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Alireza Nili

Queensland University of Technology, a.nili@qut.edu.au

Mary Tate

Victoria University, mary.tate@vuw.ac.nz

David Johnstone

Victoria University of Wellington, David.johnstone@vuw.ac.nz

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User Persistence in Solving Self-Service Technology Problems

Alireza Nili ^{1,*}
Mary Tate ²
David Johnstone ³

*Corresponding author

¹ Senior Lecturer, Queensland University of Technology, Brisbane, Australia, a.nili@qut.edu.au

² Associate Professor, Victoria University of Wellington, Wellington, New Zealand, mary.tate@vuw.ac.nz

³ Senior Lecturer, Victoria University of Wellington, Wellington, New Zealand, david.johnstone@vuw.ac.nz

ABSTRACT

Self-service technologies (SSTs) are increasingly becoming a primary channel of service delivery. The move to self-service is sometimes accompanied by a sharp reduction in the availability of assistance from help desk staff. Therefore, user persistence in solving SST problems is important when the problems occur. Organizations need a deep understanding of user persistence with SST problem solving to provide appropriate resources (e.g., self-help resources and user community platforms) for users. In this paper, we identify the factors that contribute to user persistence in: (1) using a specific method of solving SST problems; and (2) solving an SST problem overall.

Keywords: User persistence, self-service technology (SST), problem solving.

INTRODUCTION

Many public and private sector organizations are migrating traditional services to digital self-service channels, and actively encouraging self-service. Reasons for this include expected cost-savings, and a perceived preference for self-service by many users. For example, the Australian Office of the Auditor General estimated the cost of an average government web transaction at \$0.40c, or about 6% of the next most expensive channel, a phone transaction at \$6.60, while a face-to-face transaction is estimated to cost \$16.90 (Delliotte, 2023). Studies have suggested that 49% of Gen Z customers and 41% of Millennials prefer SSTs (Reed, 2022). From the user perspective, advantages of self-service include convenience and accessibility of the service, time and cost saving, and avoiding the necessity of dealing with service personnel (Dao & Theotokis, 2021; Le *et al.*, 2022).

However, as SSTs become more embedded in all aspects of everyday life, problems increasingly occur for users in different contexts (Keating & Aslan, 2023). The move to self-service is sometimes accompanied by a sharp reduction in the availability of 'human' support (e.g., call-center or help desk assistance). Consequently, service users are increasingly left to their own devices to solve self-service problems when they occur (Keating & Aslan, 2023; Nili *et al.*, 2019). Similar expectations of cost savings motivate organizations to consider their internal operations, where face-to-face services such as expense management, leave booking, and resource booking are increasingly replaced with digital self-service solutions for employees. While many organizations do provide 'help desk' and IT support, they are frequently seeking ways to minimize support costs for internal users, who may not have the option of seeking an alternative service to help them with their work (Dao & Theotokis, 2021; Keating & Aslan, 2023; Le *et al.*, 2022).

Users who experience SST problems will demonstrate varying levels of persistence and may adopt a range of methods to resolve their problems when they occur. Organizations will need to find ways to encourage user persistence and help them resolve SST problems, including self-help information, automated assistance (e.g., chatbots), nurturing user communities, and providing human assistance. Otherwise, there is a risk of both external customers switching to alternative service providers, and internal users experiencing frustration and loss of productivity. Service support is a true test of how much a company values customers and is more important than ever (McKinsey & Company, 2023).

It is important to understand the nature of user persistence with SST problem-solving. By identifying the factors that contribute to user persistence, organizations can better manage their support for SSTs. For internal users, these insights will assist with managing internal support costs, and likely result in more productive and happier users. For external customers, organizations can also manage support costs, while increasing customer satisfaction. Accordingly, we characterize the research problem as a need to identify the factors that contribute to user persistence with SST problem solving.

Framing the Problem

SST problem is any gap between user perceptions and expectations with the SST which motivates the user to take corrective action (Dao & Theotokis, 2021; Le *et al.*, 2022; Nili *et al.*, 2019). *Problem-solving* is a process consisting of several steps of identifying and implementing a satisfactory solution for a problem (Chang *et al.*, 2004). A *satisfactory solution* is a solution perceived to be 'satisficing' or 'acceptable', without necessarily being optimal (Nili *et al.*, 2019). Nili *et al.* (2019) developed a process theory for user-based SST problem-solving, establishing that users employ any of three different methods to solve their

SST problems: (1) *self-recovery*: where the user only employs his or her own efforts (using, for example, online instructions and digital troubleshooting guides); (2) *community recovery*: where the user asks for help from other users (e.g., a colleague, friend, or online user community); and (3) *joint-recovery*: where the user interacts with user support staff on a collaborative basis.

SST problem solving can be conceptualized as a process involving a series of decision points, each based on the question: should I continue (i.e., persist) searching for a satisfactory solution, or should I give up? Thus, the process continues until either a satisfactory solution is found or the user gives up (Nili *et al.*, 2019; Zhu *et al.*, 2013). These decision points may occur at any point in the process. However, a user may employ more than one approach in order to solve the SST problem, which identifies another type of decision point, based on the question: should I continue using this method to solve the problem, or should I give up using this method? Figure 1 illustrates the user's overall process of SST problem solving, how that process can be partitioned into a sequence of method-based processes, and the decision points the user will employ at different stages (A, B, or C). Note in this example the user fails to find a satisfactory solution before giving up.

