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An Enterprise IT Service Quality Model (EISQM) Based on Service Interaction and Its Empirical Research

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Abstract: *The respondents' perspective on service interaction is an important design consideration in service quality evaluations. In Information Technology (IT) field, the enterprise IT service, unlike the traditional service, entails more service interaction, evolving the interactions between the service users and IT department, the interactions between the service users and IT system. The importance of evaluating the enterprise IT service quality has been discussed for several decades. However, there is no universal agreement on the enterprise IT service quality model. This research, taking a cognitive approach, seeks to construct an enterprise IT service quality model based on the service interaction theory. Based on relative literature, we propose a two-dimensional model: human delivered service and system delivered service quality. Following a psychometric procedure, we have collected data and analyzed the construction of the model. The result shows that the enterprise IT service quality measurement instrument has been developed and validated. This model has provided theoretical support for IT service providers to measure users' satisfaction and improve the service quality.*

Keywords: *IT service; service quality; IT management; service interaction; quality management.*

1. Introduction

Information Technology (IT) plays a more and more important role in organizations driven by the development of society and economy [1]. With the widespread use and deepening application of IT in the enterprise, IT service function has expanded

considerably. Moreover, IT is seen as a kind of service driving enterprise business in the organizations, which called Enterprise IT Service (EIS). The IT department is gradually becoming a service provider assuring various of IT services, such as hardware service, application service, infrastructure service and so on [2]. EIS help the enterprise to carry out efficiently and stably the day-to-day business, to cope quickly and flexibly with rapid changes in the market, and to improve its competitiveness. Ensuring IT service quality has been concerned as an important issue both by researchers and practitioners [3].

Since IT service quality is so important for the enterprise, there are lots of theorists and practitioners working on exploring the salient characteristics of IT service quality models. Comprehensively, the research on EIS quality to a great extent suffers from a number of limitations. First, most of these researches on EIS quality either take into account the production-oriented perspective, or the customer-oriented perspective, seldom they consider both perspectives; Second, because of the intangible and heterogeneous feature of the service, lots of the researches on EIS quality have adopted the SERVQUAL instrument to identify the structure of EIS quality, which ignores some characteristics of IT itself; Third, some of the researches on EIS quality just focus on a particular IT service, such as desktop service OA service, which cannot demonstrate the overall view of EIS.

Basically, since a large number of IT services, service components and resources are involved, this leads to an increased complexity of the tasks in IT service management, there is a requirement for additional tools and instruments for IT managers to measure EIS quality and to examine the service-related factors within the IT function to pinpoint the causes for service shortfalls [3].The purpose of this research is to fill this gap and explore EIS quality model in order to extend IT service quality research. This paper identifies a set of core relevance criteria of EIS quality in the perspective of EIS user, based on interaction theory, constructs an EIS quality model, and tests the validity of the model with a rigorous psychometric approach. This paper is presented in the following structure: 1) review the EIS related literature, 2) identify the core factors based on interaction theory, which lead to the research model and hypotheses, 3) introduce the empirical study and report data analysis, 4) finally, discus the conclusion and give some suggestions for further work.

2. Literature review

With the development of IT, there is a trend of IT shifting from software and hardware orientated towards service-orientated [4]. In IT enterprise perspective, many of IT enterprises, such as IBM, DELL, Lenovo, are in a transition to service-oriented enterprises. In IT products perspective, services-oriented IT products become more and more popular, cloud computing which the one of the most concerned technologies directly sees the application of IT as a variety of services. In IT industry perspective, IT service industry occupies a great share of IT market. In this trend, the role of IT in the enterprise is also changed: IT is gradually seen by the enterprises as a service to support the business activities of the enterprises,

named enterprise IT services. These IT services help the enterprises to carry out stably and efficiently the day-to-day business, quickly and flexibly cope with rapid changes in the market and improve its competitiveness. Nowadays, EIS has played an important role in the enterprise. In this context, the work of enterprise IT department is gradually transformed from traditional management of the infrastructure, hardware and software into management of a variety of services. It provides a variety of IT services supporting the enterprise business processes to different users through efficient service strategy and service portfolio. As a result, ensuring the enterprise IT service capabilities and quality is very important for the normal operation and development of the modern enterprise [5].

