The Role of Technology Self-efficiency on Technology Product Acceptance and Usage: A Study on Chinese Older People

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Abstract. Aging is one of the most significant population trends in the world while technology is developing at an unprecedented rate. Technology products inevitably enter people's life, but many older people experience difficulty, frustration, or exclusion when using them. Therefore, the acceptance and usage of technology products among older people is relatively low. This study focuses specially on Chinese older people (aged between 50 and 70), using mobile phone as the research tool, to investigate whether self-efficacy would affect one's desirability and ability of using technology products.

Keywords: Technology · Self-efficacy · Acceptance · Older people

1 Introduction

Nowadays, technology products can be found in all the domains of our life (Wang and Liu 2014). Many research have proved that technology products can improve older people's life quality. They benefit older people in different aspects such as social integration and adaption, searching for information, everyday tasks, and entertainment, keeping active mind (Malla 2014).

However, numerous studies suggest that older people experience difficulty, frustration, or exclusion when using technology products. (Burnett 2009; Demiris 2004). Thus, many older people prefer to be left behind instead of learning the foreign technology that they have never encountered before. (Mieczakowski and Clarkson 2013; Kang 2009).

Self-efficacy is raised and applied in psychological domain initially. It describes individual's perception of his or her capabilities to perform and complete a task (Bandura 1997). A person who has high self-efficiency degree could be more active and confident in handling different issues. So we raise the general hypothesis that high technology self-efficacy would affect one's desirability of using technology products positively.

Also, some researchers have explored the relation between self-efficacy and task performance (Combe et al. 2013; Wolters et al. 2010) but report different results.

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Specifically, this study aimed to explore the role of self-efficacy on the acceptance and usage of technology products among Chinese older people.

The "older people" in this study were set from age 50 to 70. Usually, we define people over 60 years old as the older people while 60 is the age that people are going to retired in China. We included people between 50–60, whom we define as the 'young-old', for the consideration that this group of people are experiencing the evolvement of Internet and have been involved in different technologies to some degree, which may gives us some predictive inspiration in future design and research work. We excluded people over 70 in this study, because they are more likely to be failed in the task performance due to their physical and cognitive competence decline in aging process.

The "acceptance" is evaluated by "the frequency of technology usage" and "usage" is evaluated by "task performance".

2 Methods

This study is part of a multiple capability-related data survey conducted by the Inclusive Design Research Group at Tongji University. Seven interviewers are recruited into this survey. They have received unified training and are familiar with the process of testing. Face-to-face questionnaire and performance test are applied in this study.

2.1 Participants

There are 130 respondents aged 50–70 (mean = 57.4, male = 60, female = 70) who were recruited from seven cities in China (Fuzhou, Shanghai, Nanjing, Yulin, Lanzhou and Fuzhou). 127 respondents (Table 1) had mobile phone and completed the whole test. Most of them have an education level above high school.

Table 1. Basic information of the respondents

Age	50-59	60-69	All
Gender			
Male	31	28	59
Female	47	21	68
Education			
Primary school or below	0	4	4
Middle school	10	20	30
High school	40	8	48
Secondary technique school	6	9	15
Junior college	12	4	16
Bachelor degree or above	10	4	14

2.2 Technical Self-Confidence

Self-efficacy does not refer to people's general beliefs in themselves, such as self-esteem does. It refers to people's beliefs about their abilities in more specific realms. Therefore, in this study, Technical Self-Confidence Scale invented by Combe et al. was adopted instead of Ralf Schwarzer's General Self-Efficacy Scale (GSES). This scale is based on the Subjective Technical Competence (STC) scale used by Arning and Ziefle (2007) and the Affinity to Technology Scale used by Wolters et al. (2010). It consists of ten statements: seven positive ones and three negative ones. It is used in the research of designing technology for older people, which fits this study quite well. This scale has been carefully translated to fit the Chinese background.

The respondents rated the statements from 1 to 5 as to whether they totally disagree (1) or totally agree (5). The higher the total score is, the higher the technology self-efficacy the respondent has.

2.3 Frequency of Technology Usage

Mobile phone, computer and Internet have been widely used in China today. The "the frequency of technology usage" is evaluated by the summing up the frequency of using all these three. The respondents rated the frequency with number 1 to 4:

1 = Never
2 = Occasionally
3 = Everyday within 4 h
4 = Everyday more than 4 h

2.4 Performance Test

GALAXY Trend 3 was used as a unified tool in the performance test. The product interaction tasks consisted of making a phone call, texting and sending a message, taking a photo and sending photo through social network app (Wechat). The testing results are coded as '0' or '1' depending on whether the tasks were successfully completed. Overall performance is calculated base on the scores respondents got in all these four tasks.

3 Results and Analysis

3.1 Technical Self-confidence

The results show that the average score of all the respondents is 28 (Min = 10, Max = 48, SD = 7.932). The technology self-confidence of male (M = 29) is a little higher than that of female (M = 26).

Technology self-efficacy is most significant correlated with education (correlation coefficient = 0.282, $p < 0.01$).

Older people with higher education level have higher technology self-efficacy but people at different age within 50–70 do not show much difference in technology self-efficacy (Table 2).

Table 2. Correlation coefficient between technology self-efficacy and demographic variables

	Gender	Age	Education
Correlation coefficient	−.175*	−.118	.282**
p	.046	.181	.001

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

3.2 Frequency of Technology Usage

The average score of frequency of technology usage is 8.65 (SD = 2.562). Female respondents (Mean = 8.76) use technology a little more frequently than male respondents (Mean = 8.52).