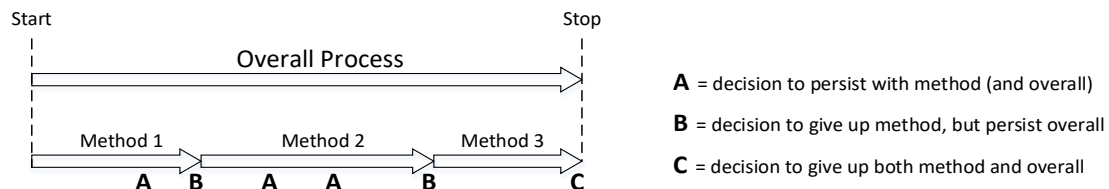


Figure 1: Process model of user SST problem solving.

While previous work has focused on what users do to solve a SST problem (the process view) (Nili *et al.*, 2019), this paper is concerned with what motivates those actions (factors that contribute to persistence with solving the SST problem). This paper and the previous work should be seen as complementary, and together provide a more comprehensive picture of the SST problem solving phenomena. Our research questions are:

RQ1: What are the factors that contribute to user persistence in solving a SST problem using a specific method?

RQ2: What are the factors that contribute to user persistence in solving a SST problem overall?

In recent years, many businesses have invested heavily in advanced AI-based systems and chatbots to make service support available 24/7 and to reduce the cost of support. Many organizations have also started to deploy the systems (e.g., IBM Watson and ChatGPT) in a part of their daily operations. However, currently, even the most advanced AI systems and chatbots do not have access to all relevant data (e.g., data stored in user profile, service profiles, and service rules) and cannot understand the personal context, service context, and situational context, which are highly important for understanding a user's unique and complex service enquiry and providing personalized responses (Barros *et al.*, 2021; Nili *et al.*, 2020). We believe that assistance in the form of self-help resources such as text-based instructions and video tutorials, as well as assistance from other users (e.g., online community of SST users) and customer service staff are still highly needed for user persistence. Therefore, in this study, we do not focus on any specific method or any specific type of support system.

In the rest of this paper, we first position the concept of user persistence within the motivation theory literature. Next, we explain how we conducted our data collection and analysis. Finally, we provide a discussion of the implications of this study for theory and practice, limitations, suggestions for further research, and a conclusion.

PERSISTENCE WITHIN THE SST PROBLEM SOLVING CONTEXT

In broad terms, persistence can be understood as a person's perseverance and continuance in a course of action toward a goal despite obstacles (Weiner, 1970). Obstacles may include the person's lack of knowledge or the lack of available resources to achieve a task. Persistence is a concept developed in the psychology literature as a construct reflective of motivation. Kanfer (1990) and Kanfer *et al.* (2017) note that while motivation is not directly observable, it is frequently described in work settings by what a person does (*direction* of behavior), how hard a person works (*intensity* of effort), and how long a person works (*persistence*). She states that direction, intensity, and persistence are the three dependent variables used as motivational outcomes in research. Furthermore, "unlike direction and intensity, persistence criteria capture a pattern of motivational consequences that emerge *only* over time," and that persistence is about "when to shift direction and [intensity]... [and thus it will] encompass elements of direction and intensity, as well as 'executive' motivational processes that maintain task activity levels." (Kanfer, 1990, p.79). Kanfer notes, citing the work of Atkinson and Birch (1970) "that the essential task for motivational researchers is to understand what causes *changes* in the direction of behavior over time (e.g., a shift from working on one task to another)" (p.80). In the context of our study, the task at hand is the SST problem to be solved, not the original task the user was engaged in when the problem occurred.

Therefore, persistence in this context can be characterized in terms of the user's two types of decision points: whether or not to give up with a problem solving method, and whether or not to give up seeking a solution overall. Giving up with a problem solving method, in order to try an alternative method, or giving up overall, each represent a change in the direction of behavior after a period of time. Using these characterizations, we define *method persistence* as a user's decision to continue to use the

same method of SST problem solving in order to achieve a satisfactory solution. We define *overall persistence* as a user's decision to continue to use any combination of methods of SST problem solving in order to achieve a satisfactory solution.

AN OVERVIEW OF RELEVANT THEORIES AND LITERATURE

We identified several theories which include constructs that are relevant to the topic of our research study. Examples of these theories include: Vroom's Expectancy Theory (1964) (which argues that an individual will evaluate each action from a range of options according to their perception of both the value of the outcome for that action and the likelihood of achieving that outcome); Anderson's theory of Rational Analysis of Problem Solving (1990) (which explains the important roles of an individual's perceptions of cost, probability, and gain/value of solving a problem); The Theory of Reasoned Action (Fishbein & Ajzen, 1975) and its later elaboration, the Theory of Planned Behavior (Ajzen, 1991) (which generally cover the roles of an individual's attitude towards a behavior, the individual's perception of control on that behavior, social norms/pressure from people who are important to the individual, and intention to perform the behavior); Coping Theory (which explains individuals' cognitive and behavioral responses to manage psychological stress) (Lazarus & Folkman, 1984); Self-Determination Theory (Deci & Ryan, 1985) (which focuses on people's basic psychological needs, including autonomy, competence, and relatedness, that are important for their growth and success); Computer Self-Efficacy (Compeau & Higgins, 1995) (which refers to individuals' judgment of their capabilities to use computers in diverse situations); and Weiner's Attribution Theory (Weiner, 1974) (which explains different ways individuals attribute the cause of an effect such as a problem).

