Senior Citizens’ Self-Efficacy for ICT Use: The Influence of Gender, Social Influence and Social Support

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INTRODUCTION

As the world becomes more connected, more information and services are delivered digitally to people, tremendously improving the quality of individuals’ daily life and even increasing social welfare (Hansen, Lundberg, & Syltevik, 2018; Choi & Dinitto, 2013). However, a digital inequality problem emerges as the socio-economically less privileged group has limited access to the digital world due to their incapability to navigate with electronic device (Hsieh, Rai, & Keil, 2011). Some researchers also called this phenomenon as the digital divide (Al-Jaghoub & Westrup, 2009). As Warschauer (2003) pointed out about the digital divide, the ultimate goal for reducing the digital divide is not about access to the internet, but about the benefits from such new social practices, e.g. better communication with the family and friends. Specifically, in the domain of Information and Communication Technology (ICT) use, senior citizens are often identified as a lagged-behind social group that has failed to keep pace with the technological advancements (Friemel, 2016). As most countries in the world have longer life expectancy and an ageing population, it is critical to understand the factors affecting ICT adoption among the senior citizens. “Active aging” requires a senior citizen to participate in the society with social, physical, and mental well-being, which also implies the importance of ICT adoption in the digital era (Moulaert & Biggs, 2013).

The previous literature on ICT adoption focused on the Technology Acceptance Model (TAM) with the support of Theory of Reasoned Action (TRA), which has been tested by a large number of studies in the context of ICT adoption (Rauniar et al., 2014; Kim & Shin, 2015; Marangunic & Granic, 2015). Two important factors identified by TAM studies include perceived usefulness (PU) and perceived ease of use (PEOU), as well as individuals’ attitude and behavioral intention towards ICT adoption. However, research testing actual ICT use remains sparse, especially in the context of senior citizens’ ICT use. This research measures the actual ICT use by senior citizens (including both frequency and ICT device variety) rather than the behavioral intention.

Moreover, previous researchers examined how various factors influence ICT adoption among senior citizens, including age, degree of functional impairment, financial resources, education level etc. (Choi & Dinitto, 2013). In addition to the demographic factors, psychological factors such as computer self-efficacy (CSE) is also crucial in understanding ICT adoption. CSE originated from the classic psychological concept of self-efficacy (Bandura, 1986), and is defined as an individual judgment of one’s capability to use a computer. It is closely related to individuals’ decision to use computers and the perceived ease to effectively operate computer systems (Bao, Xiong, & Hu, 2013; Compeau & Higgins, 1995). Individuals with higher CSE have higher confidence in evaluating their own ability to finish computer-based tasks. CSE has been found to be a significant variable to predict the behavioral intention.

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to adopt ICT (Hsia, Chang, & Tseng, 2014; Hayashi et al., 2004). Therefore, this research includes CSE in the model and verifies how CSE influences ICT use by senior citizens. We hypothesize the following pertaining to CSE:

**H1**: CSE has a positive effect on ICT use among senior citizens.

As senior citizens have a higher degree of fragility in terms of both physical and mental conditions (Culo, 2011), they usually need caregivers and are susceptible to social influence. Social influence refers to the needs of belonging and being connected with others, including family, friends, and larger social circles (Hamari & Koivisto, 2015). In other words, the fulfillment of being closely related to others is important to intrinsic motivation. A supportive environment is also required, where individuals are likely to be recognized and accepted. Moreover, the recognition by the social group emerges from acceptance, continuously motivating people to conform to the group norms. Prior research examined the effect of social influence in different scenarios, including social networking services (Cheung & Lee, 2010) and e-commerce (Hamari, 2013) etc. In the senior citizen ICT use context, perceived relatedness by the means of information systems potentially makes individuals have increased perceived readiness to use ICT (Zhang, 2008). Therefore, we argue that social influence to senior citizens may be enhanced because they depend more on others compared to individuals of younger age groups. It may potentially increase their CSE and ICT use, when the social norm to use ICT is established. We hypothesize the following pertaining to social influence:

**H2**: Social influence has a positive effect on CSE among senior citizens.

Another related construct is social support, which refers to comfort, assistance, or information from others ((Hsieh, Rai, & Keil, 2011). There are various types of social support, including emotional support (understanding and acceptance), informational support (advice and suggestions), and instrumental support (tangible help) (Mossakowski & Zhang, 2014). These social supports are usually offered by family, friends and the community. Social support not only benefits senior citizens’ CSE through encouragement and emotional support, but also through direct assistance and instrumental support. However, it may be difficult to determine whether emotional social support is more or less effective than instrumental social support for enhancing the CSE of senior citizens in ICT use. Social support may have a positive effect on CSE among senior citizens.

