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Perceived Online Service Quality: Latent Dimensions and Ontological Implications

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Abstract

Research on perceived online service quality has, since its beginnings in the 1990's, shown little consensus about its dimensionality. In this study, we modify a well-tested existing instrument to add the notion of transaction quality. We carry out exploratory factor analysis and find that our results disconfirm our a priori hypotheses about the factor structure and some of the findings of previous studies. This raises questions about the about the ontology of the latent dimensions of online service quality.

Keywords: Online service quality, ontology, exploratory factor analysis

Introduction

The nature of service delivery is undergoing change. Customers are interfacing directly with ICT systems rather than being served face to face. These changes have been reflected in the academic study of service quality. The original ServQual instrument identified five dimensions of face to face service quality (Parasuraman et al. 1985). Subsequent researchers considered service quality in such contexts as information technology departments (Pitt & Watson 1994), end user computing (Doll at al. 1988), and the Internet (Barnes & Vidgen 2002). Studies of service quality have been characterised by unstable dimensionality. Some studies have suggested that all the ServQual items loaded to a single factor (Cronin & Taylor 1994), or found support for seven to eight factors (Carman 1990). Previous studies have also found that the dimensions of perceived service quality vary between business domains, and have encouraged other researchers to extend their existing instruments with domain-specific items (Barnes and Vidgen, 2001, 2002). Following such advice, we extend an existing instrument to include online self-service transactions. We conduct a survey in a new business domain, and compare our results to our a priori hypotheses and previous studies. We then discuss the ontological implications of our findings.

Literature Review

The ontology of e-service quality

There is some confusion in the service quality discourse over the implied ontology of the latent constructs. Borsboom et al. (2003) have suggested that the use of reflective latent constructs implies a realist ontology of trans-situational, context-indifferent entities. This is reflected in the fact that studies of e-service quality frequently look

back to the original studies of face-to-face service quality conducted by Parusaraman et al. (1985), even though the context of the service encounter is markedly different. This assumption is also reflected in other studies that attempt to reconcile their latent constructs with the original ServQual dimensions (for example Alzola et al, 2005). Trans-situational constructs are also implied when Barnes and Vidgen (2000, 2002), using multiple studies of perceived online service quality in different business domains, assert that three dimensions, content quality, usability (sub-divided into "usability" and "design") and service interaction quality (sub-divided into "empathy" and "trust"), have proved stable.

However, Barnes and Vidgen (2000, 2002) also recommend extensions to the instrument when it is applied in a new business domain, suggesting in effect that perceived e-service quality is context-dependent or emergent from the context-individual system. There is also a history of unstable dimensionality and suggestions that latent dimensions concretise differently (Lagrosen et al. 2004), again calling into question the trans-situational existence of perceived service quality.

The changing nature of web services

Website functionality has evolved from static "brochure-ware", through increased interactivity, such as online calculators, to full transaction processing. The transaction, rather than the content is becoming the central object of electronic commerce (Alzola et al. 2005). Given this evolution of the service phenomenon, and based on indications of context-dependence of service quality (Section 2.1) it may be the case that the dimensions of perceived service quality also evolve over time. For example, perceived service quality may not have included the dimension of transaction quality in the early days of the Internet when websites did not support online transactions. Consequently, we expect that the quality of online transactions will emerge as a new dimension of online service quality in addition to the existing dimensions in the equal 4.0 instrument (REFERENCE). This is supported by industry studies of e-commerce trends (for example Hind, 2005) and qualitative studies of user perceptions of online services (Tate et al., 2007). *We advance the following proposition:*

> Perceived online service quality is a four factor structure (information quality, usability and design, service interaction quality and transaction quality).

Methodology

Based in prior qualitative work (Tate et al., 2007) we modified the existing eQual instrument using established guidelines for scale development and modification (see for example, Grover 1997; Hinkin 1998, Bodreau et al 2001). The resulting instrument is attached as Appendix 1. Items were presented in a random order to mitigate question-order affect. The survey was administered online, participation was voluntary and anonymous. We received 248 usable responses from 250 submitted. Respondents closely reflected the characteristics of the population of users of the website. Data were analysed using exploratory factor analysis with the following steps: (1) determine the overall suitability of the data for factor analysis, ensure that each variable is suitable for inclusion in the factor analysis, (2) determine the number of factors to extract, (3) determine the most appropriate method of factor analysis and factor rotation, (4) consider the item-factor loadings, and refine the analysis. (Field 2005). We then compared the results from our exploratory factor analysis to our a priori factor structure and to eQual instrument that we extended.

Results

The four-factor structure supported by this research

Our research identified a four-factor structure for perceived online service quality: content quality, usability, transaction safety and efficiency, and interaction quality. A summary of the actual factor structure, compared with the expected factor structure based on our literature review and previous research (Tate et al., 2007) is shown in Table 1. New items are indicated by a star. Items that have loaded to that factor which previously loaded to another factor, or that have been dropped because of cross-loading, are indicated separately. Refer to the instrument in Appendix 1 for item numbering in the table. Although the factor structure is broadly similar to our expected factor structure, and to previous studies, the item set associated with each factor proved unstable.