While each of these theories includes constructs that are generally relevant to our research phenomenon, none of the theories can help us with answering our research questions and therefore cannot help with identifying an extensive set of persistence factors. For example, Computer Self-Efficacy and Attribution Theory include concepts that are relevant to our work, but they are too specific. On the other hand, the main constructs of the Theory of Reasoned Action and the Theory of Planned Behavior (attitude and behavioral intention) are too broad for our purposes. Moreover, these theories and other theories above (e.g., Expectancy Theory and Theory of Rational Analysis of Problem Solving) are grand theories that cover a wide range of phenomena without providing specific insight for our study. We also note that while Rational Analysis of Problem Solving seems to be the most relevant theory to our work, our findings will show that non-rational factors (e.g., emotions, which can result in a non-rational analysis of a problem) can also contribute to our research phenomenon.

There are also several recent studies which have used one or a small set of the above theories to investigate the notion of SST problem solving from the user's perspective. For example, using the self-determination theory, Chiu and Nguyen (2022) studied customers' perception of their own competence, autonomy, and relatedness (sense of connectedness and belonging), centered on self-recovery of SSTs. Le *et al.* (2022) examined the role of perceived control and risk, and Zhu *et al.* (2013) used the expectancy and attribution theories to investigate customers' responses including self-recovery effort and recovery strategy. Moreover, there are several other studies of SST problem recovery from the user perspective. For example, Yi and Kim (2017) focused on the role of social influence and users' motives for helping each other, and Nili *et al.* (2019) conducted an analysis of problem-solving methods and the overall process of solving SST problems from the user perspective. Dao and Theotokis (2021) investigated the roles of recovery initiation and locus of responsibility (similar to the concept of external attribution of problem), and Keating and Aslan (2023) explain the importance of psychological need support for users with regards to SST recovery. Overall, while there has been an increasing number of studies on SST problem recovery in the past decade, we did not identify any study that: (a) is directly relevant to our research phenomenon (individuals' persistence in solving their SST problems) and (b) provides an extensive set of factors that contribute to user persistence with each method and to overall process of solving SST problems. Our research study fills this important gap.

RESEARCH METHODS

We obtained ethics approval from the Human Ethics Committee of our university, and then conducted focus groups and semi-structured individual interviews to collect empirical data. We did not use experimental, cross-sectional survey, and observational methods, as the problem solving in our context extends over time (e.g., several days) and limits the insights that the methods can provide. Similarly, data mining methods were not used, as a large part of the overall problem-solving process is not captured by data logs and other similar sources. We explain how we conducted our data collection and analysis.

Data Collection Through Focus Groups

First, we conducted focus groups with users of SSTs, inviting them to describe their experiences with persisting with SST problems. Data was collected using the Critical Incident Technique (CIT) (Flanagan, 1954). With this method, the researcher asks participants to recall incidents related to the topic of the research. Previous research suggests that the incidents recalled are important and representative. CIT was suitable for this study, as it helped us to concentrate in detail on specific instances of SST problem-solving using a technique associated with high recall. The overall process of persisting with SST problems may be spread over a considerable period of time. The technique allows us to gather relevant data about the factors that contribute to user persistence with various methods of problem solving that SST users use. We used the CIT technique with three focus groups. The social and interactive nature of focus groups encourages participants to recall their experiences of significant events of SST problems and provides the opportunity for group discussion (Nili *et al.*, 2017) and elaboration of the factors that they believe contribute to persistence when attempting to solve their SST problems.

We needed a context through which we can increase the chance of obtaining as much insights about user persistence as possible. We selected user participants from the students, teaching staff and administrators at a large New Zealand university. The users had some degree of choice over whether to persist or give up, and yet where they were not likely to switch quickly to another provider, as this would have made it difficult to gather in-depth data on persistence. The SSTs included mandatory SSTs (e.g., SSTs for submitting online applications or register for an event) and optional SSTs (e.g., self-checkout systems at libraries). Online self-help information, help-desk support, and user forums existed for many (but not all) services.

The focus groups were advertised throughout the university via notice boards and snowball sampling. Participants were diverse in age, gender, IT expertise, area of study, and role in the university. The first focus group comprised seven teaching staff, with positions ranking from tutor to professor. The second focus group comprised seven students, and the third focus group consisted of ten participants, including six students, two school administrators and two teaching staff. Across the three focus groups, approximately half of the participants were male, and the rest were female. Approximately 60% of the participants were 18-29 years old, 15% were 30-39 years old, 15% were 40-49 years old, 2% were 50-59 years old, and 8% were 60-69 years old. Based on CIT, participants were asked to: (1) recall a SST problem that occurred during the six months prior to the focus group, and how they approached solving it; (2) explain what contribute to their persistence; and (3) engage in a group discussion to elaborate on their points. We video recorded each focus group and transcribed the recordings. Overall, we identified and discussed 52 events of user persistence with solving perceived SST problems, 41 of which relate to distinct SST problems.

Data Collection Through Individual Interviews

We also collected data from a different set of participants through individual interviews. We used the same data collection context and invited the users to participate in the study through the same channels of communication we had used for the focus groups. Through our emails and information sheet the participants were asked to take note and send (via email) a description of a SST problem that occurred during the two weeks since agreeing to participate. Participants were notified that the interviews would be based on the problems reported. Also, they were informed that at least one instance of a SST problem was the minimum requirement and the two-week period may be extended if no SST problem had occurred.

