

## Digital Inclusion of Senior Citizens: A Practice Theory Approach

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### Abstract

*The use of Information and Communication Technology (ICT) is becoming pervasive in many societies around the world, rendering people who are less technologically savvy to be digitally excluded in an increasingly digitally-enabled world. One such group is senior citizens who are among the least technologically savvy in many societies. This paper studies the use of ICT among senior citizens by leveraging Bourdieu's Practice Theory. Implications are drawn from the results to discuss how various forms of Capitals and Disposition affect ICT use among senior citizens and what may be done to bring about greater digital inclusion for senior citizens.*

**Keywords:** digital inclusion, digital exclusion, senior citizens, ICT usage, Bourdieu's Practice Theory.

### 1. Introduction

Interest in studying digital inclusion and exclusion can be traced to the early 21st century, as the role of Information and Communication Technology (ICT) in shaping societal disparities and divides became increasingly prevalent (Pethig & Kroenung, 2019; Trauth & Howcroft, 2006; Warschauer, 2003). ICT is capable of either exacerbating social exclusion or expanding social inclusion (Srivastava & Panigrahi, 2019; Warschauer, 2003). One particular social group that is disadvantaged by the advances brought about by ICT innovations is the senior citizens (Adams & Fitch, 2006). The importance of arresting the digital exclusion of senior citizens is exacerbated by two global trends. One trend is the onslaught of a 'silver tsunami' as the world's population ages at an unprecedented rate (Chand & Tung, 2014; Tam Grover & Thatcher, 2014). The other global trend is the increasing ubiquity of ICT with the development of smart cities around the world (Chan et al., 2013). There is hence an imminent need to ensure the digital inclusion of senior citizens even as societies become increasingly technologically enabled.

This paper examines the use of ICT among senior citizens to understand the dynamics that gave rise to the disparity of ICT use among senior citizens. The

motivation is to understand the proclivities and conditions that predispose senior citizens to use or not use ICT so that systemic policies and interventions can be established to ameliorate the digital exclusion of senior citizens even as societies become increasingly technologically enabled.

The research model developed in this study is based on Bourdieu's Practice Theory (Bourdieu, 1997, 1986, 1990), and provides a theoretical basis to examine digital inclusion and exclusion of senior citizens in using ICT. In particular, the constructs of Disposition, Bodily Capital, Cultural Capital, Economic Capital, and Social Capital in Bourdieu's Practice Theory are used to develop the research model. It is posited that such an approach affords a theoretical conceptualization of digital inclusion and exclusion that is not only contextual, multifaceted, and embedded in societal practices and structures, but also affords agentic enactment such that practical interventions can follow from the research findings (Hsieh et al., 2011; Kvasny & Keil, 2006; Tavakoli & Schlagwein, 2016).

A total usable sample of 499 individuals aged between 55 and 75 years old was collected using person-administered survey to test the proposed model. The empirical study comprises two phases. Phase 1 used exploratory factor analysis on 40% of the sample (Sample 1) to establish the measurement. The factor structure was replicated on an independent sample (Sample 2, 60% of the sample) using confirmatory factor analysis. Phase 2 tested the hypotheses using structure equation modelling. The empirical results largely support the proposed hypotheses.

### 2. Digital Inclusion and Exclusion & ICT Use Among Senior Citizens

Digital exclusion has traditionally been termed as digital divide (Al-Jaghoub & Westrup, 2009). However, this term has been criticized as being technological centric as the focus is directed towards the availability and access of ICT, at the expense of ignoring or downplaying the associated psychological, political, social, cultural, or even economic dimensions (Al-Jaghoub & Westrup, 2009; Trauth & Howcroft, 2006).

Warschauer (2003) argued that the focus should not be on eliminating the digital divide, but furthering the process of social inclusion in and through the use of ICT. Social inclusion is concerned with emancipating and reducing inequalities among heterogeneously advantaged groups (Adams & Fitch, 2006; Olbrich et al., 2015). The notion of social inclusion can be understood from its apparent obverse of social exclusion, where certain groups or communities in society are rendered into certain disadvantaged dispositions (Al-Jaghoub & Westrup, 2009; Trauth & Howcroft, 2006). Social inclusion is thus concerned with emancipating and reducing inequalities among heterogeneously advantaged groups (Adams & Fitch, 2006).