The definition of quality has different interpretations in a different context. Five different perspectives, in which researchers define quality, are summarized by Garvin: 1) based on the psychological cognitive perspective; 2) based on the product itself perspective; 3) based on the user perception perspective; 4) based on the production process perspective; 5) based on the value of the product perspective [6]. Also, in IT research field there is not a unified definition about quality [7]. Most of the quality related researches in IT field are based on the user perception perspective and on the product itself perspective [8]. In the production perspective, quality is consider as determined by its developing process and producing process, such as system design, system implementation [9]; In the user perspective, quality is consider to be determined by user perception [10].

Service Quality is a complex structure variable which was in the focus of many researchers. Grönroos, as pioneers of service quality, addressed the concept of perceived quality, considered the service quality is customer perception of the service, and customer perceived quality includes two aspects, which are the technical quality and the functional quality [11]. P a r a s u r a m a n et al. [12, 13] considered service quality as the gap between the customer's expectation of the service and the customer's perception of the service, proposed a GAPs model and service quality measure instrument SERVQUAL. SERVQUAL is a scale consisting of five different dimensions (tangibility, reliability, responsiveness, assurance and empathy). Now SERVQUAL is widely considered and applied to different areas by many researchers to evaluate the various types of services

In IS research field, the research on quality is mainly focused on a specific IT service, such as web site service, e-commerce service, e-mail service, etc. B a r n e s and V i d g e n applied SERVQUAL in a web site service, proposed a web site service quality measurement instrument – WebQual [14]. S i g a l a applied SERVQUAL in ASP application service, proposed an ASP application service quality measurement instrument-ASP-Qual [15]. Parasuraman applied a refined SERVQUAL in e-service, proposed an e-service quality measurement instrument-E-S-Qual. Y a n g applied SERVQUAL in a software test service, proposed a software test service quality measurement instrument-TESTQUAL [16]. B e n - l i a n applied SERVQUAL in SaaS service, proposed a SaaS service quality measurement instrument-SaaS-Qual [17]. G o l a m and A h s a n explored an index system and applied AHP to measure the mobile service quality [18].

In the enterprise IS research field, service quality is very important for the enterprise IS department and attracts a lot of researchers. K e t t i n g e r et al. applied SERVQUAL to measure the enterprise IS service quality, indicated that SERVQUAL can effectively measure the enterprise IS service quality [19]. V a n D y k e reviewed the difficulties in using SERVQUAL in enterprise IS context, and gave some suggestions [20]. J a m e s examined the validity of SERVQUAL used in IS service quality in another aspect [21].

These researches mainly focus on the service functions of the enterprise IT department; consider the IT department just as other service enterprises, which ignore the other characteristics of the enterprise IT services. Therefore, this study will be based on the service interaction in order to fully explore the characteristics of the enterprise IT service, and propose an enterprise IT service quality model.

Comprehensively, the research on IT service quality suffers a number of limitations. First, most of these researches on EIS quality either take into account the production-oriented perspective or the customer-oriented perspective, seldom they consider both perspectives; Second, due to the intangible and heterogeneous feature of the service, lots of the researches on EIS quality have adopted the SERVQUAL instrument to identify the structure of EIS quality, which ignores some characteristics of IT itself; Third, some of the researches on EIS quality just focus on a particular IT service, such as desktop service OA service, which cannot demonstrate the overall view of EIS.

3. Theoretical development

The research on interactions laid a fundament for exploring the multidimensional construction of EIS quality model. The service is defined by interactions between the service provider and the service customer. For the identifying of IT service interactions, there has been some related research.

An extensive literature review was conducted to develop a set of dimensions for the construction variables of EIS quality. The review included the quality management literature, service management literature, and related IT management literature.

