

Assessing e-service quality, customer satisfaction and customer loyalty in subscription-based
self-service web environments

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Abstract

As today's world is becoming more and more characterized by technology-facilitated transactions, an increasing number of customers interact with technology instead of sales and support employees. Compared to traditional self-service options such as automated phone systems or interactive kiosks, the Internet provides a wider variety of self-service possibilities and, even though it has some drawbacks, could be a more attractive and beneficial option to customers. Research into the construct that defines online service quality (e-service quality) has been prominent, but the definition has been inconsistent. Previous studies that investigated e-service quality found that e-service quality may affect customer satisfaction. Customer satisfaction has in turn, found to be related to customer loyalty. Whether these two relationships apply for online self-service environments specifically is yet to be studied. The aim of this study is twofold: To formulate a number of best practices for online self-service environments and to test the hypothesized associations between e-service quality and customer satisfaction, and customer satisfaction and customer loyalty in online self-service environments. This study has made use of three different research methods, with which both qualitative and quantitative data were gathered. Concerning the qualitative data, expert reviews (N = 1) were employed, in which a number of best practices have been found. These were later validated by a usability test (N = 6) in which actual users evaluated the self-service interface. Quantitative data from an online survey (N = 103) were used to test the hypotheses. In the current study concerning online self-service environments, both the relationship between e-service quality and customer satisfaction and the association between customer satisfaction and customer loyalty turned out to be significant and positive. In conclusion, the results of this study will contribute to existing research concerning

the relations between e-service quality, customer satisfaction and customer loyalty. Application of the found best practices may help companies improve their online self-service environment to more optimally suit the expectations of their customers, which will have a positive effect on e-service quality and will likely lead to more satisfied and loyal customers.

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self-service web environments

The conduct of business has, over the last decades, been dramatically affected by the rising popularity and usage of the Internet. This has led to a rapid global growth in electronic commerce (e-commerce), where companies attempt to gain a competitive advantage by interacting with their customers over the Web. The first wave of e-commerce was largely based on the online retail of commodity goods, the use of advertisements and mass media to drive transactions and counting on operational efficiencies in order to reduce costs of selling (Rust & Kannan, 2003). In these times, merely low prices and Web presence were thought to be the key drivers of success. However, service quality issues soon became pivotal (Parasuraman, 2005). Thus, this traditional view of conducting e-commerce gave way to a new paradigm known as “e-service”. E-service, or the service offered in online environments, has become recognized as an important factor in determining the success or failure of electronic channels. It can be defined as the consumers’ overall evaluation and judgment of the excellence and quality of online service offerings in the virtual space (Santos, 2003).

What makes electronic service offerings different from traditional services?

A few key differences exist between traditional and electronic services. In traditional services, the only people involved in the service encounter are the employees, whereas in e-service, IT is mainly involved. Compared to traditional service, the e-service encounter features lower context sensitivity, a decreased sense of personal service and no use of body language. Therefore, e-service is sometimes described as a relatively impoverished experience, due to the absence of face-to-face interaction, which is seen as central to relationship development

(Zeithaml et al., 2000). Finally, traditional service is restricted by distance and opening hours, whereas e-service substantially circumvents these barriers (Surjadjaja et al., 2003). This provides the customer with convenience and control. (Rowley, 2006)

The business case for e-service

There are several reasons why a customer-centric approach may be important for e-commerce firms. As the online marketplace becomes increasingly competitive and transparent, with comparable offers just one mouse-click away, retaining a customer base is critical for sustaining profitability and market share. Also, satisfied customers are a less expensive and more effective advertising channel (via word-of-mouth) than print or mass media, due to increased credibility associated with personal experiences. Customer retention may also provide additional revenue opportunities via cross-selling (selling new products or services to existing customers) or upselling (selling more expensive items or upgrades to customers). Finally, acquiring new customers may cost five times as much compared to generating repeat business from existing customers, due to the costs of searching for new customers, setting up new accounts and initiating new customers to the company's products and services (Bhattacharjee, 2001).

Growing popularity of self-service interfaces

As today's fast-paced world is becoming increasingly characterized by technology-facilitated transactions, a growing number of customers interact with technology instead of service firm employees. Self-service technologies (SSTs; Meuter et al., 2000) are a cost-effective way of providing a greater level of customer service for firms and allow customers to use the service interface without any interaction with, or assistance from employees. Examples of SSTs

are automated teller machines (ATMs), automated hotel checkout, or fully automated phone systems, but can also include Internet-based services (Curran & Meuter, 2005).

Differences between traditional and online self-service

Compared to the traditional SST options such as ATMs and interactive kiosks, the Internet provides a wider variety of self-service possibilities (Chen, Chen & Chen, 2009). For example, consumers may navigate and search for information they need on the Web while some Internet-based service providers let consumer submit inquiries. In online self-service environments, consumers may change their contact information, pay their bills or modify their subscription. Also, consumers are able to communicate with service representatives or other customers through Web fora, e-mail and chat rooms.

Benefits of SSTs

Although using Internet self-service technology may demand a relatively higher level of technological ability, it could be a more attractive and beneficial SST option to customers (Yen, 2005). Consumer evaluations of e-services and SSTs can be impacted by experience-based norms and the use of traditional services as comparison standards (van Riel et al., 2001). Numerous studies have demonstrated that consumer benefits of using SST include convenience, saving time and money (Meuter et al., 2000) and being in control (Dabholkar, 1996), while the benefits to the firm are a combination of cost savings, increased customer satisfaction, the identification of profitable customers (Stockdale, 2007) and an increase in sales opportunities (Hornick, 2014).

Tools for evaluating e-service quality

With the ever-increasing use of e-commerce, the need to appraise service has moved to the virtual world. Early investigations of online service quality used an approach in which the researchers adapt or extend SERVQUAL (Parasuraman et al., 1985), a multi-item scale for measuring the quality of face-to-face services with five dimensions: tangibles, reliability, responsiveness, assurance and empathy. However, face-to-face services differ from online services in their fundamental quality dimensions. As Parasuraman et al. (2005) comment, attempts to adapt or extend a face-to-face service scale to measure or evaluate online service quality may lead to decreased reliability and questionable validity.

Differing views on the definition of e-service quality

Nowadays, research on elements of e-service quality has been prominent and has advanced to a level of substantial sophistication in literature. However, although there is some overlap, constructs of e-service quality have been operationalized inconsistently (Yen, 2005). For example, E-SQ (Zeithaml et al., 2000) primarily includes concepts such as efficiency, fulfillment and privacy, the SITEQUAL (Yoo & Donthu, 2001) scale embraces characteristics such as ease of use, aesthetic design and processing speed and e-TailQ (Wolfenbarger & Gilly, 2003) measures attributes such as security, reliability and customer service.

