Conference on ENTERprise Information Systems / International Conference on Project MANagement / Conference on Health and Social Care Information Systems and Technologies, CENTERIS / ProjMAN / HCist 2016, October 5-7, 2016

Self-service technology adoption: An analysis of customer to technology interactions

Eoghan Considine[a], Kathryn Cormican[a]*

[a]*College of Engineering & Informatics, National University of Ireland, Galway, Ireland*

Abstract

Self-service technologies (SST) have become ubiquitous in modern life. The adoption of such technologies has been well researched in consumer contexts but little research exists in business contexts where knowledge workers interact with technology to consume work related services. This study attempts to address this deficit. Four dimensions of the SSTQUAL quality scale namely (a) functionality, (b) security, (c) design and (d) customization were used as a reference guide to collect data from 182 knowledge workers in a financial services multi-national organization. Findings from this analysis are presented herewith. The study is important for many reasons. First, it expands the discussion on SST adoption by focusing on a specific business (as opposed to consumer) context thus contributing to the body of knowledge in the domain. Second, it captures and analyzes real world empirical data and helps bridge the gap between theory and practice. Finally, the findings can help decision makers to ascertain whether to invest in SST as an alternative to service representative solutions.

1. Introduction

Knowledge workers in general and technology based knowledge workers in particular, increasingly use self-service technology (SST) within their organizations to obtain services. Self-service technology is defined as

---

* Corresponding author. Tel.: +353-91-493975; fax: +353-91-494524
  E-mail address: kathryn.cormican@nuigalway.ie

"*technological interfaces that enable customers to produce a service independent of direct service employee involvement*" [1]. Self-service technology (SST) adoption has been cited by businesses as a critical element in controlling costs and improving customer experience. However, researchers warn that there are several elements to consider in order to guarantee the successful implementation of these technologies. SST service quality can be measured by examining many dimensions including functionality, enjoyment, security, assurance, design, customization and convenience [2],[3]. Previous research has shown that the adoption of self-service technology has been studied from many perspectives in many different contexts. For example, recent research has been conducted in contexts such as banking [4],[5], television [6], air travel [7] and hospitality [8]. We note that all these studies have focused on SST adoption in consumer markets and little attention has been paid to understanding the business context.

The goal of our research is to ascertain whether the replacement of information technology service capabilities, based on a customer self-service approach caters for evolving technology knowledge workers' demands. Specifically, we aim to assess the level of satisfaction with an organizations SST in a business context. To do this our study adapted the SSTQUAL measurement scale developed by Lin and Hsieh [9] which is acknowledged as the de-facto SST quality measurement scale [5],[10]. We adapt four constructs namely (a) functionality, (b) security, (c) design and (d) customization as these were most relevant to our requirements and context. The target group for this study included approximately 400 knowledge workers comprising software engineers, software quality assurance engineers, system administrators, software architects and technical managers. The group was geographically distributed across multisite boundaries. Data was collected from 182 people and key findings of our analysis are presented in this paper. This study is important to both academics and to practitioners. We answer calls for research by extending the discussion on SST by analyzing empirical data in a real world business context. We expect that the findings will help practitioners with their decision on whether to invest in SST as an alternative to service representative services. Our findings can also provide valuable insights to help the successful design and implementation of such technologies.

2. Measurement scales for consumer-to-technology interactions

A number of measurement scales exist which can be used to measure specific service dimensions. Most notably SERVQUAL measures consumer-to-service-representative quality [11]. The technology assessment model (TAM) measures the potential drivers and inhibitors of technology acceptance [12]. Work has been conducted in the area of technology readiness (TR) to assess consumer readiness to adopt new technology [13]. Lin and Hsieh's SSTQUAL scale measures the service quality of a SST [9]. Many researchers have adopted SSTQUAL and it is acknowledged to be the foremost scale for measuring the quality of consumer-to-technology interactions [5], [10].

A synthesis of the extant literature reveals similar or cognate studies that have been conducted in this space. For example, Oh et al. studied tourist adoption and intention to use SST in a resort hotel context citing extrinsic motivations as a key motivator to adoption [8]. This study developed a conceptual framework using dimensions of perceived ease-of-use, privacy, autonomy and efficiency coupled with the human desire for interaction. The scale used, based on TAM, found that these dimensions most positively affected customer adoption of SST in a hotel context. Choi and Park's study investigated the adoption of a smart entry service SST in an airport context [7]. An alternative model for testing SST service quality was developed to assess the intention to use i.e. functionality, security, perceived enjoyment, perceived ease-of-us and perceived usefulness. Jang and Noh's work examined SST service quality in the internet protocol television (IPTV) sector [5]. These researchers created a model extending the TAM scale. This study examined intention to use of SST by examining the correlation between functionality (including ease-of-use), design, enjoyment and security. The study concluded that service quality had an influence on perceived usefulness, ease of use and enjoyment. All three of these studies used a version or an extended version of TAM with some including or excluding dimensions of the SSTQUAL.