S u et al. [22] in the study of the quality of the e-Commerce service proposed that there are two types of interactions involved in e-Commerce context which are human-system interaction and human-human interaction. Human-system interaction is the interaction between the human and system in e-Commerce service; Human-human interaction is the interaction between the service provider and service customer in e-Commerce service. In [22] is applied service interaction theory to conceptualize the information system quality as having two dimensions, including the system service and people service, in different service contexts [23].

This two-dimensional model, based on interaction theory, is likely to be applied in an enterprise IT service quality context. This research applied the concept in enterprise IT service context to analyze the enterprise IT service quality. The interactions in a traditional service are mainly face-to-face between humans. In the enterprise IT service context, the interaction is not only acting between humans, but

also between a human and an IT system. So we define that human delivered service quality and system delivered quality are potential variants of EIS quality, as Fig. 1 shows.

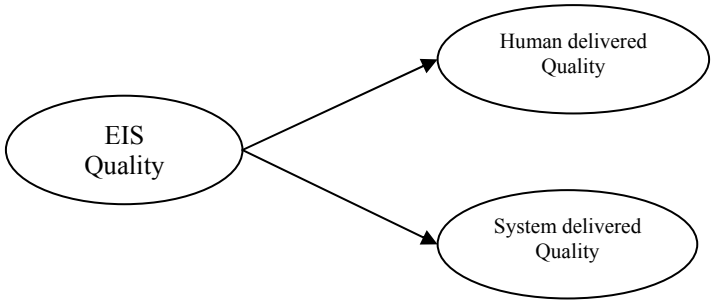

Fig. 1. EIT Service quality model: a two-dimensional model

Human delivered quality is the IT user perceived service quality in the process of human-human service interaction. As above mentioned, human-human service interaction is the interaction between humans in the IT services process. In this interaction scene, IT department employees, as the service provider ensures IT services, such as desktop services, IT training services, and so on, for the users.

SERVQUAL is an efficient instrument to measure the human delivered quality. Therefore, this research applied SERVQUAL to reflect human delivered quality.

Therefore, we propose a hypothesis: Human delivered quality is one of the influencing factors of enterprise IT service quality. Human delivered quality includes five dimensions which are tangibility, reliability, responsiveness, assurance and empathy, as depicted in Fig. 1.

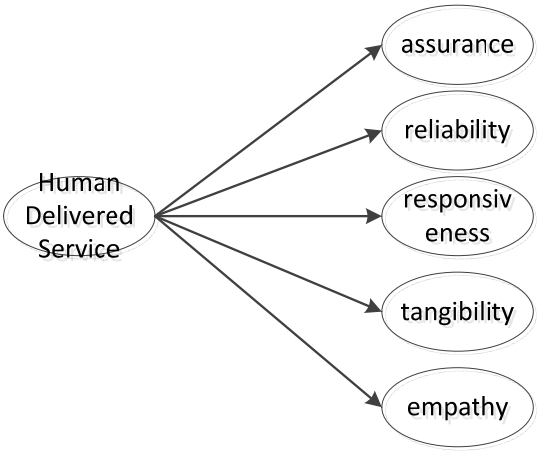

Fig. 2. The dimensions of human delivered service quality

System delivered quality is the IT user perceived service quality in the process of human-system service interaction. As above mentioned, the human-system

service interaction is the interaction between a human and IT system in the IT services process. In this interaction scene, IT system service provider ensures IT services, such as email service, OA services, and so on, to the users.

D&M model, proposed by D e L o n e and M c L e a n is one of the most influential models for measuring information system success. The model indicates that the system quality and information quality are dependent variables for IS success. System quality refers to the information system ability, mainly describes the stability of the system, the response time, ease of use, and other factors; The information quality refers to the quality of the data generated by the information system [24, 25].

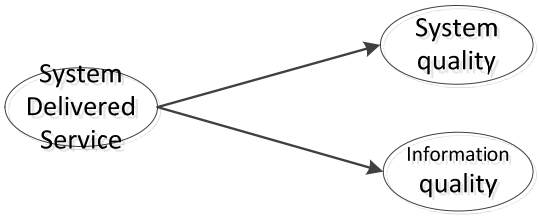

Fig. 3. The dimensions of system delivered service quality

Therefore, we propose a hypothesis: system delivered service quality is one of the influencing factors of the enterprise IT service quality. System delivered service quality includes two dimensions which are system quality and information quality, as depicted in Fig. 4.

