정부기관이 제공하는 인터넷 서비스의
고객 만족도 측정 및 평가

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Public Internet Service and Customer Satisfaction with a Focus on Public Agencies in Korea

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Abstract

Internet development requires the evaluation of secure Internet service quality. This study evaluated public Internet service quality categories and items based on the eQual program developed by Barnes & Vidgen (2006). Using a questionnaire designed to test Internet service qualities for public websites designed by The Knowledge and Information Resources Management Project, we examined 707 users and then measured the effects of service quality factors on customer satisfaction. In conclusion, we found that information quality, usability, and service interaction had a positive effect on customer satisfaction.

1. Introduction

Access to a large amount of information and products is possible due to the rapid growth of the Internet. Also, the Internet can yield up-to-date information and provide access to databases which contain further information (Hamel & Smapler, 1998; Teo & Choo, 2001).

The development of the Internet also changes the methods of customer communication. In other words, it changes the interactions with customers into on-line communications and interactions rather than in person or phone interactions. Many organizations provide information, products, and services to internet customers (Ranganathan & Ganathy, 2002).

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Aspect of the change don't incline to in certain fields but, it makes good effect in all fields. Societal change typically first occurs in the public sector. The United States and other nations began providing online government services in the 1980s (NIA, 2008).

In other words, Through the use of websites, information and communication technologies have brought about changes in the form and method of public service. For this reason, the government offered services beyond the fragmentary forms and hopes to improve confidence and responsibility and to reduce costs. This achievement has influenced people and commerce, while website technology seems to improve at a relentless, accelerating pace. Because of recent developments and changes, businesses and customers hope that Internet services will be delivered equally to both the public and gov-

ernment in the future (UN, 2008).

Yet with all of these expectations, the study of on-line consumer service is very active. However, there seem to be relatively few studies about website service quality in the public sector. Parasuraman et al. (1985) claimed that it is difficult to evaluate service quality because it tends to concentrate on the customer more than on product quality. Also, service evaluation should not be tested not individually, but within the whole delivery process. Public service quality should therefore be evaluated within the website service delivery process.

Many methods for service quality evaluation have been developed over the past half century. But too many on-line service quality evaluation methods use off-line methods, such as SERVQUAL. Moreover, in most cases, service quality has been evaluated using a success factor or method which is based on the information system that is attempting to be evaluated (Aladwani & Palvia, 2002).

In order to address these issues, in this study, the website tested was that of a Korean public agency and was a site relating to a knowledge and information offer. The eQual program (Barnes & Vidgen, 2006) was used to assess the web service and to understand the societal influence of the website.

2. The Knowledge and Information Resources Project of the Korean Government

Worldwide, the importance of knowledge and information resources has been recognized as a resource of great worth, and these resources have typically been administered by each individual nation. In 1999, the European Union launched an ambitious program, 'eEurope,' to manage the changes caused by digital technology development. 'eEurope' aimed to provide information that was accessible to all European nations. Also, the European Union is working to combine 'eContent' to the current sys-

tem, which would include the ability to use and manage information from various the public fields (EU, 2003).

In the United States, the NDIIPP (National Digital Information Infrastructure and Preservation Program) has been enacted for digital information protection and management because most governmental documents and information is digitized. Before the NDIIPP was made into law, much information for public agency preservation was lost. There was no method to protect from the damage and loss of digital information. The NDIIPP has been chosen to solve these problems. In other words, the NDIIPP aims to promote and preserve digital contents over a long period of time and to protect this data from being damaged and lost (Hyuckbin et al., 2009).

In accordance with global trends, the Korean government launched a program called the Information Technology New Deal in 1999 and established a law called The Knowledge and Information Resources Management Law in 2000. Since this program and law were enacted, it has been difficult to manage resources because knowledge and information resources are scattered all over the nation. The Knowledge and Information Resources Management Project was implemented as a government-led national project which ranked resources according to value, which was defined by usefulness and worth of preservation. Knowledge and information resources are defined as 'It is worth preserving and using in national and digitalized data about the cultural or scientific technology and acknowledged to digitalizing necessity of it' and are classified as scientific technology, scientific education, culture, history, administration, and so on. After digitalization and construction, the knowledge and information resources are provided to the people through the National Knowledge Portal (www.knowledge.go.kr), which connects with the resources managed by public agencies. The performance of The Knowledge Information Resources Project is shown in Table 1 (NIA, 2008).