Relationship between e-service quality and customer satisfaction

Implicit in the services marketing literature is the idea that service quality and customer satisfaction are related concepts, with service quality mirroring managerial concerns and customer satisfaction mirroring customer concerns (Iacobucci et al., 1995). According to these authors, the difference between quality and satisfaction lies in these different concerns; a

manager and service-providing firm try to provide high-quality service, and a customer experiences the service encounter and is satisfied or not. Rust and Zahorik (1993) argue that the improvement of service quality leads to an increase in perceived quality, which in turn leads to increased consumer satisfaction. Considering e-service quality, aspects such as information quality or user-friendliness seem to have positive effects on the level of consumer website satisfaction (Zeithaml et al., 2002). Moreover, Yang and Fang (2004) highlight a number of online service quality dimensions (such as responsiveness and reliability) leading to satisfaction. Zviran et al. (2006) indicate that websites have different, hidden and subjective factors that stem from the process of use and system interaction and affect overall user satisfaction. In line with the above arguments, we think it's reasonable to think of e-service quality as an antecedent of customer satisfaction and therefore expect to find a positive, significant relationship between these two constructs.

Relationship between customer satisfaction and customer loyalty

Finally, we review the impact of customer satisfaction on customer loyalty. Yi (1990) finds customer satisfaction to be a significant influence of post-purchase attitude. Yoon and Kim (2000) likewise found higher levels of consumer satisfaction to lead to an improvement in loyalty levels. Loyalty in the online environment, or e-loyalty, also seems to be affected by satisfaction, with increased satisfaction levels leading to increased e-loyalty (Anderson & Srinivasan, 2003). Cristobal et al. (2007) argue that the individual who perceives that the business complies with the agreed conditions believes that this behavior will continue in the future, which strengthens their willingness to continue the relationship and increases their degree of commitment. Anderson and Mittal (2000) found that removing the causes of dissatisfaction is

crucial for customer retention. In keeping with these findings and previous research in service management and marketing literature, we therefore predict that customer satisfaction has a positive and significant effect on customer loyalty.

Goals and hypotheses of the current study

As this research project was commissioned by a client, the research goals are primarily based on the needs and wishes expressed by the client. The main aim of the underlying study is twofold. First, a number of online self-service environments will be evaluated in an attempt to formulate a number of best practices for online self-service environments. Secondly, the e-service quality of these environments will be assessed, and its ties with customer satisfaction and the relationship between customer satisfaction and customer loyalty will be examined. As these relationships have not yet been found specifically for online self-service environments, we aim to investigate whether these two associations are true in these specific web environments. Consistent with existent literature, we expect to find significant effects for both relationships.

General Method

This study has made use of three research methods in order to satisfy both research goals. Expert reviews (an effective and cost-efficient method of discovering usability problems in which one or more evaluators examine and judge the user interface and compare it against accepted usability principles, developed by Nielsen and Molich, 1990) were used, both to formulate the best practices and to assess the web sites' user-friendliness and to evaluate their overall e-service quality. For the online self-service environments that were to be reviewed, a

selection of nine subscription-based service providers in three different sectors (Telecom, Energy and Health insurance) was made, based on the client's wishes and recommendations.

After conducting these expert reviews, a selection of two service providers was made, again based on the client's preferences. A usability test (a technique to evaluate a product by testing it on users, giving direct input on how actual users use the system, popularized by Nielsen, 1994) was then employed to obtain direct input on how actual users (the service provider's customers) use the online self-service environments. The qualitative data derived from these tests allowed us to validate both the criteria that were used and the best practices that were found in the expert reviews. Quantitative data on both e-service quality and customer satisfaction have also been gathered from these tests.

Finally, an online survey (structured questionnaire that is completed by participants over the internet) has been administered to a larger sample of customers of the two selected service providers to gain an understanding on their judgment of e-service quality of, their satisfaction with, and their loyalty towards their service provider. It was also used to validate the assumed common tasks that were used in the expert reviews and usability test. The chosen research methods and the measured constructs are depicted in Figure 1.

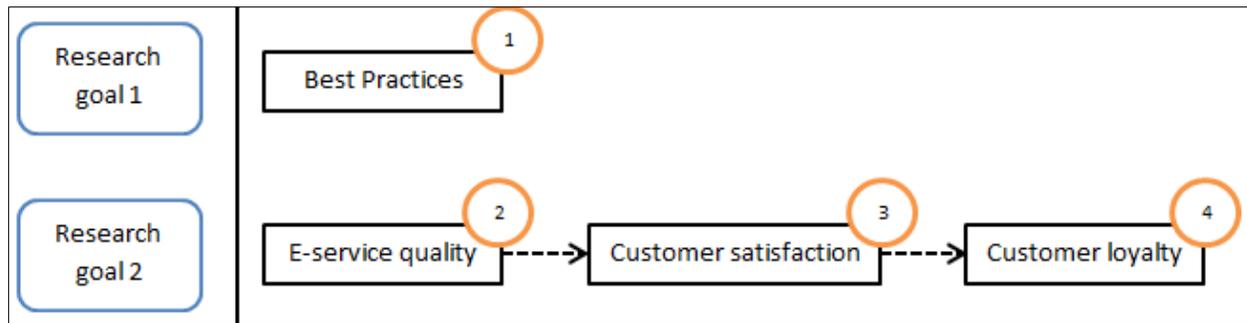


Figure 1. Illustration of the research goals and the employed constructs in the current research. Expert reviews were used to gather data concerning constructs 1 and 2, data for constructs 1-3 were obtained with the usability test and the online survey measured the hypothesized connection between constructs 2-4.

Since the study employs a number of different research methods (expert reviews, a usability test and an online survey) to test the hypotheses, the following section has been divided into three parts; one for each research method used. Each of these sections contains both the method and results section of their relevant research method.

Research method 1 – Expert Reviews

The expert reviews were carried out for two reasons. The first reason was to obtain a set of best practices for online self-service environments. Best practices are a set of guidelines that represent the most efficient or usable course of action. In this study, they represent the elements that are thought to (sometimes severely) increase the usability of the self-service environment. The second reason was to score each of the selected online self-service environments on a number of tasks in order to obtain an overall score for the e-service quality for each evaluated self-service environment. These scores helped to make comparisons between the different online self-service environments.

Method

Participants

The expert reviews were carried out by one of the researchers, with the assistance of several experienced colleagues.

Materials

A subset of assumed common tasks was devised and used to evaluate the online self-service environments in the three selected sectors (see Table 1). The vast majority of these tasks were similar across sectors, while certain tasks were sector-specific. A distinction was made between qualitatively and quantitatively ranked tasks, where the tasks that were thought to be consumer-oriented were scored quantitatively and tasks that were related with certain business goals were evaluated qualitatively. As we were most interested in the consumers' perception and evaluation of the online self-service environments, the quantitatively ranked tasks were used to indicate the overall quality of the evaluated web sites.

Table 1. Listing of evaluated tasks in the three selected sectors. Tasks A, B and C were not scored, but openly evaluated.