Overall, 30 participants from a diverse range of backgrounds (e.g., in terms of age, gender, ethnicity and expertise) agreed to participate and attended the interview sessions. Approximately, 27% of the participants were teaching staff, 17% were administration staff, and 56% were students. Among them, about 73% of the participants were male and 27% were female. Approximately 53% of the participants were 18-29 years old, 23% were 30-40 years old, 17% were 41-50 years old, and 7% were 60-69 years old. During the individual interviews, we asked the participants to describe the problem briefly, and then discuss: (1) why they believe it is a problem; (2) why they persisted in solving it; (3) whether they believe that their persistence was important in solving the problem; (4) what things helped them or had a negative effect on their persistence; and (5) whether they have any further comment about factors that contribute to their persistence. Each user was also asked probing questions, dependent on the response to each question. All interviews were audio recorded and fully transcribed. We identified 60 instances of SST problems and user persistence, 51 of which relate to distinct SST problems.

Data Analysis

We read the transcripts of the focus groups and individual interviews several times. We categorized the most frequent types of SST problems based on the types of participants who experienced the problems. We then imported the transcripts into NVivo for inductive coding. We highlighted and coded data 'chunks' (i.e., units of meaning) such as words, sentences, or paragraphs (Miles *et al.*, 2014, Nili *et al.*, 2017). Each code represented a potentially relevant persistence factor. We were expecting that our iterative process of coding may result in outcomes such as relabeling and merging some of the codes with similar meaning. While the coding of data was fully inductive and grounded in data (we were not constrained by any existing study in the literature), we benefited from our literature review (presented in the previous section) in terms of naming/labeling the codes we had identified in our data and ensuring that we have not missed any important insight. The codes (persistence factors) we identified from the data were then sorted into broad themes based on the similarities in their concepts and nature. Each theme was further revisited for the possibility of being divided into sub-themes. The process required us to revisit and, where necessary, modify the results of the previous analysis efforts and needed several rearrangements and refinements of the themes, i.e., constant comparison (Miles *et al.*, 2014; Nili *et al.*, 2017).

In addition to coding for persistence factors, we also identified methods of SST problem solving from the user perspective, and then used note-taking and diagrams (memoing) to keep track of and refine our ideas, helping us to identify the relationships between the persistence factors and relevant methods and with the overall process of persistence. We held frequent meetings within the research team, and carried out 'member checking' by providing the participants with an interim summary of the results. We present the results for the methods of problem solving first, as these inform aspects of our understanding of the results for each set of factors.

RESULTS

The most frequent SST problems reported by the teaching staff were related to obtaining and sharing files via the learning management system as well as other temporary problems that related to accessing features of communication tools, particularly email and online teamwork sites, after an upgrade was made to the systems. The most frequent SST problems that students were experiencing were about retrieving course materials from the learning management system and obtaining data from library

applications, mostly due to network connectivity issues when trying to use mobile devices and sometimes due to users' unintentional mistakes. Finally, the SST problems that the administration staff experienced were often related to problems with storing and retrieving data from systems such as workforce management tools, research administration database, and online booking systems, mostly due to limited data storage issues, limited access to the systems, or user's own mistakes. In the rest of this section, we present the major findings including the methods participants were using to solve SST problems, factors that contribute to user persistence with each method, and factors that contribute to the overall process of solving SST problems.

Methods of Solving SST Problems

From all focus groups and individual interviews, it became clear that in the event of a perceived SST problem, a user often employs more than one method to solve the problem. We identified three methods of solving SST problems from the user perspective: (1) *self-recovery method*: the user performs problem recovery through their own efforts and may use troubleshooting features (e.g., guides received from a chatbot) and any other self-help information provided by the organization, such as online instructions and video tutorials; (2) *community-recovery method*: the user asks for help from other users such as a friend or colleague in an offline environment, such as an office, or via an online community of users; and (3) *joint-recovery method*: both user and organizational support staff participate in solving the problem and try to solve it jointly/collaboratively. The participants' comments below respectively provide examples of: how users solved their own SST problems through the self-recovery method; through community-recovery method; and the joint-recovery method:

"I did it (solved the problem) all by myself. I just used the how-to (self-help) information on their website..."

"I used a discussion forum. I was sure there are many users who have experienced that problem or know a lot about it".

"It is not simply a matter of saying, OK I am giving my problem to support service and then I just fold my arms and forget... You are the one who wants a solution. ... In your case (the participant points to another participant) for example, you handed it back and forth more than once before you were satisfied with the solution".

All SST users started solving their SST problems through the self-recovery method. Interestingly, there were no exceptions to this pattern. However, some of them demonstrated a low level of persistence with using the method (e.g., just restarting or rebooting the SST) and some others persisted for a longer time and used various self-help information that they had access to. We also realized that where the participants used two methods of SST problem solving, in the majority of cases (almost 80% of the cases) the sequence of using the methods was: self-recovery and then community-recovery. Where all three methods were used, in the majority of cases the sequence of using the methods was: self-recovery, community-recovery, and joint-recovery. While the majority of our participants followed the same sequence of using the three methods, they also reported that they sometimes needed to use a previous method if need arose (e.g., when during the joint-recovery method they discovered a new potential solution that required going back and use the community-recovery method). With regards to the choice of using technological resources for solving SST problems, users used a range of resources such as online video instructions, text-based self-help information, platforms that support online community of users, and chatbots. Advanced artificial intelligence technologies such as ChatGPT did not exist at the time of our data collection or they were not popular tools. Only 10% of the users used chatbots or similar tools to receive information for solving their SST problems. The low percentage was also due to the technologies' lack of capability to provide detailed responses to users' specific questions.

