The Relationship Between Technology Self-Efficacy Beliefs and User Satisfaction – User Experience Perspective

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Abstract. Scholars and researchers are becoming more interested in research that focus on the users' interaction with mobile technology as information technology providers are striving to develop innovative devices to attract more users. User self-efficacy and specifically Technology Self-Efficacy (TSE) has been largely used to predict user's task success and user's acceptance of technology. In other words, we assume that users who report high TSE are likely to succeed technology-based tasks and are likely to accept and use technology. However, little research investigates the relationship between pre- and posts-task self-perceived TSE and its relationship with user satisfaction. Based on the theory on self-perception, we aim to fill in this gap. First, we explore the relationship between TSE and user satisfaction. Second, we investigate on one hand the relationship between satisfaction and individuals whose TSE increase after the user test, and on the other hand, the relationship between satisfaction and individuals whose TSE decrease at the end of the user test. Theoretical contributions to HCI literature and practical implications to HCI practitioners are discussed.

Keywords: User experience · Satisfaction · Self-efficacy ·
Technology Self-Efficacy

1 Introduction

Self-efficacy is defined as people's beliefs in their capabilities to produce desired effects by their own actions [1]. One type of self-efficacy is Technology Self-Efficacy (TSE), which has been defined as "an individual's belief in his or her ability to use a computer effectively" [1]. The TSE construct has been used extensively to predict users' task effectiveness and technology acceptance [2]. The rationale is that when an individual believes he has the ability to successfully perform a task using a technology (High TSE), he will engage and make all efforts to successfully complete the task using the technology. He considers failures as challenges and believes that failures are usually dues to lack of experience and technological knowledge or skills that can be accessed or acquired easily [4].

Over the past decades, TSE has gained prominence in the social science literature, particularly in Information Systems (IS) and Human Computer Interaction (HCI) research as scholars use it as a predictor of users' responses (e.g., attitude and behaviors) towards a technology (p. 190) [5]. However, no or very little research has been conducted to investigate relationship between TSE and user satisfaction. Understanding this relationship leads to many managerial implications. For example, when a specific technology is deployed in an organization, managers are more concerned with the outcomes (users' satisfaction) towards the technology and are rarely concerned with why some users are more satisfied with the technology than others. If the TSE and satisfaction are correlated, then managers might want to explore ways to enhance TSE for low TSE users.

In order to address this gap in the literature, an experiment involving twenty-six users was performed. Prior to the experimental task, users reported their TSE. Then, they performed a task, which consisted of interacting with an electronic device. Finally, they were asked to report their post-task TSE. Results suggest that users with high TSE are more satisfied than users with low TSE.

Our findings add knowledge to existing research on user experience by exploring the relationship between user Technology Self-Efficacy and satisfaction. Technology Self-Efficacy can be added as a determinant to user satisfaction in IT implementation, acceptance and success models. Our findings may help these organizations ensure a high degree of user satisfaction in regards to the new technology.

2   Theoretical Background and Hypotheses

2.1   Satisfaction

From psychology perspective, user satisfaction "has been considered as the sum of one's feelings or attitudes toward a variety of factors affecting the situation" (p. 192) [6]. From an information technology perspective, user satisfaction is considered as one of the most important measure of IS success [7]. It is one of the essential factors, which researchers need to take into consideration when studying technology usage [7]. Delone and MacLean included user satisfaction as a major construct in their updated model of IS success [9]. DeLone and MacLean argue that when users are satisfied with a technology, this technology is considered to be beneficial and therefore leads to some success [9]. Sharma and Baoku added that the understanding of user satisfaction is vital to the success of business on the Web [10].

2.2   Self-perception, Self-efficacy, and Technology Self-Efficacy

Self-efficacy is defined as people's beliefs in their capabilities to produce desired effects by their own actions [1]. It is the expression of beliefs of individuals related to their own capability to perform a certain behavior [4, 11]. Bandura argues that people with high self-efficacy consider tasks as challenges [12]. The more challenging the task is, the more they get engaged. Bandura also argues that these people not only complete their task, but they also ensure the task is completed with a high degree of effectiveness [12].

Self-Efficacy is also fueled by the degree of skills of the individual who can be either low in self-efficacy or high in self-efficacy in specific disciplined. The self-efficacy scale developed by Bandura is a psychometric tool often deployed in UX testing. The Self-efficacy scale is assessed based on two concepts: the capacity and the confidence personally perceived by the user – the "I can do" [13] which influence a third construct, the motivation – the "I will do" [14]. Moreover, according to the self-efficacy literature, user's dissatisfaction occurs when the user lack confidence about the goal he wishes to attain [15, 16].