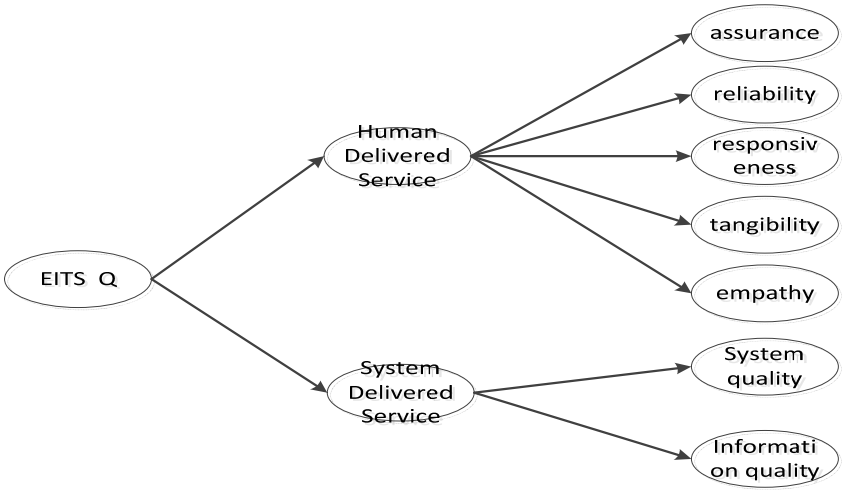

Fig. 4. EIT service quality model

4. Research methods

Following the guidelines in the references, the validation was carried out in six stages: (1) Instrument development; (2) Content validity check; (3) Instrument testing; (4) Data collection; (5) Construct reliability analysis and (6) Construct validity analysis.

1. Instrument development. First, an appropriate measuring instrument of EIS quality must be developed for an empirical test. It is recommended that researchers should reuse the existing scales designed by other researchers for the same construction. For this reason, the measure scales are based on the general service quality empirical research and the D&M model related empirical research. This paper uses a 7-point Likert scale to measure these items, range from very do not agree (1) to strongly agree (7).

2. Content validity check. Before carrying out a large-scale survey, according to the group discussed method, the content validity needs to be checked firstly. Organized by China IT Service Standard (ITSS) workgroup, a total of 12 IT services experts were selected to participate as team members to discuss. In the interviews with experts, the experts are asked to read an initial questionnaire and then to examine the scientific applicability and readability of the questions. Then the reviews of the experts are summarized and the scales refined to ensure that the investigators can correctly understand the meaning of the measure items in a large-scale survey.

3. Pilot study. Again organized by China ITSS workgroup, 20 representatives are organized to fill out a questionnaire, these participants are enterprise IT users, they have a wealth of experience with IT services, which helps them better reflect the scientific aspect of the study. The analysis of the data from the pilot study found that the questionnaire has good reliability and validity.

4. Data collection. Questionnaires are distributed by China ITSS workgroup. In order to meet the needs of the research, the survey object must meet three requirements: First, the enterprise, participating in the survey must have implemented or implementing IT service management, so that to ensure that the participators have certain understanding of the enterprise IT services; second, the participators must come from the business sector, because this research is based on the service user perspective; third, the participators must have a wealth of IT services experience, this will ensure certain understanding of the enterprise information status quo.

In March, 2011, a total of 200 questionnaires are sent out through email by China ITSS workgroup, and then the participators were informed by telephone. In September 2011, 156 valid questionnaires were recovered, a recovery rate of 78 %.

5. Construct reliability analysis. This research verifies reliability using Cronbach α coefficient. Nunally points out that when Cronbach α coefficient is higher than 0.7, this means that the factor has good internal consistency. Table 1 shows the sample reliability analysis. As seen from Table 1, if Cronbach α coefficient of the structure varies within the range of 0.719 up to 0.872, this indicates that the sample is reliable.

