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Usability and relational factors in user-perceived quality of online services

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Abstract. The purpose of this paper is to identify the key determinants of consumer-perceived usability of online service websites and their impact on e-loyalty potential, expressed by customer's willingness to return and to recommend the website to others. In this experimental usability study fifteen video-recorded users performed specific tasks in financial, travel and health online service websites. After completing the tasks users filled in a questionnaire relevant to their perceived experience as to nine main evaluation factors. High correlations (above 0.7) have been found among factors:

- *Visual clarity, Ease of use and User guidance*,
- *Interactivity, User guidance and Information content*,
- *Interactivity, Personalization and Service demo*,
- *Service demo and User guidance*

and statistical significance of differences in user-perceived quality among online service websites have been evaluated.

Keywords: Human-Computer Interaction, online services, e-commerce, usability, User Experience

1. Introduction

The intensive development of information technologies related with economic applications of the Internet has brought about the widespread of e-commerce and online services.

From the point of view of online service providers it is essential and important to identify determinants of consumer-perceived usability of online service websites and factors building the loyalty of consumers expressed by their willingness to return to the e-service and to recommend it to others.

The above issue is an interesting research problem, frequently dealt with in the literature on e-marketing, e-commerce system design and human-computer interaction. Results of empirical research available in this area concern first of all the Internet banking [JuSh01], travel [FIGG06] and e-commerce services [PeMR06].

The procedures of measuring consumer-perceived online service quality have been derived:

- partly from research methods used in the field of human-computer interactions (user interface optimization, investigations of e-business system usability, *User Experience* analysis),
- partly from methods used in e-marketing (questionnaire surveys, analysis of consumer behaviour, relationship management).

The mechanisms of influencing the customer by the use of the Internet communication channel are becoming increasingly complex. Apart from the online service ergonomics, also the impact on customers' emotions, appealing to their psyche, to feeling part of a defined social group and making use of economic factors which shape buying behaviour are considered. At the same time, technologies of information solutions putting e-business objectives into practice are also becoming increasingly complex. They involve not only automatic mechanisms of tracking and analysing customer behaviour in the service website, but also agent systems or artificial intelligence algorithms suggesting offers which refer to former behaviour.

In view of the above, the user-perceived service website quality surveys embrace several methodological groups:

- evaluation of user interface ergonomics and analysis of website usability [Siko12, DFAB04, Niel00],
- analysis of user's impressions and experience [TuAI08],

- measurement of e-customer loyalty [Amir08],
- enhancement of the user's participation in the service design process [ScSt11].

In this paper we deal with the following research questions: what are the relationships between usability factors of on-line services and the customers' willingness to return and recommend the website

Consequently, the objective of the present study was to determine relationships between user-perceived characteristics of online service website usability and the willingness to return and to recommend the website to others. The following issues were also raised:

- the assessment of the structure of factors building up customer-perceived online service quality,
- determination of relationships among usability factors of these websites.

The study was performed on a group of Polish online service users and, in majority, concerned websites of Polish service providers.

Apart from identification of factors building up the user's opinion on the quality of selected online services, the survey was intended to indicate determinants of the website's development potential in the scope of advancement in relations with customers by the use of the Internet communication channels.

2. Methodology of survey and data analysis

The survey was performed on a group of customers already experienced as online service website users. It was assumed that participants of the survey should meet the following criteria:

- be experienced in making use of online banking, travel or health services,
- be experienced in using social networking services.

Overall 87 extramural students of the Faculty of Management and Economics of Gdańsk University of Technology responded to the recruitment questionnaire. Finally, a test group of 15 persons, 9 men and 6 women, who met the above criteria and declared participation in the examination was appointed. Seven persons were under 25 years of age, six were 26–35 and two were 36–45 years old.

Websites were chosen from among those popular in each category of services (i.e. financial, travel or health online services). Moreover, in order to facilitate identification of potential determinants of willingness to establish relationships, in this survey expressed as the declared readiness to use the service website once more, it was assumed that each of the

services would be studied in two variants, selected by an expert method within the framework of an earlier research stage [SDGR12].

