E-service quality evaluation instruments

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Abstract - Although the World Wide Web is one of most widely used Internet services, little attention is given to its real potential. Apart from its dominant position among the current media of communication, it is increasingly becoming a major marketing and communication channel enabling interaction between the seller and the customer. In order to benefit from advantages of this means of communication, the seller must provide quality electronic service to the customer. Electronic service (e-service) quality plays a significant role in web site evaluation. E-service quality refers to interaction between the seller and a potential customer based on computer and Internet use. The key element in this interaction is the potential customer's experience. E-service quality refers to the degree of perceptual gap between the customer's expectations and a particular web site e-service perception. E-service quality evaluation is based on the customer's perception before, during and after interaction. In this paper existing instruments for e-service quality evaluation are presented, as well as their basic characteristics, methods of development and usage.

I. INTRODUCTION

The huge potential of new technologies, along with the exponential growth of the number of computers used in daily business interactions, is forcing businesses to use all the possibilities of information and telecommunications technologies while interacting with their customers. This is why traditional shopping, where the customer is personally present at the point of sale and directly interacts with the physical salesperson, is increasingly being replaced by online shopping in a virtual store. Using web sites as the communication and sales medium is the principal novelty brought on by trade conducted in the virtual market. The service provided by the business to its users and potential customers, as well as the quality of such service, plays the crucial role in interaction via the Internet. The increase in the number of researches dealing with service quality in online environment indicates that service quality has been recognized as an important factor in determining how successfully a certain company executes its business. Therefore, immense efforts are being made to develop a system which would reliably evaluate the quality of such service.

II. ELECTRONIC SERVICE

Over the last two decades intense research has been made into customer-oriented service and its quality. The customer presents the focal point to businesses, which therefore adapt all their procedures and offer with the customer in mind. An ever greater presence of computers in business operations within a company, as well as their usage by individual customers for their own purposes, has compelled companies to embrace a new method of conducting business and commerce. All the advantages of new technologies, accompanied by certain disadvantages, had to be incorporated into the concept of service quality. Conventional ways of doing business have been expanded to computer- and Internet-aided business, which have increasingly been referred to as electronic commerce, or e-commerce. One of the aspects to be considered in this way of conducting commerce is the service entailed within it. In the field of services, technology is a tool for improving a company's efficiency and effectiveness, as well as for increasing service quality. Although electronic commerce accelerates the business cycle, establishing a relationship with the customer also requires a certain amount of time, just like in conventional commerce. [1] Commercial web sites or online shops are those web sites whose primary aim is to serve as a medium for both the customer and the seller to execute the process of buying or selling, respectively. E-shopping, just like conventional shopping, consists of five basic stages, wherein the main difference between these two types of shopping lies in the choice of media used in information transfer, as well as the way in which the information transfer is carried out. These five stages of shopping are [2]:

1. promotion or initiative;
2. operational activity;
3. transaction closure;
4. goods delivery;
5. payment.

The service provided to the customer during their visit to a commercial web site is referred to as electronic service, or e-service. Conventional service, which can also be defined as interaction between the customer and the conventional company not based on the Internet, with a due emphasis put on the customer's experience in such transactions, has been studied for decades, as well as the quality of such service. Unlike conventional service and its quality, e-service and e-service quality are relatively new concepts in research. This is why there are several mutually different definitions of these concepts, as well as various points of view regarding the domain of their research. The most commonly used definition of e-service is the one according to which e-service is the customer's perception of the service as provided by the web site before, during and after the shopping (interaction) on the web pages of that particular site. E-service opportunities present a new way of meeting the customer's requests.

Currently, there are two tendencies in e-service research. One of them focuses on the interface and the latest generation of categories in self-service technologies, whereas the other tendency applies the existing knowledge of traditional service quality in order to make new insights in e-service. Some authors [3], however, distinguish between three tendencies in e-service research. The first

tendency is to use the existing knowledge of conventional service quality as a starting point in e-service research; the second is based on newly generated categories of self-service and e-service technologies; the third tendency is based on the theory of information systems quality and web quality.