Due to the fast changing pace in advancement of the digital world, senior citizens may have technology anxiety. More specifically, such anxiety and depression may pose a more serious challenge for females (Hodes et al., 2015). Previous research showed women have twice the possibility of suffering from anxiety disorders (Kessler et al., 1996). Social support could serve as an effective buffer to significantly reduce the anxious feelings (Mossakowski & Zhang, 2014). Therefore, women may be more in need of the social support compared to men in ICT use. We further hypothesize the following pertaining to social support and gender:

**H3**: Gender moderates the effect on social support and CSE among senior citizens. Specifically, the effects on women are augmented.

Figure 1 summarizes the conceptual framework.
RESEARCH METHODOLOGY

A survey methodology was used to quantitatively test the developed hypotheses. All operational definitions of construct were adapted from related literature. Table 1 shows a summary of the measurement items and sources. The measurement items were slightly modified to suit the context of ICT usage for seniors. 503 Singaporeans between 55 and 75 years-of-age without mental conditions (e.g. dementia) participated in the person-administered survey with a trained administrator. To maximize representativeness of the Singapore population, a quota sampling approach was adopted. Quotas were determined by the proportion of Singaporeans according to their age range, gender, and ethnicity, as per the 2010 Singapore Population Census (Singstats, 2011). As a survey participation incentive, each participant was offered SG$10 (US$7.43) worth of supermarket vouchers for completing the survey. The questionnaire was also translated into Mandarin and Malay for standardized administration to non-English speaking participants.

Table 1: Measurement items and sources

<table>
<thead>
<tr>
<th>Construct</th>
<th>Measurement items</th>
<th>Adapted from</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Self-Efficacy (CSE)</td>
<td>1. you feel comfortable using e-services on your own? 2. you can easily operate e-services on your own? 3. comfortable using e-services even if there is no one around you to tell you how to use it?</td>
<td>Taylor &amp; Todd 1995; Hsieh et al., 2011</td>
</tr>
<tr>
<td>Social Influence</td>
<td>1. your family thinks that you should use e-services? 2. your relatives think that you should use e-services? 3. your friends think that you should use e-services?</td>
<td>Taylor &amp; Todd 1995; Hsieh et al., 2011</td>
</tr>
<tr>
<td>Social Support</td>
<td>1. you have someone to help solve e-service related problems? 2. you have friends or family to provide necessary help to use e-services? 3. you have friends and family to help with e-service related problems? 4. supported by those around you when you have difficulty using e-services?</td>
<td>Wu &amp; Rudkin, 2000; Hsieh et al., 2011</td>
</tr>
</tbody>
</table>

Aside from the latent constructs, demographic data such as age, gender, ethnicity, and highest education level were also collected. Table 2 shows the details of respondent characteristics.
Table 2: Demographic distribution of participants by ethnicity, age group, and gender

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Chinese</th>
<th>Malay</th>
<th>Indian</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 55 - 64</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>136</td>
<td>17</td>
<td>10</td>
<td>1</td>
<td>164</td>
</tr>
<tr>
<td>Female</td>
<td>140</td>
<td>19</td>
<td>12</td>
<td>3</td>
<td>174</td>
</tr>
<tr>
<td>Age 65 - 75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>64</td>
<td>7</td>
<td>7</td>
<td>1</td>
<td>79</td>
</tr>
<tr>
<td>Female</td>
<td>71</td>
<td>8</td>
<td>4</td>
<td>3</td>
<td>86</td>
</tr>
<tr>
<td>Total</td>
<td>411</td>
<td>51</td>
<td>33</td>
<td>8</td>
<td>503</td>
</tr>
</tbody>
</table>

Data Analysis
The data in this study were examined using partial least squares (PLS). PLS is recommended for use when: the sample size referring to the number of latent variables is small; the model is complex and has numerous latent and manifest variables; the model has less strict assumptions on the distribution of variables and error terms; and the model has both reflective and formative variables (Henseler, Ringle, & Sinkovics, 2009). PLS has become increasingly more popular because of less restrictions on measurement scales, sample size, and residual distribution (Chin, 1998), and because it analyses both a measurement model and a structural model. A measurement model was used to evaluate reliability, convergent validity, and discriminate validity. A structural model was used to determine the significance and association of each hypothesized path, and the explained variance ($R^2$ value).