Factors Contributing to User Persistence

In this next section, we present the persistence factors that we identified from the focus groups and individual interviews. Table 1 presents these factors grouped in the forms of themes and sub-themes. As we developed the codes, we could see that some of the factors were linked to persistence with one or more of the problem-solving methods (Table 2) and some of the factors contribute to persistence with the entire process of solving SST problems (Figure 2).

Table 1: Factors contributing to persistence in solving SST problems.

Themes and sub-themes	Persistence factors	Definition	Participants' comments
Outcome/Goal-Related Factors	Probability of a Satisfactory Outcome through a Method	User's perceived probability of solving a SST problem through a specific method of solving SST problems	"I was pretty hopeful about solving the problem. I somehow knew it can be solved if I ask another user for help."
	Overall Probability of a Satisfactory Outcome	User's perceived probability of solving a SST problem through all possible methods of solving SST problems	"The probability [that I can solve it] was definitely important. I never thought that I will never have the network"
	Importance of Satisfactory Outcome	How important it is for a user to achieve a satisfactory SST problem resolution	"I needed it... Any solution that works is enough for me." "...The importance of the output - what I want to achieve..."

				because eventually the output is the most important thing.”
Cost-Related Factors	Expected Method Cost	Expected Time	Expected amount of time for solving a SST problem through a specific method	“I don't waste time. I phone someone.”
		Expected Effort	Expected amount of effort for solving a SST problem through a specific method	“I was expecting I need to make much effort to figure out what’s wrong with it...”
		Expected Negative Emotions (anxiety and frustration)	The amount of negative emotions a user expects to experience with regards to solving a SST problem through a specific method	“It was becoming really frustrating... That’s why I didn’t want to continue”
	Expected Overall Cost	Overall Expected Time	Expected overall amount of time required for solving a SST problem through all possible methods	“..., but, overall, it was taking too long and I needed the system to upload my document.”
		Overall Expected Effort	Expected overall amount of effort required for solving a SST problem through all possible methods	“I may be just investing more effort and some cost... You may continue to make the investment.”
		Overall Expected Negative Emotions (anxiety and frustration)	The overall amount of negative emotions a user expects to experience with regards to solving a SST problem through all possible methods	“When you are more frustrated ..., you are less likely to be thinking thoroughly or willing to spend time...”
Personal Factors		SST Problem Solving Self-Efficacy	Individuals’ judgment of their capability in executing actions of resolving SST problems	“I believe I can handle these [SST] problems by myself”
		Prior Knowledge of Solving SST Problems	Prior knowledge of solving SST problems, helping a user with solving a SST problem	“It depends on how much we know... so based on our previous experiences we decide what our course of action would be.”
		Internal Attribution of SST problem	Tendency to attribute the cause of a SST problem to one’s own actions	“I usually think it (the reason) is me. I usually just think I am ignorant. There should be a button somewhere that I have not seen...”
		External Attribution of SST problem	Tendency to attribute cause of a SST problem to external factors (e.g., bad SST design or business’s ignorance)	“The [reason for the] problem is not me... I just contacted them (service staff) to fix it...”
		Subjective Norm	User’s perception that most people who are important to them think that the user should or should not solve the SST problem	“...their opinion was important; I [felt] I have to solve it.”
		Perceived Control over Solving the SST Problem	Perception of control on one’s own activities and behavior of solving a SST problem	“... because for my problem I cannot have the admin right, sometimes I found the answer, but I could not apply it.”
System Quality/ Characteristics Factors		SST Interactivity	User’s perception of how well a system responds to commands and how easily it enables arrangement of the amount, sequence, and style of presented information	“... how do I get that on that university computer now? It was straightforward. It looked like, okay, transfer to external device and stuff like that. I just followed all the things [it asked me to do], like talk me through, basically.”
		SST Ease of Use	A user’s perception that using a SST would be free of effort	“It was really difficult to find the option you want... Even if you find it, it is not easy enough.”

	Usefulness of SST	A user's perception that using the SST enhances job or activity performance	"It (the SST) was a useful thing... otherwise, why to persist?"
Situational Factors	Trustworthiness of Staff Joint-Recovery Performance	The overall trustworthiness (covering reliability, helpfulness, and responsiveness) of the support that service support staff provide for SST users	"I had them on the phone and we tried to solve it. They couldn't work out what it was. ...the quality of their work was not good at all."
	Quality of Responses from Users in the Community	The overall quality (covering reliability, usefulness, and presentation quality) of the response that SST users in an online or offline community provide for a user who experienced a SST problem	"... A lot of people probably already know many tricks about it and they could contribute.". "The only thing I could do was to join the discussion forum...I have found it quite amazing that these discussion forums really solved the problem."
Quality of Self-Help Information (provided by the business in the form of do-it-yourself guidance, video tutorials, and responses from chatbots deployed by the business)	Usefulness of Self-Help Information	The extent to which the self-help information is complete, current, accurate, easy to understand and relevant to solving a specific SST problem	"The information was useful. Really thorough, up to date, comprehensible, correct, and most importantly relevant to the problem I experienced."
	Obtainability of Self-Help Information	The extent to which the available self-help information is fast and easy to obtain	"It was easy for me to obtain the self-help info. I mean so fast and easy to access."
	Presentation of Self-Help Information	The extent to which the self-help information is concise, consistent, and contextualized for solving SST problems	"So much information, even though you try to be specific and use specific keywords...". "For one problem, you have got different information...".
	Reliability of Self-Help Information	The extent to which the self-help information is original, believable and reputable	"A user says I did this, which had this result, and another user may say I did this and it magically worked." "If it (the information) is original, I continue...". "If the information I find online was provided by a reputable source... I continue..."

