	0.12	0.46	0.65	0.03
Educ: Post-Secondary	0.11	0.11	0.97	0.33	0.06
Educ: Polytechnic Diploma	-0.06	0.08	-0.78	0.43	-0.05
Educ: Bachelor Degree	0.06	0.08	0.75	0.45	0.05
Educ: Post-Graduate Degree	0.11	0.13	0.82	0.42	0.05
Income: \$3k - 5,999	0.09	0.06	1.45	0.15	0.09
Income: \$6k - 8,999	0.05	0.09	0.55	0.59	0.03
Income: \$9k – 11,999	-0.03	0.14	-0.25	0.81	-0.01
Income: \$12k – 14,999	0.28	0.17	1.61	0.11	0.10
Income: \$15k – 19,999	0.01	0.16	0.05	0.96	0.00
Income: \$20k &above	0.21	0.32	0.65	0.51	0.04
ICT Access: Outside of home	-0.04	0.04	-1.16	0.25	-0.08
ICT Access: Instrumental	0.15	0.03	5.19	0.00	0.36
ICT Access: Non-Instrumental	-0.00	0.03	-0.01	0.99	-0.00
_cons	3.43	0.12	28.89	0.00	.

Table 72: Block 2 - Hierarchical Regression of ICT access and usage on Self-Perceived **Empowerment**

Source	SS	df	MS	Number of obs	=	302
				F(28, 273)	=	3.33
Model	16.6585785	28	.59494923	Prob > F	=	0.0000
Residual	48.8296799	273	.178863296	R-squared	=	0.2544
				Adj R-squared	=	0.1779
Total	65.4882583	301	.217568965	Root MSE	=	.42292

DV: Empowerment	Coef.	Std. Err.	t	P>t	Beta
Sex: male	-0.00	0.05	-0.08	0.94	-0.00
Race: Others	0.23	0.10	2.22	0.03	0.12
Race: Indian	0.06	0.08	0.73	0.47	0.04
Race: Malay	0.12	0.08	1.53	0.13	0.09
Age: 65above	0.28	0.10	2.88	0.00	0.18
Age: 55-64	0.03	0.08	0.39	0.70	0.02
Age: 35-44	-0.14	0.07	-1.96	0.05	-0.13
Age: 25-34	-0.07	0.09	-0.81	0.42	-0.05
Age: 18-24	-0.10	0.16	-0.63	0.53	-0.04
Educ: Lower Primary	0.28	0.20	1.39	0.17	0.08
Educ: Primary School	0.06	0.11	0.58	0.56	0.03
Educ: Post-Secondary	0.03	0.11	0.31	0.76	0.02
Educ: Polytechnic Diploma	-0.12	0.08	-1.52	0.13	-0.10
Educ: Bachelor Degree	0.01	0.08	0.08	0.93	0.01
Educ: Post-Graduate Degree	-0.08	0.13	-0.57	0.57	-0.04
Income: \$3k - 5,999	0.11	0.06	1.74	0.08	0.10
Income: \$6k - 8,999	0.06	0.09	0.67	0.50	0.04
Income: \$9k – 11,999	-0.04	0.13	-0.31	0.75	-0.02
Income: \$12k – 14,999	0.22	0.17	1.34	0.18	0.08
Income: \$15k – 19,999	0.03	0.16	0.20	0.84	0.01
Income: \$20k &above	0.10	0.31	0.31	0.76	0.02
ICT Access: Outside of home	-0.09	0.04	-2.14	0.03	-0.15
ICT Access: Instrumental	0.04	0.04	0.98	0.33	0.09
ICT Access: Non-Instrumental	0.00	0.03	0.17	0.87	0.01
ICT Usage: Higher-Order	0.11	0.04	2.82	0.01	0.24
ICT Usage: Production	0.04	0.04	0.88	0.38	0.06
ICT Usage: Lower-Order	0.12	0.04	3.39	0.00	0.30
ICT Usage: Consumption	-0.04	0.03	-1.62	0.11	-0.11
_cons	3.25	0.13	25.82	0.00	.

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