#	Telecom	Energy	Health Insurance
1	Change contact information	Change contact information	Change contact information
2	Change subscription	Change subscription	Change subscription
3	Request unlock code (PUK code)	Change monthly installments (payments)	Submit a declaration
4	View (monthly) usage	View (monthly) usage	View (monthly) usage
5	View (monthly) invoice	View (monthly) invoice	View premium amount
A	Make use of online help	Make use of online help	Make use of online help
B	Evaluate targeted marketing	Evaluate targeted marketing	Evaluate targeted marketing
C	Evaluate offered extra services	Evaluate offered extra services	Evaluate offered extra services

As shown in the introduction, little commonality exists among the scales that have been developed to measure the dimensions of e-service quality. The present study has made use of a conceptual framework that aims to capture the quality of self-service web environments. This

framework has been developed and successfully employed in previous research by the client. It identifies six attributes as important antecedents determining a user's satisfaction with the quality of the self-service web environment. Originating from a total of nine topics including 247 web usability guidelines (Travis, 2009), six topics were picked and interpreted in the context of the online self-service environment to score the quantitatively ranked tasks. For the list of used criteria, see Table 2.

Table 2. Criteria used to score the five consumer-oriented tasks

Usability criterion	Is concerned with:
Navigation & Information Architecture	Structure, Labels, Logic, Sequencing
Flow & Task Orientation	Task flow, Distraction, Functionality
Trust & Credibility	Accuracy, Up-to-dateness, Handling of personal information
Control & Feedback	Notifications, Help options, Usage of progress indicators
Page Layout & Visual Design	Readability, Buttons/Links/Labels, Consistency
Content & Writing Quality	Clarity, Content structure, Jargon, Abbreviations

Procedure

As each of these online self-service environments is login-protected, login access was obtained for all nine web sites with the help of colleagues, friends and family. All of the (positive and negative) findings on individual web sites were listed, and were later summarized across sectors and for online self-service environments overall. For the ranked tasks, a criteria-based distinction was made between positive and low, medium and high priority negative findings. Starting off at the initial (and maximum) score of 5 points, low priority usability issues reduced the score on their relevant criteria by 0.5, medium priority issues reduced this score by 1 and high priority issues reduced the score on the relevant criteria by 2. Following this procedure, scores were obtained for each task and each criterion, including a total score for the quality of the

online self-service environment overall. After reviewing all nine online self-service environments, two telecom service providers were selected for further analyses.

Results

All nine online self-service environments, across three sectors, were reviewed and scored on the consumer-oriented tasks. Results showed that tasks 1 and 2: changing contact information (3.95) and changing subscription (3.91), scored the lowest across all self-service environments. In contrast, tasks 4 and 5, viewing the (monthly) usage (4.30) and invoice (4.31), got a relatively higher score. Task 3, which was different for each sector, obtained the highest score (4.36). Concerning the criteria, both Control & Feedback (3.99) and Content & Writing (3.94) received the lowest scores with both scoring just under a 4. Page Layout & Visual Design got the highest score (4.46). The remaining three criteria, Navigation & IA (4.29), Trust & Credibility (4.18) and Flow & Task Orientation (4.13) fell between these lowest and highest scores. Comparisons between sectors, finally, showed that the Health Insurance (4.32) self-service environments obtained the highest scores, with Energy (4.11) coming second, closely trailed by third-place Telecom (4.06).

The scores of the two service providers that were selected for further research by means of usability testing and the online survey are displayed in Tables 3a and b. Please refer to the Appendix (I) for the results of the other seven evaluated self-service environments.

Table 3a. Expert review results of Telecom provider 1

#	Task	Scorecard (1 = very bad, 5 = very good)					Average Score	
		Navigation / IA	Flow / Task orientation	Trust / Credibility	Control / Feedback	Page Layout / Visual Design		Content / Writing
1	Change contact information	4	4	3	3	4	4,5	3,75
2	Change subscription	4	4,5	4	4	4,5	4,5	4,25
3	Request unlock code (PUK code)	5	5	5	4	5	4	4,67
4	View (monthly) usage	3,5	3,5	5	5	4	3,5	4,08
5	View (monthly) invoice	4,5	4,5	4	3,5	4	2,5	3,83
	Average Score	4,2	4,3	4,2	3,9	4,3	3,8	4,12

Table 3b. Expert review results of Telecom provider 2

#	Task	Scorecard (1 = very bad, 5 = very good)					Average Score	
		Navigation / IA	Flow / Task orientation	Trust / Credibility	Control / Feedback	Page Layout / Visual Design		Content / Writing
1	Change contact information	3,5	3	3,5	2	3,5	4,5	3,33
2	Change subscription	5	3	3	2	4	2,5	3,25
3	Request unlock code (PUK code)	4	4	4,5	4,5	4	4	4,17
4	View (monthly) usage	4,5	4,5	4,5	4,5	4,5	4	4,42
5	View (monthly) invoice	3,5	3,5	4,5	5	4	3	3,92
	Average Score	4,1	3,6	4	3,6	4	3,6	3,82

Besides these quantitative findings on the selected self-service environments, a number of best practices were found for each task, sector and for self-service environments overall. The entire set of found best practices would be too extensive to list here, therefore a selection of ten factors is made, which are thought to considerably increase the quality of self-service environments overall. These best practices, based on the results of the quantitatively ranked tasks, can be found in Table 4.

Table 4. Found best practices for online self-service environments

Best practices self-service environments (based on consumer-oriented tasks)
1. Multiple navigation routes from the dashboard (landing page) facilitates search and flow
2. Direct insight in data and information on the dashboard
3. Well visible and consistent calls-to-action, labels and links throughout the self-service environment
4. Processes to change data are straightforward, if necessary supported by a progress indicator
5. Requirements for correct data entry are indicated in advance
6. Erroneous data entry is accompanied by clear and descriptive error messages
7. Information concerning usage and/or invoices is clearly displayed, if necessary supported by an illustrative graph
8. Information concerning usage and/or invoices may be viewed at a detailed level
9. Insight in the monthly and yearly usage and invoices
10. Usage and invoice view of both the current and previous subscription period(s)

For the resulting best practices from the business-oriented, qualitatively ranked tasks, please refer to the Appendix (II).

Research method 2 – Usability Test

The usability test was, like the expert reviews, also carried out for two reasons. First of all, the input from real users was used to validate the used criteria and found best practices in the expert review. Second, the usability test was used to explore differences between the two selected service providers and to explore whether e-service quality and customer satisfaction might be related.

Method

Participants

Six participants, of varying age, gender and education level, were recruited through a recruitment agency. The sample was divided into an even number of customers of both telecom service providers; three each. Other criteria the participants were selected on were self-reported familiarity with the self-service environment of their mobile telecom service provider and regular use of the Internet. The participants in the usability test consisted of two males (33%) and four females (67%). Their age varied between 21 and 63 years old ($M = 40.67$, $SD = 14.68$) and most participants' highest level of completed education was college (83%), while one participant had a university degree (17%).