<Table 1> Digitalization status of knowledge and information resources

Year	'99	'00	'01	'02	'03
Budget	421	396	265	247	427
Digitization	5	5	80	10	90
Year	'04	'05	'06	'07	Tot.
Budget	423	560	365	197	3,301
Digitization	30	30	20	20	290

The Knowledge and Information Resource project has been recognized as a major resource of the nation by various sectors of society. What is impressive about the performance of this project is its diffuseness of resource digitization, revitalization of resources, and so on. In spite of this performance, it is difficult to measure the qualitative performance, an inability which has had negative effects on future plans and improvements (Kado, 2008).

Considering the situation about the public sector, on-line services, and lack of qualitative evaluation, we attempted to understand customer needs through the measurement of web service quality.

3. eQual(previously called WebQual)

One of the most largely used on-line service quality systems is eQual (previously called Web-Qual), developed in U.K., with features complementary to those of Parasuraman et al.'s (1985) ServQual for on-line service quality measurement.

WebQual was invented and developed by Barnes and Vidgen as a result of a workshop and literature review on web quality, web site evaluation, and IS quality. WebQual (Version 1.0) consisted of 24 questionnaires considering a U.K. Business school website with respect to web service quality based on 'ease of use, experience, information, communication and integration' (Barnes & Vidgen, 2000).

The application of WebQual 1.0 to websites was one of the most overlooked characteristics of the service interaction. In WebQual 2.0, Barns & Vidgen(2001a) included service interaction in the service quality categories, because interaction quality is important in the success of e-businesses. Also, WebQual 2.0 accepted the ServQual method through the comparative analysis of items. Selected items are used to evaluate online bookstores (Barnes & Vidgen, 2001a).

From the results of WebQual 1.0 and 2.0, the influences of information quality and interaction quality were identified. Moreover, both quality categories were related to IS success and technical factors of websites. WebQual 3.0 compensated for these issues by including an integrated view of website quality, including 'web information quality,' 'web interaction quality,' and 'site design quality.' Using a 27 item questionnaire designed to assess web services, the action sites examined three web sites, eBay, Amazon, and QXL(Barnes & Vidgen, 2002).

Through this development process, three dimensions of web service were drawn from WebQual 3.0. Based on results of version 3.0, 'usability, information quality, and service interaction' were included in version 4.0, in which a total of 22 items were drawn from literature reviews to be used for measurements.

WebQual 4.0 evaluated customer perceptions about service quality in e-commerce fields using an on-line service evaluation measurement that ensured quality measurement reliability and validity from various websites. We concluded that this was a positive input in the development of quality categories and items through various literature reviews and workshops.

Recently, others have applied eQual to measure the public web service quality of a UK Inland Revenue website (Barne & Vidgen, 2006). Despite the developments in eQual, a problem remains with its application to public websites because it was developed originally for e-businesses. Thus, to apply

this system to a public website, it was necessary to improve and adjust the existing criteria.

4. Research Methodology

It is true that eQual is difficult to apply to the e-government web service (Barnes & Vidgen, 2006). Therefore, it was necessary to adjust the assessment factors for application to e-government service.

Based on this desired change, we held a workshop for public and service experts, including representatives of The Knowledge and Information Resources Management Project. The eQual questionnaire is shown in Table 2.

Some items similar in character were combined into comprehensive items. The results of the adjustments are shown in Table 3.

5. Research Design

5.1 Research Model and Hypothesis

We identified items that are required to measure public website service quality using eQual and a panel of experts. We evaluated public agency websites for service quality level and service quality effect on customer satisfaction using these chosen items. For this study, the research model is composed of independent and dependent variables as shown in Fig. 1. The independent variables are usability, information quality, and service interaction. The dependent variable is the overall satisfaction of customers.

eQual, developed by Barnes & Vidgen (2002 & 2006), was used to measure web service quality and customer satisfaction. Based on this research model, we formed the following hypothesis.

H: Usability, information quality, and service interaction have a positive influence on customer satisfaction.