The leading author advocating the first tendency is Parasuraman [5, 6], who has been researching the conventional service quality, applying his findings to the field of e-service. Another important author in the same area of research is Grönroos [4], who has divided the quality of traditional service into its functional aspect (depending on how the service is dispensed) and the technical one (focused on advantages and benefits the user is gaining by opting for a certain service). He suggests that in Internet services the concept of traditional services, consisting of core service, facilitating services and supporting services, needs to be complemented by another, fourth factor—user interface.

Van Riel, on the other hand, representing the second tendency, has added yet another component of e-service. According to Van Riel, Liljander and Jurriëns [4], e-service consists of core service, facilitating services, supporting services, complementary services and user interface. He introduces complementary service, which is to be distinguished from supporting service. According to Van Riel, complementary service does not add value to basic service, whereas supporting service does. In his comparison of the five service components with the aforementioned division into functional and technical services, he perceives core service, supporting service and complementary service as "what the user gains", that is, the technical function of the service, whereas he interprets user interface and facilitating service as "how the service is provided to the user, how it is delivered to the user", that is, the functional service. Likewise, he states that satisfaction with each component of the service is related to the overall satisfaction with that service.

The third tendency has resulted in the development of conceptual web quality models. These models have been developed on the basis of current knowledge of information systems covering various aspects of data quality, information quality, software quality, documentation quality, information system service quality, as well as the quality of information system functioning. Insights into information systems are being complemented by insights into web quality.

In order to develop and put into practice a reliable instrument for measuring e-service quality, it is necessary to begin with a clear definition of the domain such a system is intended to cover. Therefore, it is important not only to define the concept of e-service, but also the quality of such service.

III. E-SERVICE QUALITY

E-service quality needs to be defined in order for all the stages of the customer's interaction with the web site to be encompassed. Thus, it represents the extent to which a web site enables an efficient and expedient choice, purchase and delivery [5], which is why such e-service quality defined in this way does not only offer an opportunity for a company to gain comparative advantage in the virtual market, but it also involves the user/customer to participate in the process of product development and improving relations through immediate feedback [7].

E-service encompasses perception prior to, during and after the purchase at a web site, although the transaction itself does not necessarily imply a purchase. Each person visiting a web site is involved in one of the following three models of behavior [5]:

1. visitor – a person visiting a certain web site, who presently leaves the site without having read in detail the content of the web site, nor has considered the offer presented there;
2. reader – a person taking time to read the content of a web site in detail, studying the content and the offer presented there;
3. customer – a person who, having considered and read the content and offer of a web site in detail, chooses to purchase a product or a service from that web site.

Parasuraman [6] defines service quality as the measure of divergence between the customer's expectation from a service, and their perception of the same service. The concept of e-commerce quality, that is, the concept of e-service quality, can be defined as the customer's overall estimation and judgment regarding the excellence and quality of e-service provided at the particular site. Most authors are endeavoring to build on the existing knowledge of conventional market services in order to define systems for measuring e-service quality.

Research by Jessica Santos [7] from NFO World Group, Wembley, UK, was primarily motivated by the attempt to define factors determining e-service quality and investigate their impact on the customer's attitude. Her research resulted in the conceptual model of e-service quality. This model consists of 11 determining factors which can be grouped in two dimensions: incubation dimension and active dimension.

In defining these dimensions time was used in such a way that the time prior to making the web site fully operational determines the incubation dimension, whereas the time after making the web site fully operational determines the active dimension.

The incubation dimension is defined through the appropriate design of a web site, the ease of access, as well as the user-friendliness and the visual appeal of the web site. The main elements of this dimension are as follows:

the ease of use – defining how the customer can locate the desired web site, as well as how the customer is able to navigate and search within the web site; appearance – defining the appropriate use of color, graphics, images, animations and the size of web pages; linkage – refers to the number and quality of links on the web site; structure and layout – refers to the organization and presentation of content and information within a web site; content – refers to the presentation of information and functions offered at the web site.