Building upon the notion of social inclusion, digital-enabled social inclusion, or digital inclusion for short, is not only concerned with enabling disadvantaged groups to access and use ICT (e.g., Hsieh et al., 2011; Lam & Lee, 2006; Leong et al., 2016; Olbrich et al., 2015; Pethig & Kroenung, 2019; Schehl et al., 2019), but also with having the disadvantaged groups benefit from being able to engage in new social practices and opportunities through accessing and using ICT (e.g., Ganju et al., 2016; Leong, et al., 2016; Oreglia & Srinivasan, 2016; Manzoor & Vimarlund, 2018). For instance, when an elderly person is able to use social media, the key benefit is less about the access to social media in itself but the ability to connect and communicate with friends and relatives, and have higher level of social engagement by keeping abreast with the latest news and fads on social media (Srivastava & Panigrahi, 2019).

One population that is often identified to be in need of greater digital inclusion is senior citizens (Friemel, 2014; Hill et al., 2015; Lam & Lee, 2006). Oft-cited reasons for their disadvantaged disposition can be classified into two broad categories of physiological deterioration (e.g., weaker perceptual, cognitive, and psychomotor abilities that hinder their ICT use) and socio-psychological orientation (e.g., preference for human contact, anxiety, and lack of confidence towards ICT use) (Charness & Boot, 2009; Niehave, 2011; Niehaves & Plattfaut, 2014; Tams et al., 2014; Tams et al., 2018).

Research suggests that ICT use can improve senior citizens' quality of life in terms of psychosocial well-being and maintaining functional independence (Blaschke et al., 2009; Wilson, 2018). Moreover, the implication of their disinclination towards ICT is not just a matter of personal well-being, but has broader social and economic ramifications. From a social angle, the ongoing shift in the transaction of products and delivery of services from traditional offline channels to online channels is intensifying the threat of digital

exclusion among senior citizens. For example, offline channels are being curtailed as online channels are implemented (Chan et al., 2008; Chan et al., 2011), with firms offering preferential discounts on products or incentivized services for their online channels. With the current pursuit to develop smart cities, where cars may become driverless and medical consultation and therapy may be delivered remotely through telemedicine, the ramifications for senior citizens who do not use ICT can be dismal as society becomes increasingly digitalized. To prevent the development of such digital exclusion, a greater understanding of ICT use among senior citizens is crucial (Lam & Lee, 2006; Niehaves & Plattfaut, 2014).

From an economic angle, as the population of senior citizens grows, more seniors will also need to remain actively and gainfully employed in the workforce to sustain the economy (Niehaves & Plattfaut, 2014; Tams et al., 2014, 2018), and reduce the fiscal stress on the state in providing for their needs (Chand & Tung, 2014). With contemporary workplaces becoming highly digitalized, many senior citizens are challenged to remain productive in the workforce.

### 3. Practice Theory

Bourdieu's Practice Theory is among the major social theories for studying digital inclusion and exclusion (Hsieh et al., 2011; Kvasny & Keil, 2006). It is a theory of social action that has been employed mainly in the social sciences, particularly by sociologists and anthropologists (Bourdieu, 1977, 1986, 1990; Bourdieu & Wacquant, 1992). Conceived and developed by Pierre Bourdieu to overcome what he felt to be a redundant categorical distinction between the concepts of 'individual agency' and 'social structure', it argues for the intersection between these two concepts to be the central focus in analyzing social behavior and practice. This is because neither the individuals (i.e., individual agency) nor their situated environment (i.e. social structure) is independent of each other.