Table 1 attempts to compare and contrast the various constructs used in each of these studies relative to the SSTQUAL scale [9] and to each other. We can see that Oh et al. excluded constructs such as enjoyment, security, assurance, design, convenience and customization [8]. Choi and Park excluded assurance, design, convenience and customization [7] while Jang and Noh [6] excluded assurance, convenience and customization. We note that Radomir and Nistor [5] used all the SSTQUAL constructs in their study.

Table 1.Comparative analysis of constructs used to measure service quality in cognate studies

Dimension	Description	Lin and Hsieh [9]	Oh, et al. [8]	Choi and Park [7]	Jang and Noh [6]	Radomir and Nistor [5]
Functionality	Represents functional aspects of SST including reliability, perceived ease of use and responsiveness.	✓	✓	✓	✓	✓
Enjoyment	Tests perceptions of perceived enjoyment during SST delivery and the outcomes of use.	✓	-	✓	✓	✓
Security/Privacy	Examines perceived security including fraud and general safety and loss of personal data.	✓	-	✓	✓	✓
Assurance	Portrays the confidence of the consumer in the competence of the SST provider.	✓	-	-	-	✓
Design	Tests the overall design of the SST service system.	✓	-	-	✓	✓
Convenience	How accessible and convenient to use is the SST service.	✓	-	-	-	✓
Customization	Tests how customizable the SST is and if it can be adapted to meet the individual customers' needs and historic transactions.	✓	-	-	-	✓

3. Method employed

400 technology based knowledge workers employed in a large multi-national financial services organization were targeted for this study. The sample comprised software engineers, software quality assurance engineers, system administrators, software architects and technical managers. Overhead functions such as finance, human resources and administration staff were excluded and deemed out of scope. The group was geographically distributed across multisite boundaries. A survey which adapted the original SSTQUAL scale was developed to examine participant's perception of SST in terms of the technologies' functionality, security, design and customization features. A 7 point Likert scale, codified from 0 through 6, containing the bipolar ranges from strongly disagree to strongly agree was used to measure negative or positive responses to statements. The questionnaire was distributed using email and included a blog post to educate participants on the nature of the research. An overall response rate of 45.5% was obtained.

4. Findings

4.1. Sample and rater consistency

In total 182 responses to the questionnaire was received of which 69% came from male respondent and 31% came from female. The age profile of respondents is illustrated in Table 2.

Table 2. Age profile of sample

Age	Count	Percent
18-29	31	17%
30-39	68	37%
40-49	53	29%
50-59	25	14%
60 and over	5	3%
	182	100%

Cronbach's α (alpha) was used to assess the internal reliability, consistency and therefore trustworthiness of the data for each construct namely functionality, security, design and customization (see table 3). Overall the results indicate good reliability however our analysis revealed that the items used to assess security or privacy items was just below the point of acceptance (> 0.7).

Table 3. Rater consistency

	Functionality	Security	Design	Customization
Cronbach's α*	0.91782	0.684036	0.8264138	0.83194

*Good Reliability is measured > 0.8

*Acceptable Reliability is measured > 0.7

4.2. Functionality

Four items from the extended SSTQUAL scale were adapted and used to examine the functionality of the SST in the case organization. These were:
- I can get my service done with the organization's SST in a short time
- SSTs already in place at the organization are simple and easy to use
- Using the organization's SST requires little effort
- I can get my service done smoothly with the organization's SST

A likert scale ranging from 0 to 6 where 0 is "strongly disagree" and 6 is "strongly agree" was used to assess these items. The responses, illustrated in Table 4 indicate a mean within the central tendency while more interestingly a median and mode above the central tendency. The standard deviation is 1.7 which indicates a good variation in responses.

Table 4. Descriptive statistics for functionality

Mean	Median	Mode	Standard Deviation
3.359341	4	4	1.704681

Table 5 summarizes the aggregated responses for all the items relating to functionality. The data indicates that 461 or 50.66% of responses agreed with the items to measure the level of functionality of the organizations SSTs. We found that in our sample respondents believe that SSTs in the organizations can help them get their services completed in a short time they are easy to use and little effort is required to operate the technology. We also learned that while the sample group is positive in general to the functionality of SSTs in the organization, they do not agree that the experience is error-free.