Table 1: Actual versus Expected: Emergent factor structure compared to items expected to load to that factor based on our literature review and prior qualitative work (Tate et al., 2007).

Content Quality (CQ)			**Usability (U)**		
Expected: CQ	Actual: CQ	Comments	Expected: U	Actual: U	Comments
2	2		1	1	
7	7		5	5	
10	10		9	9	
14	14		13	13	
23	23		16	X	
26	26		18	X	
17	17	cross-loading	20	X	
	18	moved from U	22	X	
	20	moved from U	25*	X	
	27	moved from SIQ		3	moved from SIQ
				4*	moved from TQ
				19*	moved from SIQ

Transaction Quality (TQ)			**Service Interaction Quality (SIQ)**		
Expected: TQ	Actual: TQ	Comments	Expected: SIQ	Actual: SIQ	Comments
4*	X		3	X	
8*	8*		6	X	
12*	X		11	X	
	6	moved from SIQ	15	15	cross-loading
	11	moved from SIQ	19*	X	
	16	moved from U	21*	21*	
			24	24	
			27	X	
				12*	moved from TQ
				22	moved from U
				25*	moved from U

Legend	
Expected	*Items expected to load to that factor based on our literature review*
Actual	*Items that actually loaded to that factor in our EFA*
*	*New items (not included in e-Qual)*
X	*Item did not load to this factor as expected*

We found that Content Quality includes accuracy, believability, timeliness, relevance, level of detail, and appropriateness of format. It also includes the degree to which the design is appropriate for the type of site, the degree to which the site conveys organisational competency, and confidence that goods and services will be delivered as requested.

Usability includes learnability, site reputation, the ability to complete useful transactions, clear and understandable interaction, navigability, and a sense of control.

Transaction quality is reflected in feeling safe when completing transactions on the website, security of personal information, believing that transactions on the site will be efficient (will save the user time or money). These items are strongly negatively correlated with the belief that the site has an attractive appearance.

Interaction quality includes the range of transactions offered, a sense of enjoyability or entertainment, the degree to which the site creates a positive experience, the degree to which the site makes it possible to communicate with the organisation, and whether, overall, the user considered the response time acceptable.

Two factors, information quality and usability, have remained relatively stable. For information quality, most existing items loaded consistently to the same factor. For usability, the hypothesised items associated with usability were confirmed in our study, although items related to attractiveness and visual design did not. The remaining two factors were less stable. These factors reflect the recent evolution in website transaction functionality, and included the majority of the new questions.

Factor structure compared to eQual

Table 2: EQual factor-item loadings compared with actual factor item loadings

eQual: Content Quality			**eQual: Usability (usability)**		
eQ:CQ	Actual: CQ	Comments	eQ:U(U)	Actual: U	Comments
2	2		1	1	
7	7		5	5	
10	10		9	9	
14	14		13	13	
17	17	cross-loading	16	X	
23	23		18	X	
26	26		20	X	
	18	moved from U(U)	22	X	
	20	moved from U(U)		3	moved from SIQ(T)
	27	moved from SIQ(T)		4*	new question
				19*	new question

eQual Usability (design)		**eQual Service Interaction Quality (trust)**		**eQual Service Interaction Quality (empathy)**	
eQ:U(D)	Actual: U	eQ:SIQ(T)	Actual: SIQ	eQ:SIQ(E)	Actual: SIQ
16	X	3	X	15	X
18	X	6	X	24	24
20	X	11	X		
22	X	27	X		

Legend	
Expected	*Items expected to load to that factor based on eQual*
Actual	*Items that actually loaded to that factor in our EFA*
*	*New items (not included in e-Qual)*
X	*Item did not load to this factor as expected*

We compared the results with the eQual instrument, since this factor structure has been argued to be stable across several studies (Barnes and Vidgen, 2000, 2002). A summary is included as Table 2. EQual included: Information quality; the quality of the content of the site and suitability for the user's purpose (accuracy, believability, timeliness, relevance, level of detail, appropriateness of format): usability; qualities associated with site design (attractive appearance, appropriate design, competency, positive experience), and usability (learnability, understandability, navigability, ease of use): service interaction; the quality of the service interaction as they delve deeper into the site, in particular, organisational trust and empathy.

Broadly, most content quality and usability items remained stable in the study. However, items associated with site design did not load with usability, but spread out across several factors. They were also rated lowest in terms of importance to users. Service interaction, which has been the least stable factor in eQual, collapsed completely, with only one of the original questions loading to this factor. Questions associated with institutional trust, which previously loaded to this factor, loaded with transaction quality in our study.

Implications for research and practice

The implications of the emerging factor structure for research

Our results provided a closer fit to our expected results than to those indicated by the eQual instrument, but neither our a priori factor structure, nor the well-established eQual factor structure were fully supported.