From the perspective of Practice Theory, social practice involves individuals in constant communication, interaction, and negotiation with the influences exerted by the social structure in which these individuals are situated within. Practice is often forged through the emergence of personal sense-making of one's relationships with the situated environment. Practice is not necessarily an outcome of pure rational or intentional processes but includes a dynamic conflux of discursive past practices and other pre-existing conditions. At the same time, the individual is also not an absolute passive agent of the social structure, but possesses a degree of autonomous capacity to strategize and enact various practices within the social structure of

their situated environment. Such practices can in turn give rise to the emergence of a new social structure. Hence, there is a constant circular interplay between agency and structure in all forms of practice.

While there are several key concepts covered in Bourdieu's Practice Theory (e.g., Habitus, Field, Strategies, Capital, Logic of Practice), exercising the principle of parsimony in theory development (Weber, 2012), only the concepts of Disposition and Capital that are pertinent in this study are elaborated below.

### 3.1 Disposition

Practice Theory posits that past practice and other pre-existing conditions and structures predisposed individuals towards certain tendencies of behavior and choices. The term Disposition is used to conceptualize such tendencies of behavior and choices (Bourdieu, 1990; Bourdieu & Wacquant, 1992).

Essentially, Disposition is a culmination of the dynamic interplay between the subjective past experiences as well as the existing endowment of an individual on one hand, and the broader social forces in the situated environment of the individual on the other. Disposition can constrain or motivate certain forms of thought, action or behavior. Individuals may not always be completely aware of their Disposition, consequently, finding it hard to articulate, much less rationalize, their own Disposition. Disposition may manifest as attitudes, motivations, and aspirations, existing as a preconscious basis for action (Bourdieu, 1977).

Disposition is dynamic in nature and changes over time. Such changes may be influenced by the constant interaction that an individual is subjected to by their social structure. Disposition may also change through practice as every instance of practice leads to the accumulation of experience and modification of their endowment. Disposition is thus malleable and may evolve and change over time (Bourdieu, 1977, 1990; Bourdieu & Wacquant, 1992).

### 3.2 Capital

The concept of Capital refers essentially to objectified or embodied forms of the social environment (Bourdieu, 1997, 1986, 1990). While the concept of Capital is more often associated with the idea of economic advantage that an individual possesses, Bourdieu argues that Capital can also be expressed in non-economic or even non-material ways. Capital serves as a theoretical concept to facilitate understanding of the association among social structure, pre-existing conditions and practice (Hsieh et al., 2011). Capital takes time to accumulate and can enable or constrain individuals' practice. The assorted

composition of different forms of Capital serves as an immanent structure of the social environment. The composition of Capital evolves over time, and the influence exerted by the historical composition of Capital towards an individual's practice, while durable, is not absolute. Such influence of Capital over practice is embodied as Disposition. As an individual enacts upon his Disposition through practice, such enactment not only leverages existing Capital, but also leads to changes to specific forms of Capital or even a re-composition of an individual's repertoire of Capital (Bourdieu, 1986, 1990). Key forms of Capital conceptualized in Practice Theory include Bodily Capital, Cultural Capital, Economic Capital, and Social Capital (Bourdieu, 1986; Wacquant, 1995).

Bodily Capital refers to the incorporated forms of corporeal abilities and functions which have been learnt, developed and embedded into how an individual can use his body. Cultural Capital refers to erudite abilities and qualities that afford an individual certain advantages within a specific social context. Economic Capital is commonly recognized as finances and monies, but it can also include other manner of economic assets such as property, stocks, and shares. Social Capital refers to the quality and quantity of one's relationships with others within a specific social environment.

## 4. Hypothesis Development

Disposition can be discerned from an individual's preference and inclination, as well as motivation and emotions. In the context of ICT use among senior citizens, negative attitude, lack of self-efficacy, anxiety and lack of motivation have all been suggested to impact senior citizens' ICT use (Hsieh et al., 2011; Jay & Willis, 1992; Phang et al., 2006).

**Hypothesis 1:** Disposition towards ICT has a positive relationship with ICT use among senior citizens.

Bodily Capital includes the health status, physical appearance, cognitive ability, and sensorimotor skills that each individual possesses. In the context of ICT use among senior citizens, senior citizens often experience age-related deterioration in their cognitive ability and sensorimotor skills, affecting their use of ICT (Charness & Boot, 2009; Tams et al., 2018).