Materials

The participants used a desktop computer with a 21.5" monitor and were filmed using a Logitech HD Pro Webcam C910. The installed operating system on this computer was Windows

8, and the browser the participants used was either Google Chrome or Internet Explorer (depending on their preference). Morae Usability Software (version 3) was used to capture the participants' video and audio streams. A questionnaire containing questions about specific e-service quality elements (content, structure and visual design; adapted from NETQ's *Website evaluatie*, n.d.) and customer satisfaction (Ribbink et al., 2004) was also used, and a translated version of this questionnaire can be found in the Appendix (III).

Procedure

A script was prepared and used to guide the participants through a number of pre-test questions concerning their usage of the Internet and the self-service environment of their service provider. Then, the users were given three tasks to complete. Similar to the tasks in the expert reviews, these tasks were assumed to be commonly carried-out tasks in an online self-service environment, which was later validated in the online survey. These tasks ranged from logging in to the self-service environment, to using the self-service environment to change the e-mail address or to download an invoice. The participants were asked to comment on their actions and thoughts while performing the tasks. After each task, the participants were asked to give a rating based on how easy or hard it was for them to complete the task (Customer Effect Score; CES). A score of 1 meant they found it very hard, while a score of 10 indicated a very easy task. Then, they filled out a questionnaire regarding the overall quality of the self-service environment (dividing the overall quality in three subtopics: content, structure and design) and their satisfaction as a customer (these last questions were only asked if the web site they evaluated was from their actual service provider). After filling in the questionnaire, the participants were asked about their general impression of the web site and to give more specific feedback about the

content, structure and design. They were also asked to voice their thoughts about possible improvements for the web sites. After completing this procedure for one self-service environment (from their own service provider), they moved on with the same procedure, pre-test questions excluded, for the self-service environment of the other service provider. Lastly, the participant was asked which of the two web sites he/she preferred and why. Each session took approximately one hour.

Data analysis

The two selected online self-service environments were compared on e-service quality by means of an independent samples t-test. As the low N did not allow for statistical testing, the assumed relationship between e-service quality and customer satisfaction was explored using a scatter plot graph. Concerning the e-service quality construct, both the scores each participant gave to the content, structure and design of the web sites and the ratings that were given to each statement (also related to either the content, structure or design) were averaged and computed into a new variable, representing e-service quality (with mean scores ranging from 1-10 and mean ratings ranging from 1-5). Customer satisfaction was measured by computing the average score on the four statements concerning customer satisfaction. Similar to the mean rating, the mean customer satisfaction scores also ranged from 1-5. An alpha level of 0.05 was used for all statistical analyses.

Results

A main aim of the usability test was to obtain qualitative data to validate the best practices from, and the used criteria in the expert reviews. Most comments from the usability test were consistent with the found best practices, as, for example, users really seemed to appreciate

the direct insight into their data from the dashboard, saying ‘I like that you immediately see your internet usage’ and ‘What appeals to me is that you immediately have information about your subscription’. Other frequently recurring comments concerned an appreciation of a personal welcome message, proximity grouping of similar blocks (such as subscription and usage) on the dashboard and a preference of a small amount of steps to make changes or look up information. Users often disliked sudden pop-ups where they were asked to give feedback on the web site, with one user saying ‘Irritating. I’m on my personal environment, not the open (telecom provider) web site’. Users were also confused as to why the invoice of January 2014 contained data from December 2013 and disliked providers’ attempts to push sales with flashy advertisements and big buttons labeled “Extend now”. Opinions were mixed concerning the aesthetics and design of the personal environments, with one user saying ‘They do not make it attractive to visit this site often’, while another user commented ‘It’s not very attractive, but it doesn’t need to be. All the information that I want is displayed’. Finally, and perhaps most interestingly, almost all participants disliked having multiple navigation routes or navigation bars to get to certain pages within the personal environment, with one user saying ‘I don’t think you should have 27 ways to get somewhere’. This has implications on both the used criteria and the found best practices, as it was thought to be advantageous to have multiple navigation routes leading to pages from the dashboard. After reviewing the CES scores that the users had given to each task, Telecom 1 was found to obtain the highest scores (meaning the easiest task) on the task where users had to look up information from an invoice. Telecom 2 received the highest scores on the task where the user was asked to log into the self-service environment and the task in which the user was asked to change his/her e-mail address.

Aside from these qualitative findings, differences on e-service quality between the two service providers and the relationship between e-service quality and customer satisfaction were explored. An independent samples t-test was carried out to find out whether any significant differences in e-service quality between the two providers might be found, but this was not the case. Telecom 1 ($M = 6.19$, $SD = 1.5$) and Telecom 2 ($M = 6.11$, $SD = 0.78$) did not appear to significantly differ on the mean scores ($t(10) = .121$, $p = .906$, $d = .07$), nor was a significant difference found between Telecom 1 ($M = 3.3$, $SD = 0.72$) and Telecom 2 ($M = 3.12$, $SD = 0.35$) on the mean ratings ($t(10) = .545$, $p = .598$, $d = .314$) given by the participants. Subsequently, a scatter plot graph was used to explore the relationship between e-service quality and customer satisfaction for both telecom service providers. While the scatter plot graph comparing mean scores to mean customer satisfaction did not show any interesting patterns, the graph comparing mean ratings to mean customer satisfaction (Figure 2) appears to show a positive relationship between these two variables for one provider (Telecom 1) and a negative relationship for the other provider (Telecom 2). However, the low N means this may likely be a coincidental finding bearing no statistical significance.