<Table 2> eQual Questions

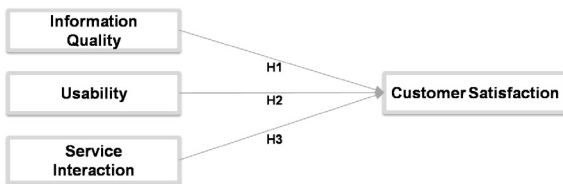| Category	Questions
Usability	1. I find the site easy to operate 2. My interaction with the site is clear and understandable 3. I find the site easy to navigate 4. I find the site easy to use 5. The site has an attractive appearance 6. The design is appropriate to the type of site 7. The site conveys a sense of competency 8. The site creates a positive experience for me
Information Quality	9. Provides accurate information 10. Provides believable information 11. Provides timely information 12. Provides relevant information 13. Provides easy to understand information 14. Provides information at the right level of detail 15. Presents the information in an appropriate format
Service Interaction	16. Has a good reputation 17. It feels safe to complete transactions 18. My personal information feels secure 19. Creates a sense of personalization 20. Conveys a sense of community 21. Makes it easy to communicate with the organization 22. I feel confident that goods/services will be delivered as promised

<Table 3> Result of item adjustments

Category	Questions
Usability	1. The site provides various access devices or routes 2. The site provides fast navigation 3. Provides various search methods 4. The site has a useful interface
Information Quality	5. Provides relevant information 6. I'm confident of the information content 7. Provides rare information content 8. Information is appropriate to the user's business and purpose 9. Provides information at the right level of content
Service Interaction	10. The site provides help to solve problems and questions 11. Makes it easy to give feedback

The overall hypothesis is divided into three sub-hypotheses, and eQual is divided into three service quality categories.

The sub-hypotheses are defined as:

H1: The usability of eQual will have a positive effect on customer satisfaction.

H2: The information quality of eQual will have a positive effect on customer satisfaction.

H3: The service interaction of eQual will have a positive effect on customer satisfaction.

<Figure 1> Research Model

5.2 Data Collection

This study targeted agencies that had been provided information and knowledge through the Knowledge and Information Resources Management Project. For this study, we conducted a questionnaire survey of customers from a total of 71 public agencies. Responses are summarized in Table 4.

<Table 4> Survey Response Summary

Category		Frequency	Percent
Gender	Male	437	61.8
	Female	270	38.2
Age	Under 20	11	1.6
	20 - 29	221	31.3
	30 - 40	274	38.8
	40 - 49	151	21.4
	50 - 59	39	5.5
	Over 60	11	1.6
Period of use	Under 6Mon.	281	39.7
	6M - 1Yr.	155	21.9
	1Yr.- 3Yrs.	181	25.6
	Over 3Yrs.	90	12.7
Purpose of use	Study	131	18.5
	Job-related	309	43.7
	Personal	242	34.2
	Hobbies	25	3.5

6. Results

6.1 Factor Analysis

There is difficulty that would use to Validity Analysis which only tried to use this analysis as identifiable method of data. It is possible that the result of the analysis will be identical results about using of same measurement and data. It should be recognized that the validity analysis use to judge about eternity with research purpose. This study used a Construct Validity of general validity method.

As shown in Table 5, questionnaires are divided according to each service quality category. Also, the results show that the factor loading values are high, indicating that the measurement variables are valid with respect to the concepts.

<div style="text-align:center"><Table 5> Factor analysis</div>

Category		Frequency		
		1	2	3
Usability	Q1	0.616	0.160	0.208
	Q2	0.630	0.417	0.327
	Q3	0.616	0.485	0.277
	Q4	0.515	0.417	0.479
Information Quality	Q5	0.314	0.799	0.271
	Q6	0.207	0.784	0.205
	Q7	0.154	0.779	0.233
	Q8	0.314	0.774	0.165
	Q9	0.257	0.637	0.410
Service Interaction	Q10	0.277	0.231	0.836
	Q11	0.235	0.263	0.833

Extraction Method: Principal component analysis
Rotation Method: Varimax with Kaiser normalization

6.2 Internal consistency and reliability

We used an internal consistency and reliability method, which is the most used reliability method in research. Results of the internal consistency and reliability analysis are shown in Table 6. Each service quality category has a high reliability, with Cronbach's Alpha values greater than 0.8

<div style="text-align:center"><Table 6> Internal consistency and reliability</div>

Category	Item	Cronbach's Alpha	Alpha with Standardization
Usability	4	0.84	0.84
Infomation Quality	5	0.89	0.89
Service Interaction	2	0.82	0.82

The results indicate that the variables have a high degree of reliability with respect to the study measurements.