**Hypothesis 2:** Bodily Capital has a positive relationship with Disposition towards ICT use among senior citizens.

Cultural Capital includes an individual's level of education and language ability. In the context of ICT use among senior citizens, those with lower educational levels (i.e., lower Cultural Capital) may feel less confident in using ICT and more likely to perceive ICT

as difficult to use (Hernandez-Encuentra et al., 2009, Niehaves & Plattfaut 2014, Phang et al., 2006).

**Hypothesis 3:** Cultural Capital has a positive relationship with Disposition towards ICT use among senior citizens.

Economic Capital is needed to acquire ICT devices and gadgets. In the context of ICT use among senior citizens, it has been posited that seniors with a mediocre level of Economic Capital endowment have a lower Disposition towards ICT use (McMurtrey et al., 2013).

**Hypothesis 4:** Economic Capital has a positive relationship with Disposition towards ICT use among senior citizens.

Social Capital can exist in the form of social networks such as family, friends and other communal associations that provide specific advantages within a particular context. In the context of ICT use among senior citizens, senior citizens with encouraging and supportive social networks may have higher motivation to use ICT (Lam & Lee, 2006; Niehaves & Plattfaut, 2014; Srivastava & Panigrahi, 2019).

**Hypothesis 5:** Social Capital has a positive relationship with Disposition towards ICT use among senior citizens.

## 5. Research Method

An empirical study is conducted to test the hypothesized effect to ascertain the relevance and generalizability of the emergent theory to the population of senior citizens.

To identify measurements for Disposition, Bodily, Cultural, Economic and Social Capital, as well as ICT Use, a structured survey is developed by adapting established scales from relevant literature in different disciplines, including Information Systems and Gerontology (see Appendix A).

Based on Bourdieu's Practice Theory, Disposition for ICT Use among Seniors was operationalized as a multidimensional second-order latent construct, with four first-order dimensions adapted from pre-validated scales, using a seven-point Likert scale for each item, i.e. Anxiety (Phang et al., 2006), Attitude (Jay & Willis, 1992), Motivation (Hsieh et al., 2011; Phang et al., 2006), and Self-efficacy (Hsieh et al., 2011).

Bodily Capital measurement comprises items relating to Vision, Memory, and Motor Skills, according to Phang et al., (2006). Cultural Capital measure comprises items relating to Education (Singstats, 2011), ICT-related Work Experience (Agarwal & Prasad, 1999), and Normative Language Proficiency (Marian et al., 2007). Keeping with how Economic Capital has often been assessed when studying senior citizens in Singapore (Jatrana & Chan, 2007; Yap et al., 2007), a proxy approach is taken through three measurements,

i.e., type of housing, last drawn salary, and total monthly income from all sources. Social Capital is operationalized as a four-item latent construct, with scale items adapted from Phang et al., (2006).

ICT Use is assessed by a 2-item usage frequency scale adapted from Park and Jun (2003) and Hartke, Prohaska, and Furner (1998). This resulted in a total of 21 items. In addition, demographic data such as age, gender, and ethnicity are also collected.

A person-administered survey is conducted by trained administrators with 503 Singaporeans between the age of 55 and 75 years old, who are assured of the confidentiality of their responses. The survey questionnaire is also translated into Mandarin and Malay for standardized administration to non-English speaking participants. Four participants with incomplete responses are excluded and the usable sample contains 499 individuals, comprising 241 males (48.3%) and 258 females (51.7%).

To assess whether common method bias is a concern, the Harmon One-Factor Test was conducted by entering all independent and dependent variables in an Exploratory Factor Analysis (EFA) (Podsakoff et al., 2003). The first factor accounts for 26.59% of the total variance, less than 50% of the cut-off value, indicating a lack of substantial common methods bias.