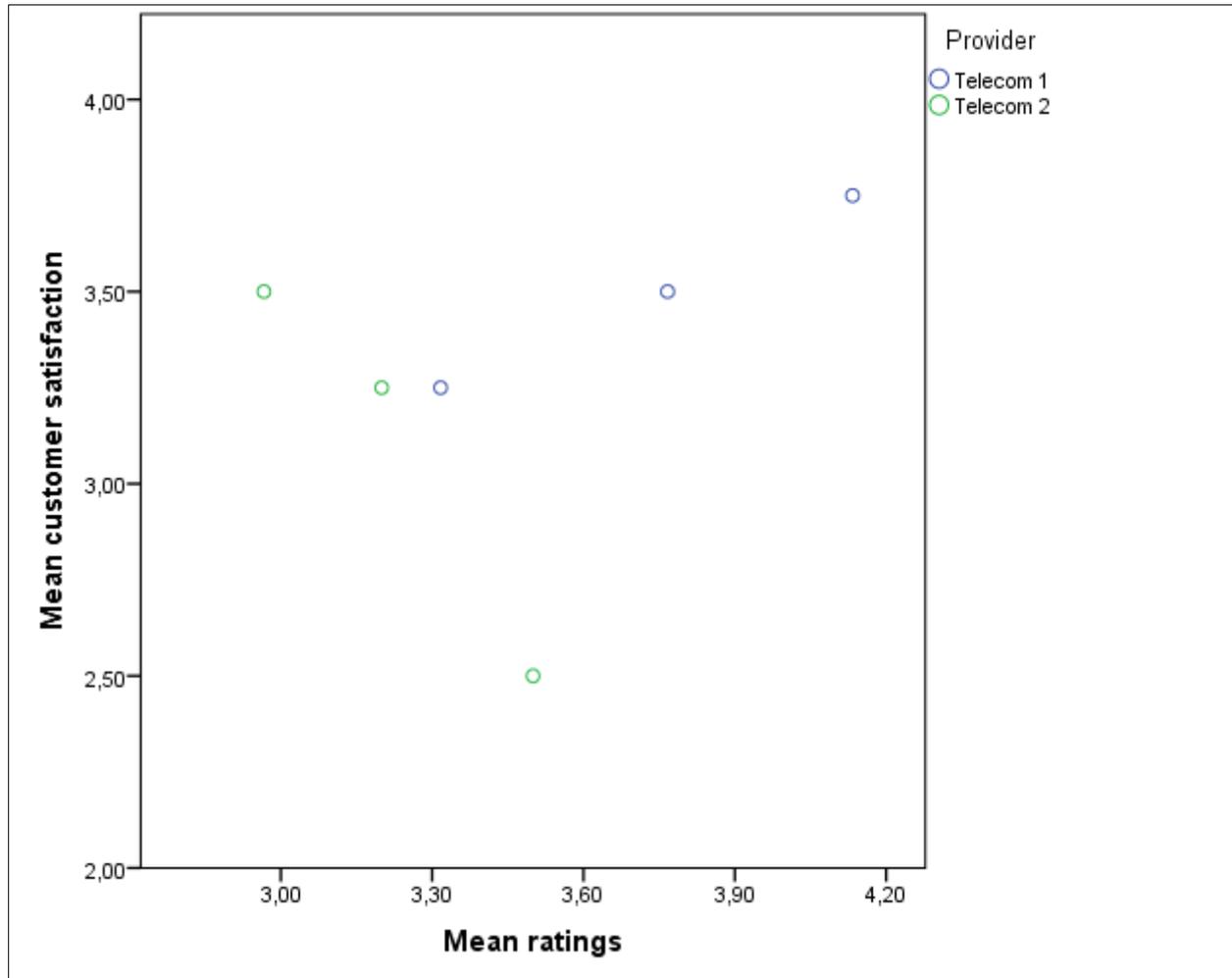


Figure 2. Scatter plot graph illustrating the patterns of mean ratings and customer satisfaction for the two telecom providers.

Research method 3 – Online Survey

The online surveys were mainly carried out to find any possible relations between e-service quality and customer satisfaction, and between customer satisfaction and customer loyalty. As shown in the literature review, both of these relationships have been found in previous studies and were therefore hypothesized to also be found in the current study. Furthermore, the online surveys were used to validate the assumed common tasks that were selected for the expert reviews and usability test.

Method

Participants

A total of 103 participants were recruited through a recruitment agency. A quota of service providers was used, so that the participants were relatively evenly distributed across both providers. 51 customers of Telecom 1 and 52 customers of Telecom 2 filled out the survey. Other specifications for the target sample were a minimum age requirement (18+), familiarity with the self-service environment of their service provider and a mobile phone subscription. The participants in the survey consisted of 53 (51.5%) males and 50 (48.5%) females. Their age varied between 19 and 81 years old ($M = 41.2$, $SD = 13.52$). Most participants' highest completed level of education was either a community college degree (36.9%) or a college degree (30.1%) and most participants used the internet (almost) every day (97.1%).

Materials

A trial version of the online research tool 'Qualtrics' was used to construct the survey. The introductory text thanked the participant in advance for participating in the survey and explained the purpose of the study. The structure of the survey was then explained. The survey consisted of three parts. In the first part of the survey, the participants were asked a number of pre-test questions, including some general demographic questions and questions regarding their service provider, such as "How long have you been a customer of <service provider>?" and "How often do you make use of your service provider's self-service environment?". Following these questions, the participants were given a number of tasks/scenarios (there were five tasks in total; log into the self-service environment, change your e-mail address, change your subscription, look up your last month's usage and view your invoice of half a year ago), to carry

out, through the use of screenshot click-tests. After each of these scenarios, the participant was asked to rate the task on difficulty. The scenarios were used to get the participant to interact with the self-service environment, prior to answering questions concerning the perceived quality of the content, structure and visual design of the self-service environment, which made up the first part of the post-test questions. The second, and final, part of the post-test questions contained questions measuring customer satisfaction and customer loyalty (Ribbink et al., 2004). A second way of measuring customer loyalty was also added, by means of the Net Promoter Score (NPS; Reichheld, 2003), which let us measure customer loyalty by asking just one question: ‘How likely is it that you would recommend this company to a friend or colleague?’ On the final screen, the participants were thanked for their cooperation and an e-mail address was provided in case the participant wanted to ask a question or leave a comment regarding the survey or overall research project. As the post-test questions were, for the most part, the same as the questions that were used in the usability test, only the new questions (related to customer loyalty) are listed in the Appendix (IV).

Procedure

After publishing the survey, a link to the survey URL was shared with the recruitment agency. In turn, the recruitment agency shared these links with the participants they recruited. After 50 completed surveys were collected for each service provider, the survey link was closed (3 participants were still completing the survey after that, hence the total N of 103) and the results were exported to SPSS.

Data analysis

The data from the survey were used to find out whether e-service quality might be related to customer satisfaction and whether customer satisfaction might be tied to customer loyalty. The two constructs that represented e-service quality were computed exactly like it was done for the usability test data, using the mean for both the scores (ranging from 1-10) and the statements (ranging from 1-5). Customer satisfaction and customer loyalty were in turn measured by computing the average score on the four statements concerning customer satisfaction and customer loyalty (both ranging from 1-5). The NPS was used as a secondary construct measuring customer loyalty (with scores ranging from 1-11). A validation of the assumed common tasks, used in both the expert reviews and usability test, was also done. Prior to the analyses, three participants with deviating scores were found by using Boxplots to detect mild (scores more than $1.5 \cdot \text{IQR}$ from the mean) and severe (more than $3 \cdot \text{IQR}$ from the mean) outliers. These participants were consequently excluded from further analyses by filtering them out. An alpha level of 0.05 was used for all statistical analyses.