We have noticed a strong interest of IT researchers towards TSE [17–23]. The Technology Self-efficacy is defined as "an individual's belief in his or her ability to use a computer effectively" (p.101) [2]. The concept has been used extensively to predict user's use and acceptance of technology (024; 025; 03). The idea is that when an individual believes he or she has the ability in successfully perform a task using a technology, he or she will engage and makes all efforts to successfully complete the task. He or she sees failures as challenges and believes that failure is usually due to lack of experience and skills that can be easily acquired.

Moreover, Bem's [26] theory on self-perception suggests that people can infer their attitudes and self-perceptions by observing their own behaviours. This theory adds much to our understanding of how people learn from their own experiences and the consequences of this learning on their perceptions [25]. Bem [26] claims that individuals come to "know" their own attitudes, emotions, and other internal states partially by inferring them from observations of their own overt behaviours and/or the circumstances in which these behaviours occur [25]. Based on this theory and by using Technology Self-Efficacy as an example of self-perception, we are interested in user technology self-efficacy before the task (Pre-TSE) and user Technology Self- Efficacy after the task (Post-TSE).

We develop two hypotheses to investigate the relationship between pre- and post-task self-perceived TSE particularly in relation to user satisfaction. The first hypothesis focuses on investigating the overall relationship between users Post-TSE and satisfaction. We argue that users with high Post-TSE are more likely to express a high degree of satisfaction after completing the task than users with low Post-TSE. Furthermore, this study goes deeper than just exploring the relationship between user TSE beliefs and satisfaction. The second hypothesis is based on Bem's [26] theory. The author claims that self-perception is likely to be altered by the experience (task). We focus this time on the variation process of user's TSE and argue that when users' TSE goes up (from Pre-TSE to Post-TSE), they are likely to be satisfied and when TSE decreases (from Pre-TSE to Post-TSE), the users are not likely to be satisfied.

We hence posit that:

Hypothesis 1: Users with high Post-TSE will likely be more satisfied than users with low Post-TSE.

Hypothesis 2: Users whose Post-TSE is greater than the Pre-TSE are likely be more satisfied than those whose Post-TSE decrease from the Pre-TSE.

3   Method

To test our hypothesis, we conducted a home device configuration study. Subjects were asked to setup a new version of a home entertainment system to a TV in an experimental living room. The Ethics Committee of our institution approved this study and each participant received a gift card to participate in this study.

3.1   Participants

During the recruitment of participant, several criteria were considered. All individuals wishing to participate in the study were asked to answer a short self-completed questionnaire so that the research team could learn about their skills and knowledge of electronic and audio-visual devices. The objective of this recruitment was to have participants whose ages ranged from 20 to 70 years, a balance between genders (13 men and 13 women) as well as between participant's IT knowledge and skills; Are the participants able to install or configure their devices on their own, on their own but with some help, do someone else around them doing it for them or are they request a technician to do it for themselves? The sample was selected to ensure that we could include and test different potential user profiles; thirteen participants with low TSE, who do not possess experience in using information technology-based tasks and thirteen participants with high TSE, who have good experience with IT. Herewith, we wanted to create some variance among the participants according to the user's ability to use technologies.

3.2   Procedure

The experiment room has been installed to reproduce a living room. The participants sat in a chair facing a television. They had at their disposal a table with all the materials that could help them complete the required configuration tasks: i.e. a spouse's note (contextualization), a remote control, a leaflet that referred to a website or an application as well as a computer or a smartphone.

In general, the basic configuration of common devices that we use on a day-to-day basis, such as an audio-visual material, are perceived as being unambiguous and easily achievable by most people. However, configuring tasks may affect a wide range of people. For this reason, in the experimental protocol, we select different tasks, which were likely to vary in their difficult to achieve across our sample. Each participant was asked to configure a smart device by performing four different configuring tasks: (1) tuning; (2) synchronization of the remote control with the device; (3) remote commands execution, and (4) search and launch of device content.

3.3   Apparatus and Psychometric Measures

As part of the user test, in total, participants were asked to complete pre and post questionnaires including the Pre-TSE and Post-TSE. Finally, in order to measure user satisfaction, we used a validated measurement scales to assess the participants' satisfaction towards the technology used. This post-questionnaire allowed participant to evaluate the usability of the technology in relation to their degree of satisfaction.

4   Results

4.1   Satisfaction Level According to User's Self-efficacy

The first objective of this research was to explore the relationship between TSE and user satisfaction. In order to analyze the effects of satisfaction on the users' Post-TSE and test the first hypothesis, we did a logistic regression with mixed model (2-tailed p-value). When crossing the results between users' satisfaction scores and their self-efficacy reported measures, results show a significant difference in the satisfaction level between users having a low Post-TSE and users with a high Post-TSE, with a p-value of <.0001. In other words, the results shown in Table 1 indicate that users with high Post-TSE seem to be more satisfied about their experience than users with low Post-TSE when completing configuration-tasks. Thus, H1 is validated. Users with high Post-TSE were more satisfied than users who reported low Post-TSE.