Thereafter, the total useable sample of 499 responses is randomly divided into 2 independent sub-samples, Sample One and Sample Two. Sample One contains 40% of the sample and Sample Two contains 60% of the total sample. Since new scales are developed/adapted, an assessment of the psychometric properties of the scales of various forms of Capital was conducted first via an EFA using Sample One (pilot study). Sample Two is then employed to test the hypothesized relationships using Structural Equation Modelling (SEM).

### 5.1 Sample One - Measurement Validation

To establish the measures of Capital, we conducted an EFA using a principal component method on Sample One as a pilot study. Diagnostic tests indicated that the model is appropriate for the data (KMO = 0.85, Bartlett's test of sphericity = 3718.19,  $p < 0.001$ ). In addition, the measures of sampling adequacy are reasonably high, ranging from 0.75 to 0.90. Examination of the scree plot indicates that a four-factor solution best fits the data (four factors have Eigenvalues above 1). Principal-component analysis extracted four factors, and Varimax Rotation is used to facilitate the interpretation of factors. For the four-factor solution, all variables had communalities above 0.54. The Rotated Factor Loadings are shown in Table 1.

The analysis identified 21 variables that loaded on four distinct Capital dimensions. Most of the items exhibited desirable psychometric properties (Hair, et al., 1995), with loadings higher than 0.70 on the designated factor and at the same time less than 0.40 on other factors (Chin et al., 1997). Although two of the items, i.e. Cultural Capital 1 and Economic Capital 2, loaded highly on both Cultural Capital and Economic Capital, these items display significantly higher loadings on their designated factor. Furthermore, the item statements fit with the theoretical definitions of the designated Capital logically. Thus, these two items are kept. Consequently, these 21 items represented the scales measuring the four types of Capitals in the succeeding study. The factor structure is replicated on an independent sample (Sample Two) using confirmatory factor analysis (CFA). We then tested the hypotheses using SEM.

**Table 1. Rotated Factor Loadings for Exploratory Analysis**

	Component			
	Factor 1 Bodily Capital (30.04% variance)	Factor 2 Cultural Capital (23.47% variance)	Factor 3 Social Capital (15.12% variance)	Factor 4 Economic Capital (6.13% variance)
Bodily Capital 1	0.869			
Bodily Capital 2	0.868			
Bodily Capital 3	0.790			
Bodily Capital 4	0.799			
Bodily Capital 5	0.892			
Bodily Capital 6	0.806			
Bodily Capital 7	0.803			
Bodily Capital 8	0.848			
Bodily Capital 9	0.711			
Cultural Capital 1		0.661		0.541
Cultural Capital 2		0.665		0.468
Cultural Capital 3		0.945		
Cultural Capital 4		0.958		
Cultural Capital 5		0.945		
Economic Capital 1				0.749
Economic Capital 2		0.529		0.658
Economic Capital 3				0.827
Social Capital 1			0.848	
Social Capital 2			0.910	
Social Capital 3			0.877	
Social Capital 4			0.939	

Note: Factor loadings smaller than 0.40 are not displayed.

## 5.2 Sample Two - Hypothesis Testing

**5.2.1 Measurement Model.** We then used Sample Two to empirically test whether the Capitals impact Disposition and ICT Use. We adopted a two-step approach by which the measurement model is first assessed by a CFA before testing the structural model to avoid misinterpretation (Anderson & Gerbing, 1988).

Model fit is assessed by four indices: Comparative Fit Index (CFI), Tucker Lewis index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). A model was considered to be satisfactory if CFI > 0.90, TLI > 0.90, RMSEA < 0.06, and SRMR < 0.08 (Gefen et al., 2000; Hu & Bentler, 1999; Kenny, 2013). The Akaike Information Criterion (AIC) is also used to compare alternative models, by which smaller values imply a better fit (Bozdogan, 1987; Steenkamp & Baumgartner, 1998).