We realized that the complexity/difficulty of solving a SST problem is captured in the expected cost factors (expected amount of time, negative emotions, and effort required to solve the problem). We also note that 'quality of self-help information', 'quality of responses from users in the community', and 'trustworthiness of staff joint-recovery performance' can be studied at a lower (more detailed) level. However, given the extensiveness of our findings, we decided not to analyze these aspects in more detail.

Factors Contributing to User Persistence with Each Method and to the Overall Process of Solving SST Problems

Analysis of the data revealed that some of the factors only contribute to user persistence with a specific method of solving SST problems, some factors contribute to persistence with each of the three methods, and some factors contribute to persistence with the overall process of solving the problem. Importance of a satisfactory outcome is the only factor that contributes to both persistence with a specific method and to the overall process (collective methods). Importance of a satisfactory outcome, probability of a satisfactory outcome through a method, and factors within the theme of expected method cost are the ones that contribute to persistence with each of the three methods. Personal factors, system quality factors, and quality of self-help information only contribute to user persistence with self-recovery method.

For example, with regards to SST interactivity, which only contributes to the self-recovery method, a participant mentioned *"the moment I tried to restart the computer, I was prompted through a message to save what I've done... I moved on [through the guidance I received] to solve it."* The Quality of responses from community of users only contribute to user persistence with the community-recovery method. For example, a participant stated *"... I visited a discussion forum and started talking with someone... He started giving me recommendations to do this and do that... We were talking at a level of very dirty tricks that you can do on computers... like I was hopeful about it. [That's why] I spent one full day working on it, with his ping pong, do this, do that."*

Similarly, trustworthiness of staff joint-recovery performance contributes to persistence with the joint-recovery method. For example, a participant stated “when I called them, and after a couple of calls from students, [the support staff] said that they just realized that the problem [with the library’s database search feature] has happened. They were not expecting this problem We were not sure about any positive outcome... I gave up after a while.”. Table 2 presents the factors that contribute to user persistence with each method of solving SST problems.

Table 2: Factors that contribute to persistence with each method of solving SST problems.

Method	Factors contributing to user persistence with the method	
Self-recovery Method	Personal factors	(a) SST problem solving self-efficacy, (b) prior knowledge of solving SST problems, (c) internal attribution of SST problem, (d) external attribution of SST problem, (e) subjective norm, and (f) perceived control over solving the SST problem
	System quality factors	(a) SST interactivity, (b) SST ease of use, and (c) SST usefulness
	Quality of self-help information	(a) obtainability, (b) reliability, (c) usefulness, and (d) presentation
	Probability of a satisfactory outcome through the method	
	Importance of a satisfactory outcome	
	Expected method cost	(a) Expected time, (b) expected effort, and (c) expected negative emotions (anxiety and frustration)
Community-recovery Method	Quality of responses from users in the community	(a) Reliability, (b) usefulness, and (c) presentation
	Probability of a satisfactory outcome through the method	
	Importance of a satisfactory outcome	
	Expected method cost	(a) Expected time, (b) expected effort, and (c) expected negative emotions (anxiety and frustration)
Joint-recovery Method	Trustworthiness of staff joint-recovery performance	(a) Reliability, (b) helpfulness, and (c) responsiveness
	Probability of a satisfactory outcome through the method	
	Importance of a satisfactory outcome	
	Expected method cost	(a) Expected time, (b) expected effort, and (c) expected negative emotions (anxiety and frustration)

Overall probability of a satisfactory outcome, importance of a satisfactory outcome, and factors related to the expected overall cost (overall expected effort, overall expected time, and overall expected negative feelings) are the factors that contribute to persistence with the overall process of SST problem solving. As we discuss in the next section, the three major factors in the figure clearly confirm our positioning of the user persistence phenomena within the group of motivation and cognitive choice research studies and in the specific real-world technology context of SST problem-solving.

Figure 2 summarizes the findings of this research study. It illustrates the factors that contribute to user persistence with each method and to the overall process of solving SST problems. It also illustrates the sequence of the methods users use and the iterative nature of solving SST problems, where (as we explained before) a user may need to go back and forth between the methods to solve the problem.