Results

The mean scores of e-service quality were found to significantly and positively influence customer satisfaction scores ($\beta = .357$, $t(102) = 7.809$, $p < .001$), also explaining a significant proportion of variance in customer satisfaction scores ($R^2 = .376$, $F(1,102) = 60.979$, $p < .001$). The mean ratings on e-service quality were likewise found to have a positive significant influence on customer satisfaction ($\beta = .901$, $t(102) = 12.161$, $p < .001$), again explaining a significant proportion of variance ($R^2 = .594$, $F(1,102) = 147.885$, $p < .001$). According to Cohen (1988), these R squared values indicate large effect sizes. In turn, customer satisfaction was found to be a significant and strong positive predictor of the mean scores on customer loyalty (β

= .850, $t(102) = 13.944$, $p < .001$), explaining a large proportion of variance in customer loyalty scores ($R^2 = .658$, $F(1,102) = 194.449$, $p < .001$). Customer satisfaction also appeared to be a significant, positive predictor of the scores on the NPS ($\beta = .924$, $t(101) = 2.738$, $p = .007$), explaining a moderate proportion of variance in NPS scores ($R^2 = .070$, $F(1,101) = 7.498$, $p = .007$). Post-hoc analyses showed that all of the aforementioned significant positive associations applied to both service providers, apart from the relationship between customer satisfaction and scores on the NPS, which was found to be non-significant for one provider (Telecom 2), $\beta = .071$, $t(50) = .097$, $p = .923$ and quite significant for the other provider (Telecom 1), $\beta = 1.746$, $t(50) = 10.342$, $p < .001$. For Telecom 1, customer satisfaction explained a significant proportion of variance in NPS scores ($R^2 = .686$, $F(1,50) = 106.963$, $p < .001$), whereas for Telecom 2, customer satisfaction did not appear to explain a significant proportion of variance ($R^2 < .000$, $F(1,50) = .009$, $p = .923$). This result is presented in Figure 3.

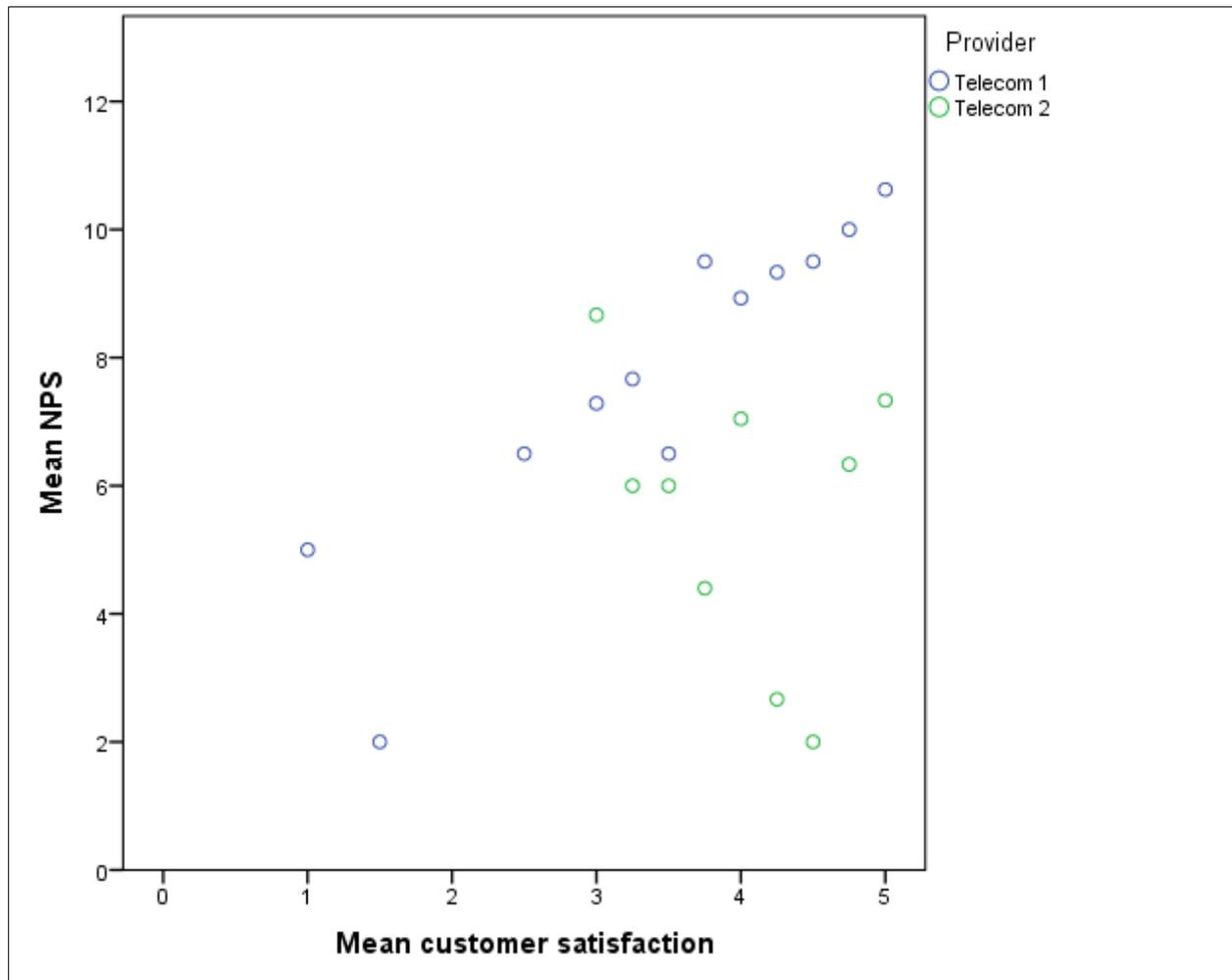


Figure 3. Scatter plot graph illustrating the effects of mean satisfaction on NPS. Post-hoc comparisons indicated that this relationship was significant for Telecom 1, but non-significant for Telecom 2.

Finally, the subset of assumed common tasks was validated. Most participants indicated to either never (55.3%) or sometimes (34%) change their contact information within their personal environment. The results for changing their subscription was similar, with 46.6% stating that they never, and 44.7% stating that they sometimes make use of this functionality. Requesting their unlock code (PUK code) was something most participants never did, with 79.6% selecting this answer. Viewing their (monthly) usage was, as expected, a more frequently

used functionality, with 46.6% indicating they would regularly, and 20.4% indicating they would often do this within their personal environment. Viewing their (monthly) invoice was, lastly, also a task done more frequently, as participants stated to do this either sometimes (23.3%), regularly (44.7%), or often (23.3%).

Discussion

The aim of this study was twofold: to formulate a number of best practices for online self-service environments and to test the hypothesized relationships between e-service quality, customer satisfaction and customer loyalty. The best practices were composed by carrying out expert reviews on nine online self-service environments and finding the user interface elements that are thought to improve the overall user experience. These best practices were later validated by the results of the usability test, which confirmed all but one of the best practices. The hypothesized ties between e-service quality, customer satisfaction and customer loyalty were evaluated by means of an online survey. Analysis of the online survey data indicated that e-service quality is indeed positively and significantly related to customer satisfaction, and customer satisfaction is positively and significantly related to customer loyalty. The following paragraphs contain short summaries of the results for each research method, followed up by a listing of limitations and restrictions that cling to the underlying research project, conclusions and suggestions for further research and finally the learnings that were obtained from this research project.