Three categories of online services and two services from each category were selected for the study:

1. financial service – two banking websites (*mBank.pl* and *pekao.pl*),
2. travel service – two hotel booking websites (*accorhotels.com* and *booking.com*),
3. health service – two websites of non-public medical facilities (*luxmed.pl* and *swissmed.com.pl*).

The tasks prepared for the users consisted in solving a problem defined generally as a choice of the best offer based on information acquired on the website. For example, the choice of a hotel in a defined location, satisfying pre-set requirements, or finding the most advantageous loan offer for buying a car, supported with a simulation of the size and schedule of loan payments.

Each task required the use of specific website functions by the user, acquisition of appropriate information and, to some extent, economic thinking, directed towards balancing diverse profits and risks perceived as effects of possible acceptance of the offer submitted on a given website.

After having completed each task, the participants were asked to fill in a questionnaire for the measurement of usability and relational factors.

Based on an earlier analysis of factors shaping the perceived website quality and satisfaction of the user, a list of nine main evaluation factors affecting the user experience during and after the use of the service website was compiled. The considered usability factors of web services and their illustrative items were the following:

1. Visual clarity (e.g. clear menu and navigation, clear division of the screen),
2. Ease of use (e.g. low mental and manual effort).
3. User guidance (e.g. immediate display of results).
4. Information content (e.g. reliable and exhaustive descriptions).
5. Interactivity with provider (e.g. diverse forms of contact, prompt reaction).
6. Personalization (e.g. history of activity in the web service).
7. Service demo (e.g. display of the price, possibility to test the service).
8. Recommendations (e.g. making opinions available, possibility of giving recommendations).

9. Customer care (e.g. visible attention to perfectionism and expression of empathy to the customer).

The items were evaluated using a 6-point Likert scale, where 1 is the lowest and 6 the highest rating. Each factor consisted of three items. Coordinates of a given factor were determined by summing up points obtained for constituent items. The scale ranged therefore from 3 to 18 points.

Apart from the evaluation of functional features described above by the nine factors, the participants of the survey were asked about two relational factors which resulted from the use of a given website.

1. The level of *willingness to return* to a given website,
2. The level of *willingness to recommend* the website to a friend.

The items were evaluated using a 6-point Likert scale, where 1 was the lowest and 6 the highest rating. 15 survey respondents have made 90 evaluations of six service websites.

In the process of data collection, there were data missing within scales used to measure usability factors. This occurred in 5 items, 1 lack (1%) and in 2 items, 2 lacks in each (2%). In the whole pool of answers the lack of data constituted 1% (11/2430), which is an acceptable level. The missing data were replaced with an arithmetic mean calculated for a given respondent based on answers to the remaining points of the scale.

The data were analysed by different statistical methods. Reliability of usability factor scales was assessed using Cronbach's alpha coefficient. It was assumed that the acceptable value of the coefficient for each scale would exceed 0,7 [Kaci92, p. 61]. An arithmetic mean was used to evaluate usability and relational factors. Student's t-test for dependent samples was used to compare the differences of the means among the factors. Pearson's linear correlation coefficient was used to find correlations between usability and relational factors, as well as between usability factors. The Bonferroni adjustment was taken into account. The assumed significance level was divided by the number of simultaneous statistical tests, thus enabling the limitation of type I error [Hoch88].

3. Results

3.1. Opinions about online service websites

Structure characteristics

Table 1 summarizes descriptive statistics and reliability of scales for individual usability factors characteristic of online services.

Table 1.

Descriptive statistics and reliability coefficients – general opinions about websites (N = 90)

Factor	<i>M</i>	<i>SD</i>	Me	Min	Max	Skewness	Kurtosis	Reliability
Visual clarity	13,84	2,48	14,00	7,00	18,00	-0,47	-0,22	0,71
Ease of use	13,60	2,81	14,00	5,00	18,00	-0,61	-0,13	0,83
User guidance	13,01	3,36	14,00	4,00	18,00	-0,55	-0,64	0,86
Information content	12,81	3,02	13,00	4,00	18,00	-0,31	-0,47	0,82
Interactivity	13,27	2,93	13,25	5,00	18,00	-0,52	-0,03	0,76
Personalization	12,44	3,16	12,00	3,00	18,00	-0,21	-0,46	0,87
Service demo	11,90	3,39	12,00	3,00	17,00	-0,67	0,19	0,81
Recommendations	8,78	3,99	9,00	3,00	18,00	0,23	-0,65	0,93
Customer care	12,42	3,24	13,00	3,00	18,00	-0,51	0,08	0,82