This study exemplifies the difficulties involved in carrying out conceptual refinements to existing theory (Straub & Carlson 1998), especially where that theory, and the supporting measurement scales, is not stable. This study provides another illustration of the destabilising effect of adding items to scales, noted by Keller & Dansereau (2001) We also confirm the concerns raised by Keller & Dansereau (2001) about the difficulties of meta-analysis across studies using different scales. It is, in fact, very difficult to reliably position this study in the context of previous research. Our factor-structure compared to eQual 4.0, and the factor structure of eQual 4.0 compared to previous versions of the same instrument, are sufficiently different that it would be difficult to perform meta-analysis on these results, despite being part of the same research stream and utilising many of the same variables. These difficulties are multiplied many times when different instruments that purport to measure the same phenomenon with different latent constructs and variables are used. Our experience suggests that customising an instrument is likely to require a validation process equivalent to that proposed for a new instrument. Large-scale confirmatory studies, studies that replicate previous research, and studies that go back to first principles with regard to our understanding of the constructs of perceived online service quality would add significantly to our understanding of this area.

The ontology of the online service quality construct

Our results also raise issues about the ontology of online service quality. Positivist, quantitative studies involving latent constructs assume the trans-situational existence of those constructs with identifiable characteristics (Borsboom et al., 2003). Our findings support the evolution of perceived online service quality along with the evolution in website functionality, and provide a further example of unstable dimensionality. These findings suggest that online service quality may not "exist" independently of its context. Perceived online service quality may be more helpfully conceptualized as a cluster of benefits which is context-dependant, and arises from an interaction between the purpose of the user and the website, the objective characteristics of the website, and the external and internal characteristics of the user.

On the other hand, our findings may indicate a wrong level of abstraction. A more stable characterization of service quality may be found at a level that is further removed from the immediate technological characteristics of the service encounter, possibly in the beliefs or attitudes of service consumers towards a service, rather than in their perceptions of the technological characteristics.

Furthermore, closely examining the existing instruments intended to measure service quality, raises doubts about the reflective properties of the instruments and their items. Instead, they may be better characterized as formative by the criteria in (Diamantopoulos and Siguaw, 2006). Such a misspecification can have large consequences for measurement models and causal models (Jarvis et al., 2003).

Finally, service quality has been characterized as a multi-dimensional first-order factor model. This assumes that service quality consists of nothing but these dimensions, in effect making it a construct with no ontological content beyond its constituent dimensions. Using the characterization by Jarvis et al. (2003), this may be better described as a second order formative factor.

From our results one may conclude that either we have had an incomplete measurement of the PSQ construct that has now been improved (reflective factor model), or that we have a different PSQ construct, constructed in a different way (formative index model). In other words, does the ontology of PSQ change, or does our epistemological knowledge of PSQ change?

In conclusion, we believe that existing research may need to be re-examined for possible misspecification and mischaracterization of the service quality construct, which may be the cause of the instability of the construct that has been in this study and in other literature on the subject.

Conclusion

Despite extensive research in this area, it appears that the dimensions of online service quality need to be regularly updated to reflect developments in the underlying technologies. Our study followed best practice guidelines for developing and modifying a survey instrument, yet previously well-established eQual dimensions were not supported. These findings suggest that perceived on-line service quality cannot necessarily be relied on to demonstrate reliable generalisable dimensions. We call on researchers in this area to re-examine and more carefully specify the nature of the constructs and their measurements.

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Appendix 1: Survey Instrument

Quality	Description		
1	I find the site eas y to learn to operate		
Score	Strongly agree	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Strongly disagree
Importance	Very important	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Not important
2	The site provides accurate in formation		
Score	Strongly agree	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Strongly disagree
Importance	Very important	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Not important
3	This site has a good reputation		
Score	Strongly agree	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Strongly disagree
Importance	Very important	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Not important
4	I believe I would be able to complete transactions that are useful to me		
Score	Strongly agree	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Strongly disagree
Importance	Very important	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Not important
5	My interaction with the site is clear and understandable		
Score	Strongly agree	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Strongly disagree
Importance	Very important	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Not important
6	It feels safe to complete transact ions on this site		
Score	Strongly agree	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Strongly disagree
Importance	Very important	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Not important
7	The site provides believable info rmation		
Score	Strongly agree	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Strongly disagree
Importance	Very important	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Not important
8	Completing transactions on this site will s ave me time or money		
Score	Strongly agree	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Strongly disagree
Importance	Very important	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Not important
9	I find the site easy to naviga te		
Score	Strongly agree	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Strongly disagree
Importance	Very important	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Not important
10	The site provides timely information		
Score	Strongly agree	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Strongly disagree
Importance	Very important	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Not important
11	My personal information feels secure		
Score	Strongly agree	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Strongly disagree
Importance	Very important	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Not important
12	This site offered the range of on -line transactions I expected		
Score	Strongly agree	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Strongly disagree
Importance	Very important	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Not important
13	I find the site easy to use		
Score	Strongly agree	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Strongly disagree
Importance	Very important	| 1 | 2 | 3 | 4 | 5 | 6 | 7 | N/A |	Not important