The active dimension consists of: reliability – refers to the ability to accurately and concisely deliver the services agreed upon; in addition, this implies keeping the content and information up to date if necessary, dealing with users' queries promptly, the accuracy in online shopping and payment delivery; efficiency – this refers to the speed of downloading content from the web site, search and navigation; support – refers to technical assistance, user guides, and advice available to the user on the web pages; communication – refers to whether the customer receives the necessary information in an intelligible way; security – this determining factor is aimed at reducing the risk during

the process of delivering online services; this primarily refers to the protection of private information and the security of financial transaction; incentive – refers to the efforts on the part of the web site owner to encourage and attract users to search and use their web sites, using any available means to do so.

IV. E-SERVICE QUALITY EVALUATION INSTRUMENTS

Currently, there are several e-service quality evaluation instruments. This chapter describes the most important instruments for measuring e-service quality of a particular web site, their basic characteristics and operational methods, followed by their comparative analysis.

A. eTail Instrument

Wofinbarger and Gilly [10] have studied defining and measuring etailing quality. They have developed an instrument they named eTailQ, consisting of 14 elements. These elements are distributed into the following four groups: website design, customer service, fulfillment/reliability and security/privacy. In order to develop this instrument it was necessary to ascertain whether it is possible to predict etailing quality by means of the aforementioned groups. Thus, fulfillment/reliability and website design are the best predictors of etailing quality, customer service seems to have a medium impact on etailing quality, whereas security/privacy does not significantly affect predicting the quality of etailing, with the exception of customers who regularly engage in online shopping.

B. PIRQUAL Instrument

Francis and White [12] have developed a scale for measuring Perceived Etailing Quality. This scale has been named PIRQUAL, and it consists of 6 dimensions: web store functionality, product attribute description, ownership conditions, delivery, customer service and security.

C. SiteQual Instruments

There are two instruments named SiteQual, both of them dealing with the same field of research.
In their paper on SiteQual instrument, Harold W. Webb and Linda A. Webb [13] identify the chief motivation in the fact that it is necessary to determine the minimum and desired levels for various service and information quality components in order to demonstrate how customers' expectations can serve as the main indicator to be used in designing and improving a web site, that is, a business-to-consumer (B2C) web site. According to them, the starting point should be the service quality model and information quality model. On the basis of both of these models, factors have been singled out which affect the customers' expectations and their perception of B2C web site quality. This model's analysis, consisting of service quality factor and information quality factor has yielded in determining four minimum factors and seven desirable factors influencing the web site quality. The four minimum factors are: reliability, assured empathy, perceived usability and reliability. The seven desirable factors are: reliability, assured empathy, tangibility, navigability, relevant representational quality, accuracy and security.
Naveen Donthu Boonghee Yoo [14] conducted a research on the quality of web sites providing online service. This research has resulted in the instrument named SITEQUAL by its authors. SITEQUAL consists of nine elements divided into four dimensions, and is intended for evaluating web site quality. It is also used for determining ways in which web site quality affects the behavior of the site's visitors.
This instrument consists of the following dimensions:
ease of use – refers to the ease of carrying out searches on a web site, as well as the suitability of a particular web site;
aesthetic design – refers to the ways in which colors, images etc. are used, along with the overall creativity;
processing speed – refers to the speed of access to a web site and the ease of obtaining the desired results and
security – refers to the customer's attitude related to whether a particular web site is secure to use.