The results ranged from 3 to 8 points within each factor. Distributions of results for individual factors satisfied the criteria for the normal distribution (skewness and kurtosis from $-1,0$ to $1,0$). The reliability measured with Cronbach alpha was good for individual factors (above $0,7$), the lowest for the *Visual clarity* factor and the highest for *Recommendations*.

Estimates for usability factors and differences between them

Average estimates of individual usability factors are shown in Fig. 1. The assessment of the *Recommendation* factor was the lowest, next was *Service demo* followed by *Customer care*, *Personalization* and *Information content*. *User guidance*, *Interactivity*, *Ease of use* and *Visual clarity* were the highest ranked factors.

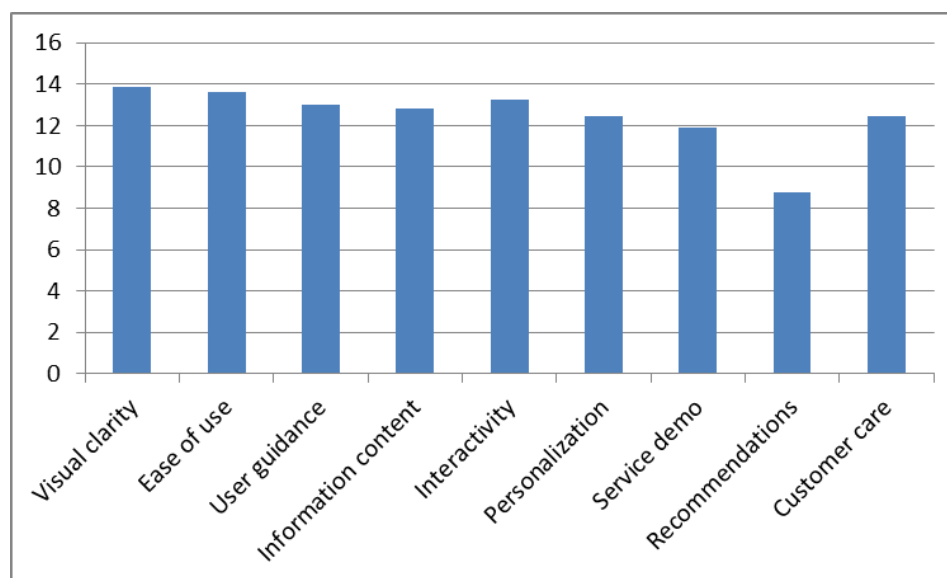


Fig. 1. General estimates of website usability factors

Taking into account the Bonfferoni correction, statistically insignificant differences ($0,05/9 = 0,006$) were found for:

- *Visual clarity* and *Interactivity*,
- *Ease of use* and *User guidance*,
- *User guidance* and *Personalization*,
- *Interactivity* and *Customer care*,
- *Personalization* and *Service demo*.

The above results imply that, first, *Visual clarity* was evaluated significantly higher compared with the majority of factors, apart from *Ease of use* and *Interactivity*. Similarly, *Ease of use* was also ranked significantly higher, except the *User guidance* factor. *Recommendations* and *Service demo* were evaluated significantly lower than other factors, that latter, however, with *Personalization* excluded.

Second, considering the estimates of website quality factors, none of them was ranked at a low level (i.e. in the interval from 3 to 8). Medium estimates (from 8 to 13) were assigned to five factors: *Information content*, *Personalization*, *Service demo*, *Customer care* and *Recommendations*, whereas high estimates (from 13 to 18) to *Visual clarity*, *Ease of use*, *Interactivity* and *User guidance*. *Visual quality* was ranked at the highest level and *Recommendations* at the lowest.

Correlations between usability factors

Pearson's linear correlations between usability factors considered are presented in Table 2.