Table 5. Aggregated responses for all the items relating to functionality

Response	Count	Percent
Disagree	285	31.21%
Neither Agree or Disagree	155	18.13%
Agree	461	50.66%
Total	910	100%

4.3. Security

Two items from the extended SSTQUAL scale were adapted and used to address the level of security of the organization's SSTs. The questions posed on the survey to capture this data are as follows:
- I feel that my transactions with the organization SST are safe
- A clear privacy policy is stated when I use the organization SST

A likert scale ranging from 0 to 6 where 0 is "strongly disagree" and 6 is "strongly agree" was used to assess these items. The responses indicate a mean above the central tendency while the median and mode are also above the central tendency (see table 6). The standard deviation is 1.6 which indicates a good variation in responses.

Table 6. Descriptive statistics for security

Mean	Median	Mode	Standard Deviation
4.0164835	4	5	1.6056899

The aggregated data of responses for security related items indicate that 229 or 62.91% of responses were positive showing overall agreement with questions dealing with the security (see table 7). In particular we found that our sample strongly believes that the level of safety when executing transactions with SST within the organization is high (74%). However, only 52% of respondents agree that the organisation has clear policies in place for using SSTs.

Table 7. Aggregated data of responses for security

Response	Count	Percent
Disagree	55	15.11%
Neither Agree or Disagree	80	21.98%
Agree	229	62.91%
Total	364	100%

4.4. Design

Two questions from the original SSTQUAL scale were adapted and used to assess the nature of design for the organization's SSTs. There are:
- The layout of the organization SSTs are aesthetically appealing
- The organization's SSTs appears to use up-to-date technology

A likert scale ranging from 0 to 6 where 0 is "strongly disagree" and 6 is "strongly agree" was used to assess these items. The responses, illustrated in Table 8 indicate a mean below the central tendency while the median and mode are also neutral indicating neither a positive or negative response. The standard deviation was 1.44 which indicates a good variation in responses.

Table 8. Descriptive statistics for design

Mean	Median	Mode	Standard Deviation
3.359341	4	4	1.704681

Table 9 summarizes the aggregated responses for all the items relating to design. This illustrates that only 176 or 48.35% of respondents agreed with the questions relating to the design construct. This is somewhat lower than the scores for the functionality (50.66%) and security (62.91%) constructs. The aggregation of negative (22.53%) and neutral distributions (29.12%) also exceeds the positive distribution (48.35%). This indicates that the sample group has concerns with the design of SSTs within the organization. We found that only 42% of respondents are happy with the layouts and the aesthetics of the organization's SST and 55% of respondents believe that the organization's SSTs employ up to date technology.

Table 9. Aggregated responses for all the items relating to design

Response	Count	Percent
Disagree	82	22.53%
Neither Agree or Disagree	106	29.12%
Agree	176	48.35%
Total	364	100%

4.5. Customization

Three questions were adapted from the SSTQUAL scale and used to assess customization. They are:
- The organization's SST understands my specific needs
- The organization's unit SST has my best interests at heart
- The organization's SST has features that are personalized for me

These questions aimed to assess respondents' attitudes towards user centered design, and personalization. The responses, illustrated in table 10, indicate a mean below the central tendency with the median and mode also below the central tendency. The standard deviation was 1.56, which indicates a good variation in responses.

Table 10. Descriptive statistics for customization

Mean	Median	Mode	Standard Deviation
3.245421	3	3	1.565168

The aggregated data of responses (see table 11) indicates that 239 or 43.77% of responses were in agreement with the questions relating to customization. This result is lower than the functionality (50.66%), security (62.91) and design (48.35%) scores. The aggregation of negative (28.39%) and neutral distributions (27.84%) also exceeds the positive distribution (43.77%). This suggests that the sample does not agree that the nature of customization provided by SSTs is adequate within the case organization.

Table 11. Aggregated responses for all the items relating to customization

Response	Count	Percent
Disagree	155	28.39%
Neither Agree or Disagree	152	27.84%
Agree	239	43.77%
Total	364	100%

4.6. Summary and discussion

The findings from this study show a good rater consistency, as verified by Cronbach's α, for three of the four constructs namely functionality, design and customization while the score for the items used to test security dimension was just below the acceptable threshold.