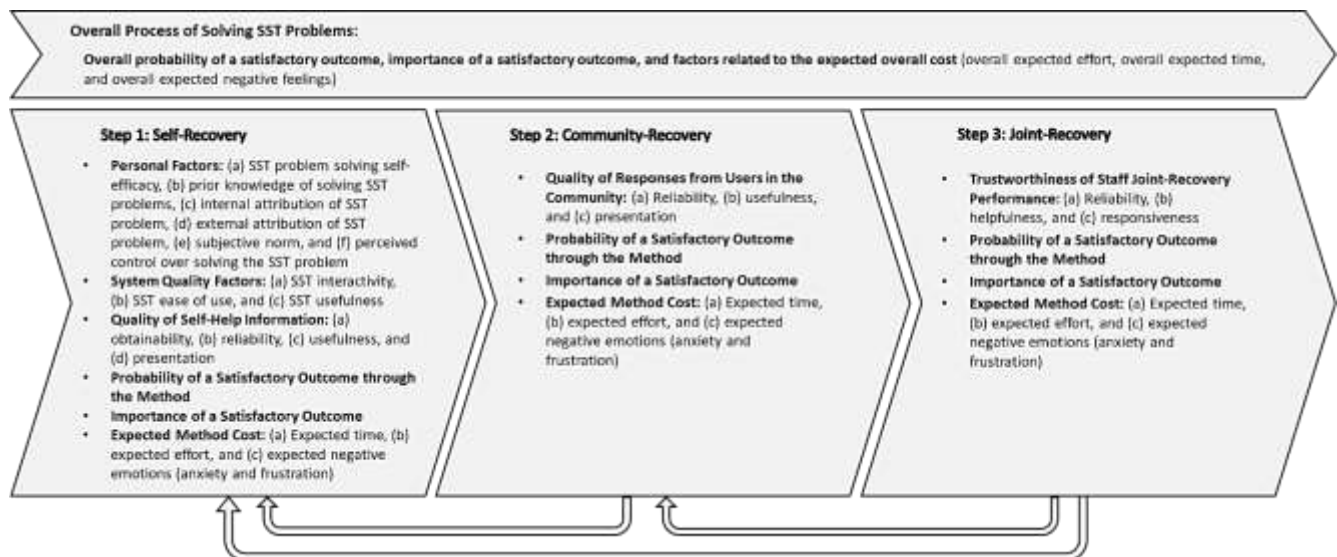


Figure 2: Factors that contribute to user persistence with each method and to the overall process of solving SST problems.

DISCUSSION

We reviewed relevant theories in the family of motivation, expectancy, and problem-solving theories, and explained that they are grand theories that cover a wide range of phenomena without providing specific insight into our research phenomenon and our research questions. Given the uniqueness of our research topic and the research questions, we conducted an inductive study, through which we conceptualized users' persistence in solving their SST problems and identified an extensive set of persistence factors that contribute to each method of solving SST problems and to the overall process of solving the problems. Our study of persistence factors in SST problem-solving provides a detailed perspective that situates our study in a specific research phenomenon and real-world technology context. Moreover, in contrast to many of the existing theories and studies, particularly Rational Analysis of Problem Solving, which focus on rational inputs, we identified both rational and non-rational factors (e.g., 'emotions' within the expected cost theme) that contribute to our research phenomenon.

E-service and SST recovery literature did not contribute fresh insights to our study. We realized that the studies draw on grand theories or they focus on organizational strategies, not the user's process of problem-solving and/or contributing persistence factors. Also, many of the studies focus on considerations such as compensation and complaint handling, which are not relevant to the specific aim and scope of our study.

For organizations designing support systems for SST recovery, understanding the factors that lead to persistence with different *methods* will inform support strategies. There is little value in an organization wishing to reduce their service costs by concentrating on optimizing their help desk performance, but not investing in interactivity of their help system, or in building users' skills and self-efficacy. We also explained why we did not focus on any automated support (e.g., AI-based chatbots) and aimed to look at the research phenomenon broadly and cover all methods that users employ to persist in solving their own SST problems. Help and problem-solving systems should be developed with the same attention to quality as the main service.

It is not realistic to expect every SST user to possess an in-depth technical knowledge and skills of SST problem recovery. For example, many millennials have a level of dependence on technologies that is higher than their technology skill-levels. However, collectively, this knowledge is usually available within the wider community of SST users. The popularity of social media platforms has led to an explosion of user forums on topics ranging from travel (e.g., Tripadvisor.com) and search for property (Nili & Barros, 2022) to health (e.g., WebMD.com) and widely used technology tools such as salesforce.com (<https://success.salesforce.com/>). Investment in building and supporting a quality user community is essential to building user persistence with problem solving.

With regards to the limitations of our study, we note that the exclusive reliance on the user's self-report and retrospective data might generate a risk of hindsight bias. We tried to minimize this risk and the risk of recall bias by employing the CIT to gather data about the most memorable SST problem events and how they were solved. We also note that we did not use experimental, cross-sectional survey, and observational methods, because the problem-solving process in our context extends over time (sometimes several days) and limits the insights that the methods can provide for us. Also, data mining methods were not used, as a large part of the overall problem-solving process is not captured by data logs and other similar sources. Future researchers may still be interested in deploying these methods to complement our research findings.

We conducted the study in an intra-organizational context where many of the SSTs used by our respondents did not have any competitors. This enabled us to gather in-depth data about all possible persistence factors. Future research may focus on data collection in a competitive context, compare their findings with the findings of our research study and complement our study.

Moreover, we did not aim to measure the degree of user persistence or study the degree to which persistence leads to success or effectiveness in solving a SST problem. This could be an interesting area for future researchers to build on our study and complement our research findings.

CONCLUSION

The convergence of rapid digital innovations, pressure to reduce costs, and a preference for digital and self-service channels for accessing an increasing number of services has led to the situation where there are a large number of users who are increasingly expected to be self-reliant when using SSTs. Supporting and retaining these customers is a major issue for organizations. In an intra-organizational context, SST problems mean lost productivity and decreased motivation. In a contestable context, SST problems cause lowered perceptions of service quality and may result in defection. The assumption that a new generation of tech-savvy users can easily get on with resolving their own problems with limited support may not be realistic. The ability to effectively understand, support, and encourage users to persist in solving their SST problems has not previously been identified as a core business competency for managing support costs, and increasing customer satisfaction. We hope our study will stimulate greater focus on this essential component of customer service in SST contexts.