Table 2.

Correlations between factors – opinions on websites in general
(N = 90)

Factor	1	2	3	4	5	6	7	8	9
1. Visual clarity	1,00								
2. Ease of use	0,75**	1,00							
3. User guidance	0,71**	0,74**	1,00						
4. Information content	0,58*	0,59*	0,61*	1,00					
5. Interactivity	0,58*	0,66*	0,74**	0,71**	1,00				
6. Personalization	0,52*	0,53*	0,67*	0,58*	0,70**	1,00			
7. Service demo	0,56*	0,57*	0,77**	0,59*	0,70**	0,75**	1,00		
8. Recommendations	0,11	0,22	0,31	0,21	0,15	0,22	0,32	1,00	
9. Customer care	0,52*	0,55*	0,64*	0,63*	0,55*	0,57*	0,67*	0,36	1,00

Note: * $p < 0,01$; ** $p < 0,001$ (the Bonferroni correction $0,05/36 = 0,0014$)

High correlations, above 0,7, significant following the Bonfferoni adjustment, were found among the following factors:

- *Visual clarity*, *Ease of use* and *User guidance*,
- *Interactivity*, *User guidance* and *Information content*,

- *Interactivity, Personalization and Service demo,*
- *Service demo and User guidance.*

The above values of correlation factors show that the coefficient of determination calculated for these factors exceeds 0,49.

Weak correlations (up to 0,4) were found between *Recommendations* and the remaining factors, thus evidencing that another aspect of online services is expressed by this factors compared with the other ones.

There are no statistically significant correlations between the following factors:

- *Recommendations and Visual clarity,*
- *Recommendations and Information content,*
- *Recommendations and Interactivity.*

The remaining correlations were moderate in the interval 0,4–0,7.

To sum up, *Visual clarity, Ease of use and User guidance,* next, *Interactivity, User guidance and Information content,* then, *Interactivity, Personalization and Service demo,* as well as *Service demo and User guidance* should be treated as strongly convergent factors, whereas *Recommendation* in relation to *Visual clarity* and *Interactivity* are suggested to be totally uncorrelated factors.

3.2. Willingness to return and to recommend the service versus usability factors

The potential to shape the relationship between the user and web service provider was diagnosed using two relational factors: *Willingness to return* and *Recommendation*. The values of descriptive statistics of these variables are given in table 3. They imply that both variables satisfied the parameters of normal distribution.

Table 3.

Descriptive statistics of relational factors.							
Factor	<i>M</i>	<i>SD</i>	<i>Me</i>	Minimum	Maximum	Skewness	Kurtosis
Willingness to return	4,27	1,38	4,50	1,00	6,00	-0,60	-0,45
Recommendation	4,30	1,41	4,00	1,00	6,00	-0,58	-0,31

According to table 3, the values of the means of both variables are similar. Taking into account the scale range from 1 to 6, the level of this estimate may be regarded as moderate. This reflects a possibility to develop online service websites on account of such features which shape the relationships with users.

Next, correlations between each relational variable and factors characterizing the usability of web services were considered (these so-called functional factors are summarized in table 1). Correlation results are presented in table 4.

Table 4.

Correlation coefficients between usability and relational factors (N=90).

Factor	Willingness to return	Recommendation
Visual clarity	0,68	0,67
Ease of use	0,66	0,63
User guidance	0,76	0,73
Information content	0,68	0,71
Interactivity	0,64	0,62
Personalization	0,56	0,59
Service demo	0,70	0,75
Recommendations	0,37	0,33
Customer care	0,73	0,71

Note: all correlations significant at the level $p < 0,05$, following the Bonferroni correction ($0,05/18 = 0,0027$)

Based on data in table 4 it may be found that *Willingness to return* was correlated:

- strongly (correlations above 0,7) with *User guidance*, *Service demo* and *Customer care*,
- moderately (correlations from 0,4 to 0,7) with *Visual clarity*, *Ease of use*, *Information content*, *Interactivity* and *Personalization*,
- weakly (correlations below 0,4) only with *Recommendations*.