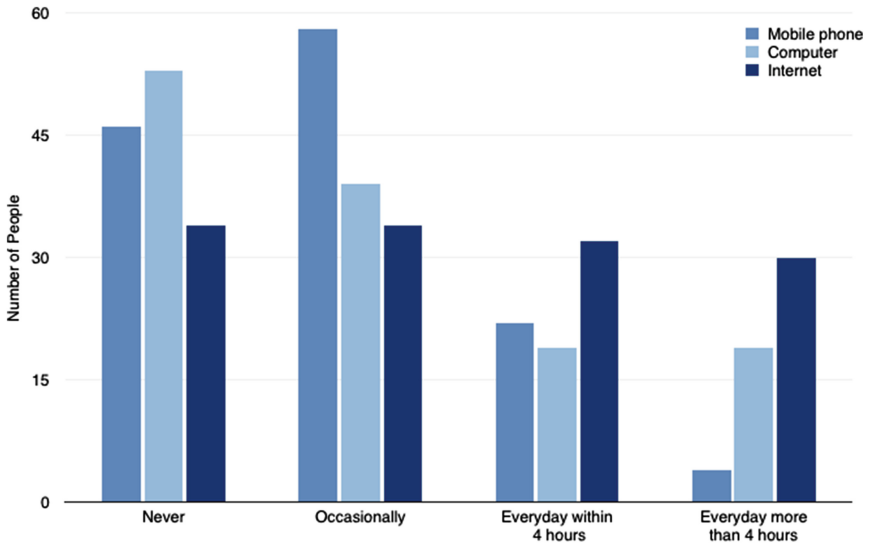

Fig. 1. Usage of Mobile phone/Computer/Internet

Figure 1 illustrates the frequency of technology products usage among the respondents and the detailed data can be seen in Table 3.

Generally, respondents use mobile phone more frequently than computer.

Table 3. Descriptive statistic of frequency of usage

Frequency of Usage	Min	Max	Mean	SD
Mobile phone	1	4	3.12	.797
Computer	1	4	2.55	1.114
Internet	1	4	2.97	1.071
Technology (overall)	3	12	8.65	2.570

3.3 Task Performance

In the performance test, 90.6 % of the respondents successfully completed the task of making telephone call; 52 % of them had successfully texted and sent message; 72 % of them had completed taking photo and 34.6 % completed Wechat testing task (Table 4).

For the older people in China, making phone calls (M = 0.91, SD = 0.294) seems to be the easiest task for the respondents in this test while sending a photo through Wechat seems to be the most difficult one (M = 0.34, SD = 0.480).

Table 4. Task performance

TASK	Fail (0)	Success (1)	Mean	SD
Make a phone call	12	115	.91	.294
Text and send a message	61	66	.52	.502
Take a photo	35	92	.72	.449
Send a photo through Wechat	82	45	.35	.480
Overall performance			2.5	1.214

3.4 Technical Self-confidence, Frequency of Technology Usage and Task Performance

The results show that older people's technology self-efficacy is significant correlated with the frequency of technology usage (correlation coefficient = 0.362, $p < 0.01$) and task performance (correlation coefficient = 0.315, $p < 0.01$). The frequency of technology usage also significant correlates with task performance (correlation coefficient = 0.563, $p < 0.01$) (Table 5).

Table 5. Correlation coefficient between technology self-efficacy, frequency of usage and task performance

	Technical Self-confidence	Frequency of Technology Usage	Task Performance
Technical Self-confidence		.362**	315**
Frequency of Technology Usage			.563**
Task Performance			

**. Correlation is significant at the 0.01 level (2-tailed).

4 Discussion and Conclusion

In this study, we explore the role of technology self-efficiency on technology product acceptance and usage, trying to figure out whether self-efficacy would affect one's desirability and ability of using technology products.

The elderly's technology self-efficacy is positive and significant correlated with the frequency of technology usage (correlation coefficient = 0.362, $p < 0.01$). People with higher self-efficacy use technology products more frequently. And in turn, using technology products frequently may contributes to higher technology self-efficacy as well.

In this study, the older people with higher technology self-efficacy reported a better task performance (correlation coefficient = 0.315, $p < 0.01$). This result is consistent with the finding of Wolters et al. (2010) but opposite to that of Combe et al. (2013).

Since task performance also significantly correlates with the frequency of technology usage (correlation coefficient = 0.563, $p < 0.01$). We analysis the correlation between technology self-efficacy and task performance again after the frequency of technology usage is controlled (Table 6).

Table 6. Correlation coefficient between technology self-efficacy and task performance after frequency of technology usage is controlled

Control Variables		Task Performance
Frequency of Technology Usage	Correlation coefficient	.170
	P	.057

This time, technology self-efficacy shows no significant correlation with task performance. Therefore, we assume that the different task performance may be resulted from the different frequency of technology usage instead of technology-self efficacy.

In conclusion, technology self-efficacy is expected to be an effective and predictive tool to evaluate the older people's acceptance of technology products while it's not very effective in predicting older people's performance of technology products usage.

This also raised a possible approach to improve older people's acceptance by improving their technology self-efficacy efficiency.

5 Limitation of This Study

Several limitations should be noted for this study. First, the study population was based on a convenience sample and the education level of the respondents in this study is relatively high. Second, the performance test used GALAXY Trend 3 as a unified tool instead of respondents' own mobile phones, in order to test how these older people performance when they using this GALAXY Trend 3 for the first time. Although none of the respondent's mobile phone is GALAXY Trend 3, but the respondent whose commonly used mobile phone has the same software system (Android) with GALAXY Trend 3 will be more likely to succeed in the task test than those whose commonly used mobile phone has a different software system (e.g. IOS). The effect of this factor on the results of this study cannot be ruled out.

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