REFERENCES

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. <https://doi.org/10.1080/08870446.2011.613995>
- Anderson, J. R. (1990). *The adaptive character of thought*. Hillsdale, NJ: Erlbaum.
- Atkinson, J. W., & Birch, D. (1970). On the dynamics of action. *Nederlands Tijdschrift voor de Psychologie en haar Grensgebieden*, 25(2), 83-94.
- Barros, A., Sindhgatta, R., & Nili, A. (2021). Scaling up chatbots for corporate service delivery systems. *Communications of the ACM*, 64(8), 88-97. <https://doi.org/10.1145/3446912>
- Chang, E. C., D'Zurilla, T. J., & Sanna, L. J. (2004). *Social problem solving: Theory, research, and training*. American Psychological Association. <https://doi.org/10.1037/10805-000>
- Chiu, Y. T. H., & Nguyen, D. M. (2022). Service failure and self-recovery in tech-based services: Self-determination theory perspective. *The Service Industries Journal*, 42(13-14), 1075-1100. <https://doi.org/10.1080/02642069.2022.2104257>
- Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly*, 19(2), 189-211. <https://doi.org/10.2307/249688>
- Dao, H. M., & Theotokis, A. (2021). Self-service technology recovery: The effect of recovery initiation and locus of responsibility. *Journal of Interactive Marketing*, 54(1), 25-39. <https://doi.org/10.1016/j.intmar.2020.09.001>
- Deci, E. L., & Ryan, R. M. (1985). Conceptualizations of intrinsic motivation and self-determination. In *Intrinsic Motivation and Self-Determination in Human Behavior, Perspectives in Social Psychology*. Springer, Boston, MA. https://doi.org/10.1007/978-1-4899-2271-7_2
- Delliotte: Digital government transformation. Retrieved from <https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-economics-digital-government-transformation-230715.pdf> (accessed 10 February 2023).
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behaviors: An introduction to theory and research*. Boston, MA: Adison.
- Flanagan, J. C. (1954). The critical incident technique. *Psychological Bulletin*, 51(4), 327-358. <https://doi.org/10.1037/h0061470>
- Kanfer, R. (1990). Motivation theory and industrial and organizational psychology. *Handbook of industrial and organizational psychology*, 1(2), 75-130.
- Kanfer, R., Frese, M., & Johnson, R. E. (2017). Motivation related to work: A century of progress. *Journal of Applied Psychology*, 102(3), 338-355. <https://doi.org/10.1037/apl0000133>
- Keating, B. W., & Aslan, M. (2023). Self-service technology recovery: The importance of psychological need support. *Journal of Service Management*, 34(4), 725-749. DOI 10.1108/JOSM-12-2021-0464
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer Publishing Company, Inc., New York, NY.
- Le, N. T., Rao Hill, S., & Troshani, I. (2022). Perceived control and perceived risk in self-service technology recovery. *Journal of Computer Information Systems*, 62(1), 164-173. <https://doi.org/10.1080/08874417.2020.1756533>
- Lien, C. H., Hsu, M. K., Shang, J. Z., & Wang, S. W. (2021). Self-service technology adoption by air passengers: A case study of fast air travel services in Taiwan. *The Service Industries Journal*, 41(9-10), 671-695. <https://doi.org/10.1080/02642069.2019.1569634>
- McKinsey & Company: The state of customer care in 2022. Retrieved from <https://www.mckinsey.com/capabilities/operations/our-insights/the-state-of-customer-care-in-2022> (accessed 12 February 2023).
- Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook*. Thousand Oaks, CA: Sage.
- Nili, A., Tate, M., & Johnstone, D. (2019). The process of solving problems with self-service technologies: A study from the user's perspective. *Electronic Commerce Research*, 19, 373-407. <https://doi.org/10.1007/s10660-018-9304-0>
- Nili, A., Barros, A., Johnstone, D., & Tate, M. (2020). Technological enablers for preventing service failure with e-commerce websites. In *Proceedings of the 27th European Conference on Information Systems*, Stockholm & Uppsala, Sweden.
- Nili, A., & Barros, A. (2022). Salient design features that your social media platform needs: The case of online communities of interest. *First Monday*, 27(3). <https://doi.org/10.5210/fm.v27i3.11831>

- Nili, A., Tate, M., Johnstone, D. (2017). A framework and approach for analysis of focus group data in information systems research. *Communications of the Association for Information Systems*, 40(1). <https://doi.org/10.17705/1CAIS.04001>
- Reed, M. (2022). Gen Z and your customer self-service. Retrieved from <https://www.creativevirtual.com/gen-z-and-your-customer-self-service/#:~:text=%2C%2049%25%20of%20Gen%20Z,generational%20shift%20towards%20self%2Dservice> (accessed 15 April 2023).
- Vroom, V. H. (1964). *Work and motivation*. New York, NY: Wiley & Sons.
- Weiner, B. (1974). *Achievement motivation and attribution theory*. General Learning Press.
- Weiner, H. (1970). Human behavioral persistence. *The Psychological Record*, 20, 445-456. <https://doi.org/10.1007/BF03393965>
- Yi, Y., & Kim, S. Y. (2017). The role of other customers during self-service technology failure. *Service Business*, 11, 695-715. <https://doi.org/10.1007/s11628-016-0325-2>
- Zhu, Z., Nakata, C., Sivakumar, K., & Grewal, D. (2013). Fix it or leave it? Customer recovery from self-service technology failures. *Journal of Retailing*, 89(1), 15-29. <https://doi.org/10.1016/j.jretai.2012.10.004>