There are nine first-order latent constructs defined in the measurement model. The result of the initial CFA did not show a good fit:  $\chi^2(847) = 1880.35$ , CFI = 0.889, TLI = 0.876, RMSEA = 0.064, SRMR = 0.059, AIC = 45802. Further inspection of the output revealed that there is a high level of correlation among some items that can result from item wording redundancy. Furthermore, some item loadings are below the recommended cut-off level of 0.60 (Chin et al., 1997). The model is thus refined by dropping three items from the latent variable of Bodily Capital and three items from attitude. The new model showed improved model fit with satisfactory loadings across items:  $\chi^2(610) = 1047.00$ , CFI = 0.944, TLI = 0.935, RMSEA = 0.049, SRMR = 0.052, AIC = 39422. Table 2 tabulates the composite reliabilities (CR), average variance extracted (AVE), and correlations of the factors based on the refined measurement model. This is examined to determine reliability, convergent validity, and discriminant validity of the scale.

**Table 2. Estimated Factor Correlation Matrix from the Revised Measurement Model**

No	Item	CR	AVE	Correlation Matrix																
				1	2	3	4	5	6	7	8	9								
1	Cultural Capital	.91	.68	.82																
2	Economic Capital	.77	.54	.72	.73															
3	Social Capital	.87	.52	.15	.13	.72														
4	Bodily Capital	.90	.63	.24	.29	.04	.79													
5	Anxiety	.80	.57	.56	.43	.23	.33	.75												
6	Attitude	.71	.34	.50	.34	.21	.24	.69	.58											
7	Motivation	.90	.56	.35	.27	.45	.04	.33	.64	.75										
8	Self-Efficacy	.88	.71	.67	.46	.27	.16	.59	.53	.56	.84									
9	Use	.89	.81	.85	.70	.21	.25	.52	.57	.38	.71	.90								

Note: CR = composite reliability; AVE = average variance extracted. Value on the diagonal is the square root of AVE.

First, reliability of the scale was examined based on computations of CR and AVE. A scale is deemed reliable if CR > 0.70 and AVE > 0.50 (Bagozzi & Yi, 1988). As shown in Table 2, most measures showed good reliability with CR ranging from .71 to .91, and AVE ranging from 0.52 to 0.81. The Attitude measure is also closed to satisfactory range (CR = 0.71, AVE = 0.34). Although its AVE is less than 0.5, the CR is higher than 0.6, the construct is still adequate (Fornell & Larcker, 1981). Second, the CFA results showed that most standardized item loadings are greater than 0.5 with the lowest being 0.48. This attests to the convergent

validity of the measures (Bagozzi & Yi, 2012). Third, discriminant validity is achieved if the square root of AVE is larger than correlation coefficients (Chin, 1998; Fornell & Larcker, 1981). All of the correlation estimates met the criterion except three. The first pair is between Cultural Capital and ICT Use. Explanation for this is provided in the ‘Discussion & Conclusion’ section. The second and third pairs are between Anxiety and Attitude, and between Attitude and Motivation. The latter two pairs posed less of an issue, as Anxiety, Attitude and Motivation are all sub-dimensions under the higher-order latent construct of Disposition, and thus these constructs are conceptually related. Furthermore, because of the size of the correlation matrix, which included 36 pairs, some violations could occur simply by random chance (Campbell & Fiske, 1959). Overall the measurement model is considered to be satisfactorily reliable.

### 5.2.2 Structural Model Hypotheses Testing Results.

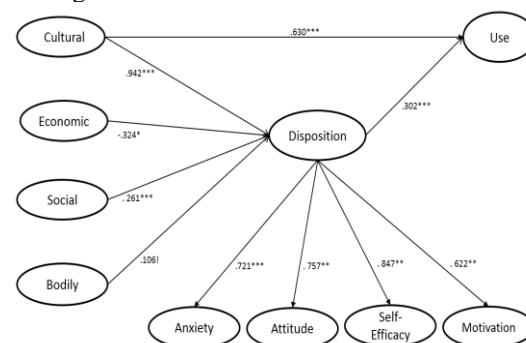
The hypothesized model is tested using SEM. Fit indices indicated that the model fitted satisfactorily,  $\chi^2(631) = 1127.44$ ,  $CFI = 0.923$ ,  $TLI = 0.914$ ,  $RMSEA = 0.056$ ,  $SRMR = 0.074$ ,  $AIC = 39561$ .