Expert review findings

The results of the expert reviews showed that Telecom 1 scored slightly higher on e-service quality than Telecom 2. A large part of this difference was due to the task “Change your subscription”, which was impossible to complete on the self-service environment of Telecom 2. Criteria-wise, the biggest difference between the two telecom service providers was found on the criterion “Flow / Task Orientation”. Overall though, the difference in scores between the two companies was too small, as well as the fact that they were evaluated by just one reviewer, to draw any significant conclusions based on just the expert reviews. However, the relatively high scores (both scored approximately 4 on overall quality, on a scale from 1 to 5) suggest that both service providers’ online self-service environments are relatively user-friendly and contribute to a pleasant customer experience.

Usability test findings

The usability test was used to validate the used criteria and acquired best practices from the expert reviews. It was found that most results from the usability test were consistent with the best practices, apart from the finding that participants generally disliked having more than one navigational route from the dashboard to browse through the different pages within their personal environment. As it was initially thought to be beneficial for the Navigation, Flow and Page Layout criteria to have more than one way to navigate around, this means the criteria have to be revised at this point. It also has implications on the found best practices, as one of these practices also promoted having multiple navigation routes, which was thus found to be not true. A review of the literature reveals that this is in accordance with Nielsen (1995), who advocates the use of an aesthetic and minimalist design. He states that every extra unit of information

competes with the relevant units of information and diminishes their relative visibility. In other words, the focus of a user's attention may be helped by reducing clutter, confusion and cognitive workload, which may lead to improved usability.

The usability test was also used to explore differences between the two providers, as well as the relationship between e-service quality and customer satisfaction. Usability test reviews indicated that indeed, no significant differences in e-service quality between the two providers seem to exist. A scatter plot graph depicting the relationship between e-service quality and customer satisfaction explored the differences between the two telecom providers, and suggests that these two may differ from each other. This finding may very well be coincidental however, because of the extremely small sample size ($N = 3$) for each group.

Online survey findings

Finally, the online survey was employed to test the hypothesis that for online self-service environments, e-service quality is significantly related to customer satisfaction, which in turn is thought to be a significant predictor of customer loyalty. Consistent with existent literature, both of these relationships were indeed found, with effect sizes that indicate strong associations between the measured constructs. One deviating finding was between customer satisfaction and scores on the NPS (a measure of customer loyalty), which was found to be non-significant in the case of Telecom 2. These results imply that, in the case of online self-service environments, these constructs are indeed related, which is in accordance with previous research concerning these constructs in other contexts.

The online survey also allowed us to validate the assumed common tasks that were employed in the expert reviews and usability test. The majority of the participants indicated to

never use the self-service environment to request their unlock code, to never or sometimes change their contact information and/or subscription and to regularly or often view their (monthly) usage and/or invoice. This implies that the majority of the tasks that were chosen to evaluate the online self-service environments with, were indeed tasks that are commonly used by the customer.

Limitations and restrictions

Like any research project, this study also had its limitations and restrictions. For one, the expert reviews were carried out by just one researcher, where it's common to have multiple evaluators. Expert reviews are difficult for a single individual to do, because one person will never be able to find all of the usability problems in an interface (Nielsen, 1995). Nielsen found that, averaged over six projects, single evaluators found only about 35 percent of usability problems in interfaces. Therefore, he recommends the use of about five evaluators, but certainly at least three. Another issue with the expert reviews was that a scoring method was used in which only the negative findings affected the scores. This meant that even if, during a task, many positive points were found, a couple of negative findings would nullify these and lead to a lower score for that task. The reasoning behind only having negative findings affecting the score came from the thought that negative information tends to influence evaluations more strongly than comparable positive information (Ito et al., 1998). This phenomenon is also known as 'bad is stronger than good', which is also the title of the often cited paper by Baumeister et al. (2001). However, we may have gone a step too far with this by completely disregarding the positive findings. A final limitation of the expert reviews was that just the consumer-oriented tasks were selected and scored for the e-service quality construct. It might well be that the business-oriented

tasks, such as the availability of online help and the offered extra services also influence the judgment of the user. Therefore, scoring these tasks and including them in the overall e-service quality construct might have been a better representation of the e-service quality construct than the one we have used in this study.

An issue in both the usability test and the online survey is that only a few tasks were presented to the participants, which may not have been enough to give a proper representation of the entire online self-service environment. However, a selection of tasks (based on experience and common sense) had to be made due to restrictions in time. Online survey results did validate (part of) the assumed common tasks however, as users indicated to make regular use of certain functionalities which we thought to be commonly used. Time restraints also caused another limitation, both for the usability test and the online survey. These two research methods were carried out for just two companies, in just one sector. This makes it difficult to generalize the results to the online self-service environments of companies in other sectors, where we cannot be certain of the probability that the same effects will be found.

Finally, the online survey has made use of screenshot click-tests to simulate the online self-service environments of both providers. It would have been preferable to test the live web sites, but this was unfortunately not possible due to privacy constraints.

Conclusions and suggestions for future research

In conclusion, we believe that the results of this study will contribute to the existing research concerning the relations between e-service quality, customer satisfaction and customer loyalty, which have been found to be related to each other in the context of online self-service environments in the telecom sector. We also believe that the listed best practices may help

companies improve their online self-service environment to better suit the expectations and requirements of their customers. A combination of expert reviews and a usability test has been found to be very viable in composing a list of best practices and validating these with the help of actual customers. The limitations of this research suggest that in further research, expert reviews should be carried out by multiple evaluators and should use a scoring method in which both the negative and positive points influence the score. We also suggest conducting more research into other sectors of online self-service environments to make sure the findings in this research paper aren't solely applicable for the online environments in the telecom sector.

Learnings from this research project

An expert review, when carried out by more than one, experienced reviewer, is a good tool to score a web-based environment, provided the employed tasks and criteria are valid and clearly defined. In this research project, we found that the online self-service environments across three different sectors scored relatively high on overall e-service quality, which implies that the web sites are user-friendly and contribute to a pleasant customer experience. Expert reviews are also a good way to obtain best practices for online self-service environments. A usability test may give interesting qualitative insights and are a way in which the found best practices in the expert reviews can be validated, provided the environments are evaluated by at least five participants. The proposed model, in which e-service quality is related to customer satisfaction and customer satisfaction in turn is related to customer loyalty was also tested. In order to draw any significant conclusions concerning assumed relationships between these different constructs, the selected research method has to employ a fairly large sample size. Usability test results could merely be used as an indication of possible effects, whereas the online

survey was found to be the most suitable research method to test the model. This model proved to be correct for the two selected online self-service environments, consistent with previous findings in other contexts. In short, the lesson that may be learned from this research paper is that e-service quality of online self-service environments has been found to be an antecedent of customer satisfaction and customer loyalty. When designing these self-service environments, take note of the best practices to make sure this e-service quality is as optimal as can be.