6.3 Multiple Regression Analysis & Hypotheses Testing

We used a multiple regression analysis to test the hypotheses. Multiple regression analysis is a statistical analysis of the relationship between one dependent variable and two independent variables. The results of multiple regression analysis are shown in Tables 7, 8, and 9.

The correlation coefficient R^2 was 0.688, which indicates that the tendency of the service quality categories increases positively with customer satisfaction. It explains 68.8% of overall customer satisfaction through the changes in the service categories.

<div style="text-align:center"><Table 7> Model Summary</div>

R	R^2	Adj R^2	Std. Error
0.83	0.69	0.69	0.49

Predictors: (Constant), Usability, Information Quality, Service Interaction
Dependent Variable: Overall Satisfaction

According to Table 8, the significance level of the overall regression has significance value of 0.000, which is less than the significance level of 0.01. Therefore, it can be concluded that the research model is statistically significant.

<div style="text-align:center"><Table 8> ANOVA</div>

	Sum of squares	df	Mean Square	F	Sig.
Regression	371.15	3	123.72	512.72	0.000
Residual	168.64	703	.240		
Total	539.79	706			

Predictors: (Constant), Usability, Information Quality, Service Interaction
Dependent Variable: Overall Satisfaction

Also, service quality categories and customer satisfaction can be characterized according to statistical regression. Table 9 indicates how the service

quality categories affect customer satisfaction.

<Table 9> Coefficients

	β	Std. Err.	Beta	t	Sig.
Constant	3.774	0.018		204.87	0.000
Usability	0.358	0.018	0.410	19.427	0.000
Information Quality	0.546	0.018	0.624	29.622	0.000
Service Interaction	0.312	0.018	0.360	17.097	0.000

All of the service quality categories have a significance value of 0.000. The t-values indicate that service quality has a strong influence on customer satisfaction. The t-value for information quality is 29.622, higher than that of any other service quality category. This indicates that information quality has a stronger effect on customer satisfaction than do the other service quality categories.

Also, usability (t=19.427) has a higher t-value than service interaction (t=17.097), indicating that, although service interaction is an important concept of web service, it has less influence on customer satisfaction than does usability.

The following equation was used for regression analysis: = 3.774 + 0.546 X1 + 0.358 X2 + 0.315 X3(1)

Y is customer satisfaction, X1 is information quality, X2 is usability, and X3 is service interaction.

Based on the above results, it was concluded that all web service quality categories in the eQual have a positive effect on customer satisfaction.

7. Discussion

The results from this study indicate that on-line service quality categories do affect customer satisfaction, and that a public website must provide a service that adheres to the intended purpose of the website.

However, there are several limitations that are summarized below.

First, a detailed measurement of the service variables is required. Web service measurement of public websites is based on eQual, but this system does not take into account items of e-business characters. We adjusted the public web service and supplemented several suitable items. The original 23 items of eQual are reduced to 11 items through this process. This process is limited with regard to detailed measurement. Furthermore, this study investigated overall customer satisfaction in public websites and has a limited ability with respect to the detailed analysis of customer satisfaction.

This study was also limited with respect to the scope of the web services studied. This study investigated a public website that provided knowledge and information resources. To apply the results more generally, more studies in more fields should be conducted.

There are a number of studies about public web services, all of which include a number of limitaions. Because public on-line service has a vast range, it can significantly affect many people. We expect that this study will contribute to public web service development.

8. Conclusion

In this study, we measured the on-line service quality of public agencies in South Korea using Barnes & Vidgen's (2006) eQual Instrument. eQual was developed to assess the on-line service quality of public websites. The results showed that on-line service quality has a positive effect on customer satisfaction. Also, we concluded that information quality has a stronger effect on customers than do other service quality categories.