We found that in our sample, respondents believe that SSTs in their specific organizations can help them get their services completed in a short time they are easy to use and little effort is required to operate the technology. However respondents do not believe that the experience is error-free. We learned that in the respondents in our sample strongly believes that the level of safety when executing transactions with SST within the organization is high. However, only half of respondents agree that the organisation has clear policies in place for using SSTs which suggests that this issue needs to be addressed. Our study revealed that the respondents of our study have concerns with the design of SST in the organization. Only 42% of respondents are happy with the layouts and the aesthetics of the organization's SST and 55% of respondents believe that the organization's SSTs employ up to date technology. It seems that user centered design, and personalization is also an issue for respondents of our study. We found that the level of agreement with items that measured user centered design, and personalization of the organizations SST was not high. In fact this construct received the lowest scores of all. This suggests that more work needs to be done to ensure that the technologies are user centric. This finding supports the work conducted by van Hillegersberg and Koenen [14] who examined the reasons for the relatively slow adoption of group based decision support systems and concluded that user interface design was essential user acceptance and should be prioritized. While our findings broadly support those of cognate studies [9], [4] it is also imperative to acknowledge that there are many external factors that can influence a user's perception of a system [15].

5. Conclusion and future work

This study has shown that the replacement of IT service capabilities with SST is acceptable to technology based knowledge workers. Our sample seemed happy with the levels of functionality and security in the organizations SSTs. However the study highlighted an issue with the design and customization of the SSTs in the organization. Generic SST quality measurement, such as SSTQUAL, simply does not transcend industries and contexts. What is critical to SST adoption in finance is not critical to adoption in retail, finance or technology. While there are factors that should be considered baseline factors to adoption some factors are more important than others depending on context.

It is clear from the results of this study, when compared to previous studies, that contextual or environmental factors determine SST adoption. However, this study focused on a single multi-national financial services organization. An extension of the sample is required to further improve the quality of results. Future research should consider broadening the scope to include more organizations within the knowledge worker technology sector. Furthermore, this study, like previous studies, employed deductive reasoning methods assuming no cultural differences existed between environments. Future studies might consider inductive methods in an attempt to isolate some of these issues.

It is important to highlight that SST quality measurement is not the only factor relevant to adoption of SST within the business context. Orchestration of SST, or the streamlining and integration of applications, is also important. The demand for support is also important when considering investment in SST, because if demand is low the most cost effective mechanism maybe to continue with traditional support representatives.

References

1. Meuter ML, Ostrom AL, Roundtree RI, Bitner, MJ. Self-service technologies: understanding customer satisfaction with technology-based service encounters. *Journal of marketing* 2000:**64**: 50-64.
2. Bitner MJ, Ostrom AL, Meuter ML. Implementing successful self-service technologies. *The Academy of Management Executive* 2002:**16**:96-108.
3. Curran JM, Meuter ML, Surprenant CF. Intentions to use self-service technologies: a confluence of multiple attitudes. *Journal of Service Research* 2003:**5**: 209-224.
4. Radomir L, Nistor CV. High-educated consumer perceptions of service quality: An assessment of the SSTQUAL scale in the Romanian banking industry. *Procedia Economics and Finance* 2012: **3**:858-864.
5. Radomir L, Nistor CV. Comparing the original and the revised SSTQUAL scale among high-educated consumers in Romania. *Procedia Economics and Finance* 2014:**15**:926-934.
6. Jang HY, Noh M J. Customer acceptance of IPTV service quality. *International Journal of Information Management* 2011: **31**: 582-592.
7. Choi JH, Park JW. Investigating the factors influencing the usage of smart entry service: Incheon International Airport case study. *International Business Research* 2013: **7**:74.
8. Oh H, Jeong M, Baloglu S. Tourists adoption of self-service technologies at resort hotels. *Journal of Business Research* 2013:**66**: 692-699.
9. Lin JSC, Hsieh PL. Assessing the self-service technology encounters: Development and validation of SSTQUAL scale. *Journal of Retailing* 2011: **87**:194-206.
10. Orel FD, Kara A. Supermarket self-checkout service quality, customer satisfaction, and loyalty: Empirical evidence from an emerging market. *Journal of Retailing and Consumer Services* 2014: **21**:118-129.
11. Patasuraman A, Zeithaml VA, Barry LL. A Conceptual model of service quality and its implications for future research. *The Journal of Marketing* 1985: **49**:41-50.
12. Davis F. 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly* 1989:**13**: 319-339.
13. Parasuraman A. Technology readiness index (TRI): A multi-item scale to measure readiness to embrace new technologies. *Journal of Service Research* 2000:**2**: 307-321.
14. van Hillegersberg J, Koenen K. Adoption of web-based group decision support systems: experiences from the field and future developments. *International Journal of Information Systems and Project Management* 2016: **4**: 49-64
15. Zabukovsek SS, Bobek S. TAM-based external factors related to ERP solutions acceptance in organizations. *International Journal of Information Systems and Project Management* 2013: **1**: 25-38