Table 1.   User's satisfaction according to their post-reported TSE.

Dependent Variable	Effect	Nbr Obs	Estimate	StdErr	DF	T_Value	P-value	HSE_Pre	HSE_Post
Satisfaction	HSE_Pre	56	1.0317	0.2022	78	5.1	<.0001	1	
Satisfaction	HSE_Post	56	1.0833	0.1996	78	5.43	<.0001		1

In the second objective, which was based on Bem's theory (1972), we focused on the variation process of user's TSE. In order to analyze the variation of users' Pre- and Post-TSE with regard to satisfaction and to test the second hypothesis, we used the Wilcoxon signed-rank test (one-tailed p-value) and found a statistically significant result with a p-value of 0.047. When comparing users whose Technology Self-Efficacy (TSE) goes up (i.e., 17 participants) to those whose TSE goes down (i.e., 4 participants), the results shown in Table 2, indicate that participants whose TSE goes up (i.e., higher Post-TSE than Pre-TSE), report a higher degree of satisfaction than those whose TSE goes down. Thus, our second hypothesis is validated.

Table 2.   Sample means and median of satisfaction (p = 0.047)

TSE variation	Number of participants	Means	Median
Down	4	4.75	4.8333
Up	17	6.5490	6.6667

5   Discussion

In summary, this research aims to investigate how self-efficacy is related to the user satisfaction. The first objective of this research was to explore the relationship between TSE and user satisfaction. Our results suggest that users with high Post-TSE are more satisfied than those with low Post-TSE. Thus, our first hypothesis is validated. The

second objective of this research is to explore the relationship between the variation of the degree of TSE from Pre- and Post-TSE and Satisfaction We found out that a high number of participants whose TSE increase from Pre-TSE to Post-TSE are more satisfied than those whose TSE decrease from Pre-TSE to Post-TSE.

As we mentioned earlier, satisfaction is the expression of the sum of many feelings. A very high number of participants who have high TSE have expressed satisfaction after completing the task. This result can be explained by many factors. First, the participants associate their satisfaction with their ability to complete the task regardless of the task itself. These people express pride and satisfaction because they prove their ability to succeeding the task. The beauty of the TSE belief is that when the task is easy to use and user friendly, the task might take less time to complete but satisfaction will always maintain high. On the other hand, when the task is complex and not user friendly, according to Brandon people with high TSE challenge themselves and make all possible efforts to bypass the task complexity and obstacles in order to complete the task [27]. At the same time, these people feel again satisfied with their work.

The task simplicity is a major factor that can explain the second result. As a matter of facts, when people found out that the task was simple and did not require much effort to complete, they felt confident on their ability to succeed IT-based tasks and this has been translated in their degree of satisfaction. On the other hand, people who found out that the task was complex have lost confidence on their ability to handle IT tasks.

5.1   Theoretical Implications

Our findings contribute to knowledge in IT and HCI [28–32] by exploring the relationship between user's Technology Self-Efficacy and user satisfaction. We found out that Technology Self-Efficacy could be added as a determinant to user satisfaction in IT implementation, acceptance and success models. The results support a correlation between Task Simplicity and TSE as well [33, 34]. The more simple the task is the higher TSE becomes.

5.2   Managerial Implications

Our results bring many managerial implications. First, from marketing perspectives and in an effort to reduce operating costs or servicing customers, many organizations turn to self-service. Self-Service Technology (SST) is defined as "technological interfaces that enable customers to produce a service independent of direct service employee involvement" (p. 50) [35]. In other words, organizations try to convince their customers to use this type of technology as an alternative to service representative service [36]. Our results bring support to these organizations and suggest that these organizations may offer customer SST only to customers who have high TSE. The use of SST aims to meet the need for greater autonomy issued by customers. Practically speaking, they can distribute TSE questionnaires to all their customers and select only those who rank high in TSE. It would be a waste of time to offer technology to people who have low to very low TSE.

Second, organizations that develop business information systems are always faced with the challenge to motivate their employees to use the new systems and technology.

There may be employees who have high TSE and others who have low TSE. The fact that High TSE leads to satisfaction is a good reason to make these organizations think of ways to enhance TSE to those who have low TSE. The higher the TSE the more satisfied users would be and the more users are satisfied the more likely they would accept and use the system.

5.3 Limitations and Future Research

This research presents limits and opportunities for future research. First, the control variables of the recruitment process, such as user IT experience, could have been further explore. In fact, since we have chosen to collect information on only two groups of people, users with high TSE and users with low TSE, we did not consider users with average TSE beliefs; users who are neither high nor low in TSE. We encourage further research to consider these individuals in order to find a trend in between these three categories and meaningful relationships. Second, in this research we measured user satisfaction only once after completing the user test. We wish we could have measured user satisfaction after completing each of the four tasks. This way, we would have investigated the impact or the relationship between the task itself and user satisfaction.

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