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Appendix (I)

#	Task	Service provider	Scorecard (1 = very bad, 5 = very good)					Average Score	
			Navigation / IA	Flow / Task orientation	Trust / Credibility	Control / Feedback	Page Layout / Visual Design		Content / Writing
1	Change contact information	Telecom 3	3	3	4	4	3,5	4,5	3,67
2	Change subscription	Telecom 3	5	5	4	4,5	5	4	4,58
3	Request unlock code (PUK code)	Telecom 3	4	4	5	4,5	5	4,5	4,50
4	View (monthly) usage	Telecom 3	4,5	4,5	5	4,5	4	3,5	4,33
5	View (monthly) invoice	Telecom 3	4,5	4,5	4	4	3,5	4,5	4,17
Average Score		Telecom 3	4,2	4,2	4,4	4,3	4,2	4,2	4,25

#	Task	Service provider	Scorecard (1 = very bad, 5 = very good)					Average Score	
			Navigation / IA	Flow / Task orientation	Trust / Credibility	Control / Feedback	Page Layout / Visual Design		Content / Writing
1	Change contact information	Energy 1	4	4	5	4,5	4,5	5	4,50
2	Change subscription	Energy 1	2,5	3	3,5	2	4,5	4	3,25
3	Change monthly installments	Energy 1	4,5	4,5	4,5	3,5	4,5	4,5	4,33
4	View (monthly) usage	Energy 1	4,5	5	2,5	4,5	4	2,5	3,83
5	View (monthly) invoice	Energy 1	5	5	3,5	3,5	5	3,5	4,25
Average Score		Energy 1	4,1	4,3	3,8	3,6	4,5	3,9	4,03

#	Task	Service provider	Scorecard (1 = very bad, 5 = very good)					Average Score	
			Navigation / IA	Flow / Task orientation	Trust / Credibility	Control / Feedback	Page Layout / Visual Design		Content / Writing
1	Change contact information	Energy 3	4,5	4,5	4	2,5	4	4,5	4,00
2	Change subscription	Energy 3	4,5	4	4	3	4,5	4	4,00
3	Change monthly installments	Energy 3	5	5	3,5	3,5	5	4,5	4,42
4	View (monthly) usage	Energy 3	4,5	4,5	5	5	5	4,5	4,75
5	View (monthly) invoice	Energy 3	5	5	3,5	3,5	5	3,5	4,25
Average Score		Energy 3	4,7	4,6	4	3,5	4,7	4,2	4,28

#	Task	Service provider	Scorecard (1 = very bad, 5 = very good)					Average Score	
			Navigation / IA	Flow / Task orientation	Trust / Credibility	Control / Feedback	Page Layout / Visual Design		Content / Writing
1	Change contact information	Energy 2	4	3,5	4,5	4,5	4	4,5	4,17
2	Change subscription	Energy 2	4	4	4,5	4,5	4	3,5	4,08
3	Change monthly installments	Energy 2	4	4	3,5	3	3,5	3,5	3,58
4	View (monthly) usage	Energy 2	4,5	4,5	3	4,5	4,5	2,5	3,92
5	View (monthly) invoice	Energy 2	5	5	4	4	4,5	3,5	4,33
Average Score		Energy 2	4,3	4,2	3,9	4,1	4,1	3,5	4,02

#	Task	Service provider	Scorecard (1 = very bad, 5 = very good)					Average Score	
			Navigation / IA	Flow / Task orientation	Trust / Credibility	Control / Feedback	Page Layout / Visual Design		Content / Writing
1	Change contact information	Health Insurance 1	4,5	4,5	4	4	4,5	4	4,25
2	Change subscription	Health Insurance 1	4	3,5	5	3,5	5	5	4,33
3	Submit a declaration	Health Insurance 1	3,5	3	5	4,5	5	4,5	4,25
4	View (monthly) usage	Health Insurance 1	3,5	3,5	4,5	5	4,5	4,5	4,25
5	View premium amount	Health Insurance 1	5	5	4,5	5	5	4,5	4,83
Average Score		Health Insurance 1	4,1	3,9	4,6	4,4	4,8	4,5	4,38

#	Task	Service provider	Scorecard (1 = very bad, 5 = very good)					Average Score	
			Navigation / IA	Flow / Task orientation	Trust / Credibility	Control / Feedback	Page Layout / Visual Design		Content / Writing
1	Change contact information	Health Insurance 2	4,5	4,5	5	4,5	5	4	4,58
2	Change subscription	Health Insurance 2	4	3	4,5	3,5	5	4	4,00
3	Submit a declaration	Health Insurance 2	4,5	4,5	5	5	5	4	4,67
4	View (monthly) usage	Health Insurance 2	4,5	4,5	5	5	5	4,5	4,75
5	View premium amount	Health Insurance 2	4,5	5	4,5	5	4,5	4	4,58
Average Score		Health Insurance 2	4,4	4,3	4,8	4,6	4,9	4,1	4,52

#	Task	Service provider	Scorecard (1 = very bad, 5 = very good)					Average Score	
			Navigation / IA	Flow / Task orientation	Trust / Credibility	Control / Feedback	Page Layout / Visual Design		Content / Writing
1	Change contact information	Health Insurance 3	4,5	3	2,5	3	5	2	3,33
2	Change subscription	Health Insurance 3	4,5	2,5	3	3	4,5	3	3,42
3	Submit a declaration	Health Insurance 3	5	4,5	5	4,5	4,5	4,5	4,67
4	View (monthly) usage	Health Insurance 3	4	4,5	4	4	4,5	5	4,33
5	View premium amount	Health Insurance 3	4,5	4,5	5	5	4,5	4	4,58
Average Score		Health Insurance 3	4,5	3,8	3,9	3,9	4,6	3,7	4,07

Appendix (II)

Best practices self-service environments (based on business-oriented tasks)
1. Usage of multiple online help resources, such as a FAQ, forum, social media and online chat
2. The different support options are easily found from the customer service landing page
3. Customer service opening hours and indications of reaction/waiting times are shown
4. Pages with lots of content, such as the FAQ page, are sorted by subject and include a search feature
5. The online chat functionality is often accessible
6. Targeted marketing, for example by showing relevant advertisements when a subscription is about to expire
7. Find a good balance between showing too little and too many advertisements
8. Enable the possibility to easily customize the subscription with additions/modifications
9. Offer an app that allows the customer to access their personal environment on a mobile device
10. Foster customer loyalty by having the customer save points that may be redeemed for a selection of products, gifts and/or trips