D. WebQual Instruments

The following two instruments carrying the same name are WebQual instruments.
In 2000, Loiacono, Watson and Goodhue [15] developed an instrument they named WebQual. This instrument consists of twelve basic dimensions:
1. fit-to-task information – refers to the fact that information available at a web site needs to be accurate, true and detailed enough, so as to assist the user while carrying out tasks related to that web site;
2. interaction – refers to the option for the user/customer to communicate with the web site in order to receive information or service from the web site itself;
3. trust – refers not only to security and privacy of information available at the web pages of a certain web site, but also to information which the user/customer provides to the web site;
4. response time – refers to time the user needs to download the web content onto their computer and achieve interaction;
5. design appeal – refers to the extent to which the web site design is appealing to the user, which encompasses both the aesthetic design and the navigational system of that web site;
6. intuitiveness – refers to how easy it is for the user to master the usage of a particular web site;
7. visual appeal – there are two components affecting the visual appeal – mood and complexity; mood refers to the stimulation of all customer's feelings in order to compel him to make a purchase; the usage of colors, text and graphics plays the major role here;
8. innovativeness – refers to the extent to which a web site is unique and creative;
9. flow-emotional appeal – Hoffman [15] defines flow in an online environment as a state induced by network navigation, characterized by responding to interactivity between the user and the computer; it produces a feeling of complex enjoyment, comparable to loss of consciousness, and is capable of self-amplification. This state actually refers to the state of the user browsing through a certain web site. In order for this state to become amplified, a balance between the user's ability to use that web site and challenges implied in using the web site needs to be maintained;

10. integrated communication – refers to the fact that promotional activity in a single medium is not as effective as promotion in several media (such as the Internet, television, radio);
11. business processes – before making their web site fully operational, a company needs to determine how it will fit in with the company's business activity, and which segment of business processes will be available online, and to which extent.
12. viable substitute – refers to the fact that a web site needs to be a replacement for physical contact between the user and the company, at least in some areas.

The authors were going to introduce yet another dimension – customer service. However, since this concept is also related to offline communication, this dimension was eventually excluded from WebQual instrument. This WebQual questionnaire consists of 36 questions ensuring the measurement of the aforementioned 12 dimensions.

Stuart J. Barnes and Richard Vidgen [8] developed another instrument which they also named WebQual, based on researching and studying the voice of customer and quality function deployment. This instrument encompasses the evaluation of e-business, its basic parameter being web site service quality. Quality function deployment is a structured and disciplined process involving the identification of the voice of customer, and is used for developing and implementing a product or a service. Apart from quality function deployment, the authors have also included a producer's perspective on quality while developing this instrument, and have devised product-based quality, including such factors as product price and pressure caused by competition. The instrument was initially focused on the quality of information provided by a certain web site, although the authors point out that a web site can also be interpreted as a service provider, so service quality must be included into research. Through further research and expansion of WebQual instrument, it has become an instrument for evaluating the customer's perception of e-business web site quality. Its latest version, WebQual 4.0, consists of 22 questions distributed into three groups: usability, information quality and service quality. By distributing questions into these three groups, a profile of an individual web site can be devised, to be used in comparing that web site with others [16]. The instrument developed by the aforementioned authors was renamed into eQual instrument in 2005.

E. E-S QUAL Instrument

Parasuraman, Zeithhaml and Malhotra [5] have studied the quality of e-service delivered by a web site. The aim of their research was to develop an instrument for measuring e-service quality of those web sites where users engage in online shopping of material products.

The authors start by defining 121 attributes grouped into eleven e-quality dimensions:

1. reliability – refers to proper technical functioning of a web site, as well as the accuracy of the procured service, prices and product information.
2. responsiveness – refers to a prompt feedback to customer's requests and provision of help in case of a problem or a query;
3. access – refers to the ability of fast access to the web site, or the business itself when necessary;
4. flexibility – refers to the ability of selecting the desired method of payment, delivery, purchase, ordering and returning the goods;
5. ease of navigation – refers to the fact that a web site provides the user with functions allowing him to find the desired product or service; well-organized search enables the user to easily navigate across the web site;
6. efficiency – refers to the ease of use of a certain web site; a web site should be well-structured, requiring a minimum number of data to be entered by the user;
7. assurance/trust – refers to trust felt by the user while dealing with a web site; this trust is based on the web-site's reputation, including the quality of goods sold there and the truthfulness of the information presented;
8. security/privacy – refers to how convinced the user is that a web site is well-protected from all kinds of attacks, and how well private information is protected;
9. price knowledge – refers whether the user can determine the delivery cost and the total price, and to which extent, and whether it is possible to compare the prices during the process of purchase;
10. site aesthetics – refers to the appearance of a web site, and
11. customization/personalization – refers to the extent to which a web site can satisfy the user and adapt to various demands, preferences and shopping habits of the user.