Measurement Model
The measurement model was evaluated by the criteria of reliability, convergent validity, and discriminate validity. Reliability was examined by composite reliability values above the 0.70 benchmark. Table 3 shows all values above 0.70, indicating satisfactory reliability. Convergent validity was examined by all indicator loadings that were significant and exceeding 0.7 and average variance extracted (AVE) by each construct exceeding 0.50 (Fornell & Larcker, 1981). Table 3 shows all indicator loadings above 0.70 and all AVEs exceeding 0.50, indicating satisfactory convergent validity. Discriminant validity is demonstrated by the square root of the AVE for each construct exceeding the correlations between the constructs (Chin, 1998). The results displayed in Table 4 show that all the criteria are met. These results indicate that the proposed models have good reliability and validity.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Standardized Item Loading</th>
<th>Composite Reliability (CR)</th>
<th>Average Extracted (AVE)</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE</td>
<td>Eff1</td>
<td>0.86</td>
<td>0.93</td>
<td>0.81</td>
</tr>
<tr>
<td></td>
<td>Eff2</td>
<td>0.94</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eff3</td>
<td>0.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Influence</td>
<td>SInflu1</td>
<td>0.89</td>
<td>0.94</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td>SInflu2</td>
<td>0.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SInflu3</td>
<td>0.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Support</td>
<td>Ssupt1</td>
<td>0.78</td>
<td>0.92</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>Ssupt2</td>
<td>0.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ssupt3</td>
<td>0.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ssupt4</td>
<td>0.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usage Freq</td>
<td>USEFreq1</td>
<td>0.94</td>
<td>0.95</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>USEFreq2</td>
<td>0.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usage Var</td>
<td>USEVar1</td>
<td>0.93</td>
<td>0.93</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>USEVar2</td>
<td>0.95</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4: Correlations among constructs

<table>
<thead>
<tr>
<th></th>
<th>CSE</th>
<th>Social influence</th>
<th>Social support</th>
<th>Usage frequency</th>
<th>Usage variety</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE</td>
<td>0.90</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social influence</td>
<td>0.47</td>
<td>0.91</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social support</td>
<td>0.24</td>
<td>0.42</td>
<td>0.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usage frequency</td>
<td>0.62</td>
<td>0.41</td>
<td>0.16</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Usage variety</td>
<td>0.63</td>
<td>0.37</td>
<td>0.11</td>
<td>0.84</td>
<td>0.94</td>
</tr>
</tbody>
</table>

Structure Model
In path model analysis, determining the significance and association of each hypothesized path and the R² value is important. Figure 2 shows the standardized path coefficient and the significance of each path reported by PLS. H1 investigates the positive effect of CSE on ICT use among senior citizens. Results show that CSE is positively related to ICT usage frequency ($\beta=.619$, $t$-value=21.35, $p<.001$, $R^2=0.383$) and variety ($\beta=.634$, $t$-value=22.98, $p<.001$, $R^2=0.402$) and explains a significant percentage of the variance in usage ($R^2=0.383$). These results support H1. H2 and H3 investigate the effects on CSE. Social influence is positively related to CSE ($\beta=.450$, $t$-value=10.07, $p<.001$, $R^2=0.222$), supporting H2. Social support does not have a significant effect on CSE ($\beta=.047$, $t$-value=.97, $p>.05$). A multi-group analysis (PLS-MGA) shows that the positive effect of social support is only significant for female users ($\beta=.180$, $t$-value=2.62, $p<.01$) but not male users ($\beta=-.040$, $t$-value=.50, $p>.05$), supporting H3. Figure 2 summarises the results of the SEM analyses.

DISCUSSION
As shown in the results, senior citizens’ CSE is positively related to their ICT usage. In turn, their CSE is positively affected by social influence and social support. However, social support only improves CSE for female senior citizens but not for male senior citizens. Although traditionally, in the promotion of ICT use among seniors, the emphasis has been to compensate for their eroding bodily capital due to natural ageing (Becker, 2005; Charness & Boot, 2009). This study suggests that social influence appears to be a strong factor in determining ICT usage among senior citizens. The results indicate that seniors are more keen to use ICT if their...
family and friends think that they should use these devices and services. For female senior citizens, they are more likely to use ICT when their family and friends provide encouragement and technical assistance. This is in line with recent research suggesting the significance of social capital in seniors use of ICT (Friemel, 2014). Therefore, to minimize the exclusion of seniors as cities become smarter and the world becomes more technology-enabled, some degree of social engineering intervention may be required. Based on this finding, such interventions may be more effective if it is not only targeted at the seniors, but also at their family and friends to be more encouraging and supportive of seniors in using ICT.

**CONCLUSION**

This research demonstrated that psychological factors such as computer self-efficacy (CSE) is crucial in understanding ICT usage among senior citizens. In ICT usage amongst seniors, we found that CSE is an important mediating factor between social influence, social support and usage. From these insights, implications to policy and practice are also articulated with the aspiration towards social inclusion of senior citizens in this increasingly technologically-enabled world. To conclude, in attempting to promote ICT usage amongst seniors, we suggest that scholars and implementers of intervention programs may find it effective to focus more on social dimensions. It is believed that such an approach can also lead to the emancipation and reduction of inequalities among differently advantaged groups even as cities become smarter and the world becomes more technology-enabled.

**REFERENCES**