Table 1. Reliability analysis

Construct	Item	Correlation	After delete Cronbach α	Cronbach α	Mean	S. D
SSC	SSC 1	0.768	0.616	0.780	2.96	1.61
	SSC 2	0.774	0.677		2.99	1.60
	SSC 3	0.721	0.672		3.04	1.59
SRL	SRL 1	0.754	0.674	0.719	3.72	1.57
	SRL 2	0.726	0.665		3.71	1.51
	SRL 3	0.728	0.658		3.73	1.55
	SRL 4	0.708	0.667		3.75	1.53
SRP	SRP 1	0.685	0.675	0.872	4.24	1.26
	SRP 2	0.675	0.725		4.28	1.34
	SRP 3	0.711	0.741		4.41	1.29
	SRP 4	0.647	0.678		4.33	1.30
SIT	SIT 1	0.714	0.721	0.734	3.60	1.55
	SIT 2	0.726	0.753		3.54	1.61
	SIT 3	0.764	0.743		3.65	1.58
	SIT 4	0.744	0.681		3.54	1.54
SFR	SFR 1	0.659	0.639	0.791	4.16	1.41
	SFR 2	0.659	0.694		4.17	1.41
	SFR 3	0.619	0.661		4.16	1.33
ISQ	ISQ 1	0.735	0.780	0.817	3.53	1.55
	ISQ 2	0.767	0.783		3.60	1.61
	ISQ 3	0.766	0.781		3.60	1.65
	ISQ 4	0.752	0.755		3.47	1.58
	ISQ 5	0.787	0.784		3.49	1.65
IFQ	IFQ 1	0.671	0.719	0.822	4.24	1.37
	IFQ 2	0.654	0.658		4.19	1.34
	IFQ 3	0.747	0.762		4.19	1.42
	IFQ 4	0.676	0.704		4.26	1.39
	IFQ 5	0.691	0.742		4.06	1.43

6. Construct validity analysis. Model validity test includes convergent validity test and discriminant validity test.

This research used an exploratory factor analysis to test the validity of the scale. The purpose of factor analysis is summed up in a relatively small number of condensed information (factors) from a large number of measurable data. It uses the same factors to explain the strong internal relations and similar variables based on the intrinsic link between each variable sample data, and determines a structural concept as composed by several dimensions.

Therefore, first calculate the sample KMO value and Bartley sphericity test. The results show KMO coefficient of 0.95, Bartlett sphericity test value is 4328.282, degrees of freedom is 465, reaching a significant level indicated the sample is suitable for factor analysis. By following the recommended procedures, use an exploratory factor analysis method to analyze the data. Table 2 shows the exploratory factor analysis result. As Table 1 shows, each item in a single dimension factor loading is higher than 0.5. This means that the scale has good convergent validity.