On the basis of the 121 attributes, two differently scaled questionnaires were created. One of them is the so-called Likert scale, and the other is based on selecting low/high performance anchors. Two groups of students at major universities in the east of USA were used as a sample for the authors to show how users react to two different types of scales, in order to eliminate the surplus of attributes, and thus provide the authors with feedback on defined elements of the questionnaires. Upon analyzing the data, two different questionnaires were made. The first questionnaire/scale is named E-S-QUAL, consisting of 22 items grouped into four dimensions: efficiency – refers to ease of use and the speed of access to a web site; fulfillment – refers to the extent to which a web site fulfills its promises related to delivery and availability of specific products; system availability – refers to proper technical functioning of a web site, and privacy – refers to the level of a web site's security and user-related information protection.

The second questionnaire/scale refers to the quality of recovery service. This questionnaire, E-RecS-QUAL, consists of 11 items grouped into three dimensions: responsiveness; compensation, and contact.

F. A comparison between systems for measuring e-service quality

Systems for evaluation of e-service quality may differ according to: focus of activity; methodology used in developing the questionnaire, and methodology used in evaluation.

Each system for evaluation of e-service quality is based on the evaluation of the experience the customer acquires during the process of online shopping. That experience encompasses a number of activities, ranging from search for information, product evaluation, decision making, order, delivery and a possible return of goods. However, most systems focus solely on the customer's interaction with the web site, whilst ignoring the importance of interaction with the web site upon completing the purchase

(successful delivery of goods, return of goods, meeting the customer's expectations). Table 1 shows that, of all the observed systems, only eTail, PIRQUAL and E-S-Qual focus on the customer's overall experience. Additionally, the customer service dimension included in eTail fully anticipates the customer's interaction upon completing the purchase. PIRQUAL also includes customer service, whereas E-S-Qual has not included the component of interaction upon completing the purchase in its questionnaire, although its authors have provided another system, E-RecS-QUAL, which is only used in those cases when a problem arises upon completing the purchase. All other observed systems focus solely on interaction with a particular web site through its interface, and thus concentrate on website design, ease of use and security.

Another important feature of each system is the way evaluation questionnaires are designed. The standard method entails two stages – during the first phase the existing literature is researched, and during the second phase questionnaires are actually designed. eTail, eQual, WebQual and E-S-QUAL systems vary from the standard method. During the development of eTail system, another phase has been included between the research phase (gathering data related to attributes crucial for e-service quality) and the actual phase of questionnaire design. This new phase was called structured conceptualization, and it defines dimensions of the attributes affecting the evaluation of quality. Such dimensions were defined according to how consumers themselves conceptualize the relationship between attributes of etailing and higher level construct, which enhances conceptualization. WebQual, later renamed into eQual, is a system developed by means of quality function deployment. The argument in favor of designing this system is that it was based on workshops consisting of three stages: establishing a single issue for discussion, collecting quality requirements and using affinity grouping to gather requirements into categories that make sense to the customer. One argument against this method is that only students participated in such workshops. Students are not sufficiently experienced in online shopping, they are neither familiar with particular businesses behind particular web sites and nor with products offered on these web sites. Therefore, their evaluation is not as reliable as that of a more experienced customer. Their evaluation is based merely on their theoretical knowledge of this subject.