Support is found for four of the five proposed hypotheses. Specifically, as hypothesized, Disposition has a positive effect on ICT Use ( $\beta = 0.897$ ,  $p < 0.001$ , two-tailed, Hypothesis 1 supported). Bodily Capital has a positive effect on Disposition ( $\beta = 0.095$ ,  $p < 0.05$ , two-tailed, Hypothesis 2 supported). Cultural Capital has a positive effect on Disposition ( $\beta = 0.984$ ,  $p < 0.001$ , two-tailed, Hypothesis 3 supported). Social Capital has a positive effect on Disposition ( $\beta = 0.191$ ,  $p < 0.001$ , two-tailed, Hypothesis 5 supported). However, contrary to the hypothesis, Economic Capital has a marginally significant negative impact on Disposition ( $\beta = -0.197$ ,  $p < 0.1$ , two-tailed, Hypothesis 4 not supported).

Lastly, we tested if the effect of the Capitals on ICT Use is fully mediated by Disposition. This is done by adding a direct path from each Capital to ICT Use and testing for a significant decrease in chi-square value. Adding direct paths to ICT Use for Bodily Capital, Social Capital, Economic Capital did not result in a significant chi-square change ( $p > 0.05$ ). However, adding a direct path for Cultural Capital resulted in a significant chi-square change ( $\Delta\chi^2(1) = 59.69$ ,  $p < 0.001$ ). Thus, the direct path between Cultural Capital and ICT Use is added to the model. The fit indices of the resultant model showed that it is a realistic representation of the data ( $\chi^2(630) = 1167.75$ ,  $CFI = 0.931$ ,  $TLI = 0.923$ ,  $RMSEA = 0.053$ ,  $SRMR = 0.066$ ,  $AIC = 39503$ ). The direct impact of Cultural Capital on ICT Use is found to be positive and significant ( $\beta = 0.630$ ,  $p < 0.001$ , two-tailed).

Figure 1 below presents the revised model. When the direct effect of Cultural Capital is introduced to the model, all of the positive relationships from the original model remain the same. Disposition has a positive effect on Use ( $\beta = 0.302$ ,  $p < 0.001$ , two-tailed). The positive effect of Cultural Capital and Social Capital on Disposition stayed significant and the positive effect of Bodily Capital on Disposition is marginally significant ( $p < 0.1$ ). Contrary to our hypothesis, Economic Capital displayed a negative relationship with Disposition ( $\beta = -0.324$ ,  $p < 0.05$ , two-tailed).

In summary, the result was in agreement with the hypotheses to a large extent. Firstly, Cultural, Social, and Bodily Capital are positively correlated with Disposition. Disposition also has a positive impact on ICT Use. The positive influence of Cultural Capital on Use is partially mediated by Disposition. However, contrary to the hypothesis, Economic Capital showed a significant negative relationship with Disposition. These relationships are further elaborated in the following ‘Discussion & Conclusion’ section.



Note:  $!p < 0.1$ ,  $*p < 0.05$ ,  $**p < 0.01$ ,  $***p < 0.001$  (two-tailed)

**Figure 1. Standardized Coefficient Estimates of the revised SEM Model**

## 6. Discussion & Conclusion

The motivation of this study is primarily to understand the proclivities and conditions that predispose senior citizens to be either users or non-users of ICT so that systemic policies and interventions can be established to ameliorate the digital exclusion of senior citizens.

As shown in the results, senior citizens’ Disposition towards ICT is positively related to their Use. In turn, their Disposition towards ICT is positively affected by their level of Bodily, Cultural, and Social Capital. Among these three Capital, Cultural Capital has the strongest positive relationship with Disposition, followed by Social Capital. Particularly, Cultural Capital has a significant and direct relationship with Use of ICT. While Bodily Capital is significantly related to Disposition, it has a relatively weaker relationship to

Disposition. Only Economic Capital has a significant and negative relationship towards Disposition.