Table 2. Factor loading table for exploratory factor analysis

Item	1	2	3	4	5	6	7
SSC1	**0.835**	0.254	0.058	0.173	0.180	0.151	0.102
SSC2	**0.748**	0.336	0.198	0.134	0.086	0.206	0.148
SSC3	**0.723**	0.315	0.233	0.143	0.111	0.204	0.137
SRL1	0.330	**0.784**	0.127	0.132	0.132	0.198	0.170
SRL2	0.195	**0.805**	0.178	0.171	0.138	0.185	0.145
SRL3	0.342	**0.730**	0.169	0.102	0.166	0.141	0.124
SRL4	0.119	**0.721**	0.115	0.188	0.197	0.141	0.160
SRP1	0.139	0.200	**0.717**	0.171	–0.011	0.294	0.334
SRP2	0.208	0.172	**0.622**	0.225	0.195	0.229	0.277
SRP3	0.148	0.147	**0.659**	0.322	0.234	0.192	0.261
SRP4	0.120	0.156	**0.758**	0.198	0.212	0.188	0.204
RIT1	0.069	0.188	0.231	**0.712**	0.143	0.261	0.317
RIT2	0.177	0.180	0.266	**0.678**	0.187	0.321	0.238
RIT3	0.178	0.162	0.218	**0.716**	0.138	0.356	0.181
RIT4	0.142	0.118	0.144	**0.825**	0.170	0.165	0.225
SFR1	0.159	0.175	0.107	0.177	**0.792**	0.190	0.252
SFR2	0.124	0.189	0.136	0.178	**0.674**	0.234	0.324
SFR3	0.123	0.214	0.272	0.203	**0.676**	0.183	0.283
ISQ1	0.219	0.249	0.197	0.227	0.111	**0.694**	0.307
ISQ2	0.207	0.118	0.243	0.265	0.123	**0.714**	0.283
ISQ3	0.168	0.138	0.171	0.292	0.220	**0.698**	0.274
ISQ4	0.059	0.213	0.234	0.178	0.254	**0.756**	0.279
ISQ5	0.206	0.179	0.174	0.289	0.141	**0.737**	0.232
IFQ1	0.132	0.154	0.244	0.246	0.215	0.187	**0.690**
IFQ2	0.010	0.069	0.122	0.251	0.204	0.272	**0.729**
IFQ3	0.156	0.079	0.265	0.231	0.247	0.279	**0.677**
IFQ4	0.117	0.208	0.229	0.161	0.185	0.205	**0.766**
IFQ5	0.170	0.197	0.240	0.154	0.176	0.310	**0.679**

Convergent validity also uses latent variable Average Variance Extracted (AVE) to test. According to Table 3, the AVE of each latent variable values are between 0.719-0.835, that are greater than the recommended value of 0.5, indicating that the latent variable has a higher convergent validity.

Discriminant validity test uses the method to compare the AVE square root of the latent with the absolute value of the correlation. By comparison, the AVE square root of the latent variables is greater than the absolute value of the correlation. Therefore, the model has good discriminant validity.

In addition, this paper uses Confirmatory Factor Analysis (CFA) through the data analysis tool Lisrel 8.7 to validate the EIS quality construct.

The research takes separate CFA by Lisrel for the first-order model corresponding to EIS quality dimensions, which are the system delivered service and human delivered service quality. The results are shown in Table 3, CFA fit indices meet the requirements, indicating that the scales have a good model fit, thus demonstrating satisfactory convergent validity.

Table 3. The result of validity analysis

Item		Number of variables	AVE	CR	CFA fit index
SDQ					χ^2/df=1.11, CFI=0.99 GFI=0.94; NFI=0.98 RMR=0.069; RMSEA=0.033
	SYQ	4	0.760	0.927	
	IFQ	5	0.719	0.928	
HDQ					χ^2/df=1.06, CFI=0.99 GFI=0.89; NFI=0.98 RMR=0.079; RMSEA=0.042
	SCR	5	0.821	0.932	
	RLB	4	0.835	0.953	
	RSB	4	0.772	0.931	
	ITG	4	0.79	0.940	
	EPH	3	0.788	0.918	

In summary, this empirical research result shows that EIS quality measurement instrument has been developed and validated, following the procedures recommended in the references.

5. Conclusion

The research explored the enterprise IT service quality from the perspective of service users, constructed an enterprise IT service quality model based on the service interaction theory. Enterprise IT service not only involves the interactions between service users and IT department, but also involves the interactions between a service user and IT system. The research defined the concepts of human delivered service and system delivered service quality, and made the hypothesis that IT service quality is influenced by them. It presented constructing of a model and designing the measure scale; finally, tested the scale reliability and validity by using factor analysis, and refined it. This model provided theoretical support for IT service providers to measure users' satisfaction and improve the quality of services.

There are some limitations in this research, first, the scale is mainly from prior literature, so more suitable for Chinese enterprises, it needs further processing; second, the data of the empirical study is not enough, third, the relationship of each variable is not well analyzed.

As an outcome of the EIS quality construct, this study has focused on the perspective of service users. Future research may investigate the other perspectives, such as those of the service provider.

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