However, the factor *Recommendations* was correlated:

- strongly (correlations above 0,7) with *User guidance*, *Information content*, *Service demo* and *Customer care*,
- moderately (correlations from 0,4 to 0,7) with *Visual clarity*, *Ease of use*, *Interactivity* and *Personalization*,
- weakly (correlations above 0,4) only with the factor *Recommendations*.

In conclusion, correlation coefficients were very similar for both relational variables, usually strong or moderate. These variables reached the assumed level of statistical significance. The weakest correlation was found between the factor *Recommendations* and each of the relational variables (below 0,4).

4. Discussion and Conclusions

As regards the usability factors of service websites considered, the factor *Recommendations* was ranked lowest, whereas *Visual clarity*, *Ease of use*, *User guidance* and *Interactivity* were ranked highest.

Following are the differences in the estimate level of individual factors: *Visual clarity* was evaluated significantly higher than the rest of the factors, apart from *Ease of use* and *Interactivity*. *Ease of use* was also ranked higher, apart from *User guidance*. Significantly lower estimates were found for *Recommendations* and *Service demo*, that latter, however, with exception of *Personalization*.

As regards correlations among the factors, it was found that those between *Visual clarity*, *Ease of use* and *User guidance*, next, *Interactivity*, *User guidance* and *Information content*, then, *Interactivity*, *Personalization* and *Service demo*, as well as *Service demo* and *User guidance* should be treated as strongly convergent factors, whereas *Recommendations* in relation to *Visual clarity* and *Interactivity* are suggested to be totally uncorrelated factors.

The estimates of relational variables of websites, *Willingness to return* and *Recommendations*, were moderate, thus reflecting a possibility of further shaping the service websites by paying special attention to the creation of market relationships. However, correlations between each relational variable and the usability factors were very similar. Each variable was strongly correlated with *User guidance*, *Service demo* and *Customer care*, while the factor *Recommendations* was additionally strongly related with *Information content*. Weak relationships occurred between relational variables and one factor only, i.e. *Recommendations*. Other correlations between relational variables and usability factors were moderate. The relationships revealed reflect a moderate or strong influence of the usability factors of service websites on relationships with users, evidencing a relatively high potential of the development of usability characteristics in relation to the building and maintenance of market relationships.

Limitations in the research conducted concerned, first of all, the following aspects:

- the way of selection and size of the sample,
- the choice of service websites,
- construction of tasks and the way of performing them.

In conclusions, despite of such limitations, the results of the research performed may be found valuable, since our knowledge has been enriched as to:

- usability factors shaping perceived quality of online services in selected categories,
- relational factors shaping perceived quality of online services in selected categories,
- relationships between usability and relational factors in selected categories of services,
- perceived quality of service websites chosen for the survey.

The present study is one of few such experimental surveys of domestic online web services. Arbitrary expert opinions prevail in majority of previous studies. Empirical investigations on online services involving Polish users are scarce and their results are published even more rarely.

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Title and abstract in Polish

Czynniki użytecznościowe i relacyjne w kształtowaniu jakości postrzeganej usług on-line

Streszczenie. Celem niniejszego badania było określenie związków pomiędzy głównymi czynnikami kształtującymi postrzeganą przez klienta jakość postrzeganą usługowych serwisów WWW i ich wpływ na potencjalną lojalność e-klienta, wyrażoną chęcią powrotu i polecenia innym. W tym badaniu doświadczalnym zostało wykonane nagranie video piętnastu użytkowników podczas korzystania usług on-line z finansowych, turystycznych i zdrowotnych. Po wykonaniu zadań przez użytkowników zebrano wypełnione kwestionariusze odnoszące się do postrzeganego do dziewięciu głównych czynników oceny. Wysokie korelacje (powyżej 0,7) zostały stwierdzone dla czynników:

- klarowności wizualna, łatwość obsługi i prowadzenie użytkownika,
- interaktywność, prowadzenie użytkownika i zawartość informacyjna,
- interaktywność, personalizacja i demonstracja usługi,
- demonstracja usługi oraz prowadzenie użytkownika.

Ponadto została oceniona statystyczna istotności różnic w jakości postrzeganej dotyczącej badanych usługowych serwisów WWW.