Cultural Capital appears to be a strong factor in determining ICT Use among senior citizens. Explanation for this may be drawn from previous studies where education and ICT knowledge reduces computer anxiety (Ellis & Allaire, 1999), increases self-efficacy (Roger & Fisk, 2010) and increases motivation to use ICT (Agarwal & Prasad, 1999). The direct effect of Cultural Capital on ICT Use may also be explained by studies showing education and knowledge as a significant predictor of usage (Hsieh, 2011; Niehaves & Plattfaut, 2014; Phang et al., 2006; Schehl et al., 2019). Moreover, it has been suggested that in multilingual and multicultural settings where ICT is predominantly designed in a normative language, elderly with low proficiency in the normative language have found it difficult to use ICT even if they have the Disposition to do so (Alam & Imran, 2015). These affirm the strong and direct effect of Cultural Capital on ICT Use. Given that existing policies focused on the provision of access to digital technology (e.g. subsidized smart devices and mobile data plans) in ameliorating digital exclusion of senior citizens, the significance of this finding is that it stresses the importance of education and training to help senior citizens acquire Cultural Capital needed in using ICT. Furthermore, besides helping seniors to be proficient in the normative language in multilingual and multicultural settings, it may also be productive for ICT to be designed for use in different languages.

Social Capital is the next strongest factor in determining ICT Use. Studies have suggested the significance of social support in seniors' use of ICT (Friemel, 2014; Schehl et al., 2019). Based on this finding, policy intervention should also look into mobilizing the network of family and friends in supporting senior citizens to use ICT. One possible approach is to set up ICT consultation clinics at community-based senior citizen clubs.

The finding also suggests that while important, Bodily Capital is weak at effecting ICT Use among seniors. An explanation for this may be the increasing usability of ICT devices as well as the improving physical wellness among younger cohorts of seniors. The usability design of ICT devices (e.g., tablets and smartphones with gesture-based interfaces) has improved considerably in the recent decade. At the same time, recent cohorts of seniors are also physically stronger and healthier as compared to earlier generations. This may be due to medical advancement (e.g., laser surgery to correct cataracts) as well as better diet and healthcare. As such, greater efforts may hence be directed toward improving the Cultural Capital and Social Capital to promote digital inclusion among senior citizens.

Interestingly, Economic Capital showed a significant and negative relationship with Disposition towards ICT Use. While seemingly counter-intuitive, a reasonable explanation is that seniors with lesser Economic Capital may have greater yearning and desire (i.e. Disposition) towards using ICT, while those who possess higher Economic Capital do not perceive ICT Use as something that is particularly more desirable. In other words, the novelty, status and desirability of ICT Use among the lower economically endowed seniors may be stronger in comparison to those with higher economic endowment. There is basis for this as similar findings where socioeconomically disadvantaged ICT adopters showed significantly higher motivation to adopt ICT than the socioeconomically advantaged has also been reported (Hsieh et al., 2011). Another explanation could be that seniors with higher Economic Capital may experience a higher level of technostress than those with lower Economic Capital as they may associate ICT Use in the context of work, whereas those with lower Economic Capital may associate the ICT Use in the context of entertainment.

While more research will be needed to examine and affirm these explanations, policy makers may leverage the findings from these study and the suggested interventions to enhance the digital inclusion of senior citizens even as societies become increasingly digitalized.

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## 7. References

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## Appendix A: Survey Items

Construct	Items	Source
<b>Bodily Capital<sup>1</sup></b>		Phang et al., (2006)
Vision	To what extent do you agree Vision... 1. ...causes you to have difficulty in performing daily activities? * R 2. ...requires you to exert more effort to perform daily activities? R 3. limits the kind of activities that you can perform? R	
Memory	To what extent do you agree Memory... 1. ...causes you to have difficulty in performing daily activities? R 2. ...requires you to exert more effort to perform daily activities? * R 3. limits the kind of activities that you can perform? R	