Usability has a weaker effect on customer satisfaction than does information quality, but there is a positive relationship between usability and customer satisfaction. We expect not to be able to recognize the differences between public websites and government websites. The results of the usability effect are included in the perception that people experienced in other websites.

Also, service interaction was shown to have a weaker effect on customer satisfaction than those of the other service quality categories. However, there is a positive relationship between service interaction and customer satisfaction. Therefore, the effect of service interaction should not to be ignored.

In conclusion, in order to assure customer satisfaction, websites must meet the expected service criteria. The goals of website customers are similar to those of the website provider. Users are trying to locate knowledge and information resources, while providers aim to provide knowledge and information resources. When all parties have a shared purpose, website quality service can bring about the largest effect.

References

[1] Aladwani, A. M. & Palvia, P. C. (2002), "Developing and Validating an Instrument for Measuring User-Perceived Web Quality," *Information and Management*, Vol. 39, No. 6, pp. 467-476.

[2] Barnes, S. J. & Vidgen, R. T. (2000), "An exploration of Web site Quality," In Proceedings of the Eighth European Conference on Information Systems, Vienna, pp. 3-5. July.

[3] Barnes, S. J. & Vidgen, R. T. (2001a), "An Evaluation of Cyber-Bookshops: The WebQual Method," *International Journal of Electronic Commerce*, Vol. 6, No. 1, pp. 11-30.

[4] Barnes, S. J. & Vidgen, R. T. (2001b), "Assessing the quality of Acution Web Site," 34th Hawaii International Conferenceon System Sciences.

[5] Barnes, S. J. & Vidgen, R. T. (2002), "Intergrative Approach To The Assessment of E-Commerce Quality," *Journal of Electronic Commerce Research*, Vol. 3, No. 3, pp. 114-127.

[6] Barnes, S. J. & Vidgen, R. T. (2006), "Data triangulation and web quality metrics: A case study in e-government," *Information and Management*, Vol. 43, No. 6, pp. 767-777.

[7] Chen, L., Soliman, K. S., Mao, E., Frolick, M. N. (2000), "Measuring user satisfaction with data warehouses: an exploratory study," *Information and Management*, Vol. 37, No. 3, pp. 103-110.

[8] Delone, W. H. & Mclean, E. R. (1992), "Information systems success: the quest for the dependent variable," *Information systems Research*, Vol. 3, No. 1, pp. 60-95.

[9] European Commission(2003), *Towards a Knowledge-based Europe: The European Union and the information society*, EC, Brussels.

[10] Hamel, G. & Sampler, J. (1998), "E-corporation; more than just Web-based, it's building a new industry order," *Fortune*, pp. 52-63.

[11] Hyuckbin, K., Theresa, A. P., Brian, B. G. (2009), "Interorganizational collaboration and community building for the preservation of state government digital information: Lessons from NDIIPP state partnership initiative," *Government Information Quarterly*, Vol. 26, No. 1, pp. 186-192.

[12] Korea Agency For Digital Opportunity & Promotion (2006), *A Study on the effectiveness of Knowledge &Information Resource Management Initiatives with respect to long term strategic plan*, KADO, Seoul.

[13] Korea Agency For Digital Opportunity &Promotion (2007), *A Study of National Knowledge Management Index Development*, KADO, Seoul.

[14] National Information Society Agency(2008), *Informatization White Paper*, NIA, Seoul.

[15] Parasuramna, A., Zeithaml, V. A., Berry, L. L. (1985), "A Conceptual Model of Service Quality and Its Implications for Future Research," *Journal of Marketing*, Vol. 49, No. 4, pp. 41-50.

[16] Ranganathan, C. & Ganapathy, S. (2002), "Key dimensions of business-to-consumer web sites," *Information and Management*, Vol. 39, No. 6, pp. 457-465.

[17] Teo, T. S. H. & Choo, W. Y. (2001), "Assessing the impact of using the Internet for competitive intelligence," *Information and Management*, Vol. 39, No. 1, pp. 67-83.

[18] United Nations(2008), *UN E-Government Survey From E-government to Connected Governance*, UN, Newyork.

[19] Zviran, M., Glezer, C., Avni, I. (2006), "User satisfaction from commercial web sites: The effect of design and use," *Information and Management*, Vol. 43, No. 2, pp. 157-178.