Through this method of designing questionnaires, voice of customer is integrated into each stage of development and implementation of products and services. In WebQual, after the stage of literature research, another stage follows – where experienced judges decide which attributes will be used in the questionnaire. However, these judges are actually just experienced web users, that is, students.

E-S-QUAL is aimed at coordinating all the criteria vital for defining e-service quality. In order for this to be accomplished, the means-end chain approach has been taken. The first component of this chain are cues representing technical and designer aspects which affect e-service quality evaluation. These cues generate perceptual attributes. Whereas cues precede the evaluation process, the evaluation itself eventually results in higher-order abstraction.

At this point, the issue should be raised again of how competent the students are to evaluate a particular web site and the attributes vital for e-service quality.

Each of the observed systems has its advantages and disadvantages that make them unique. eTail system differs from all others by its different methodology used while designing questionnaires. However, its drawback is that the authors used students to sort and categorize attributes. Although this system covers the entire shopping process, the validity of evaluation results is undermined by the interval scale used for recording the level of agreement or disagreement with a particular statement. Major advantages of PIRQUAL system include the following: its focus on the overall process of online shopping, the usage of structured open-response interviews for defining the initial attributes while designing evaluation questionnaires, and the possibility of evaluating service quality during online purchase of products (both material and electronic) and services. A drawback of this system is again the application of the interval scale. SITEQUAL™ system, apart from drawbacks inherent in the aforementioned systems, has a number of items to be evaluated by the respondent. In addition, it is strictly focused on B2C web sites.

TABLE I
INSTRUMENTS CHARACTERISTICS

Characteristics	E-service Quality Evaluation Instruments						
	eTail	PIRQAUL	SITEQUAL™ (Web & Web)	SITEQUAL (Donthu & Yoo)	WebQual/ eQual	WebQual	E-S-QUAL
Questionnaire design methodology	Structured conceptualization	Explanatory interviews	Adapting 21 service quality items	Consumer's own descriptions	Quality function deployment	Experienced judges	Means-end theoretical foundation
Evaluation method	Likert scale (1-7)	Likert scale (1-7)	Likert scale (1-9)	Likert scale (1-5)	scale (1-5)	Likert scale (1-7)	Likert scale (1-7)
Number of elements in questionnaire	14	23	43	9	24	36	22
Focus	Overall online shopping experience	Overall shopping experience	Web interface	Website interface	Website interface	Website interface	Overall online shopping experience

SITEQUAL (Boonghee and Donthu) is a universal scale for evaluating service quality during online purchase of products or services, but it is focused on the web interface only, contains a limited number of evaluation elements and uses the interval scale for evaluation.
Although the methodology for designing questionnaires presents a major advantage of eQual system, the validity of this system is undermined by the participation of students in the process of designing the questionnaire. Another drawback is the fact that, owing to the usage of the interval scale, results tend to be fairly subjective. WebQual system does not encompass customer service, which means that it focuses on web interface only. Here again the whole system relies on evaluation done by students (the authors were led by students' opinions while designing the questionnaire) and the interval scale is used for evaluation. E-S-QUAL system encompasses the entire process of online shopping but, in spite of the new methodology used in designing the questionnaire, its major drawback is the subjectivity of evaluation due to the usage of the interval scale. Namely, using the interval scale implies that quality evaluation will depend on respondents' subjective perception, as well as their preferences and requirements.

V. CONCLUSION

Based on e-service quality evaluation conducted by means of an appropriate evaluation system, it is possible to both enhance and enrich the online service provided by a certain business. The observed systems for evaluation of e-service quality use the interval scale on which the level of respondent's agreement or disagreement with a particular statement from the questionnaire is recorded. The major drawback of this evaluation method is the subjective nature of the respondent's perception. Since, as a result, evaluation depends on the subjective perception delivered by respondents evaluating their experience in the process of their online communication with a certain business, in future research attempts should be made toward finding a solution to this problem.

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