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Electronic Service Quality In Mobile Internet Music Services: Comparing Different Second-Order Measurement Specifications

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Abstract

Construct misspecification is deleterious in that it leads to Type I and Type II errors. In this study we empirically demonstrate that different measurement conceptualizations can lead to different conclusions concerning the relative importance of beliefs in predicting electronic service quality. Specifically we test three second-order measurement conceptualizations of the electronic service quality construct in the context of a mobile internet music service. We find that there is poor convergence between the three models highlighting the need for more careful measurement specification of IS constructs even at a higher-order hierarchical measurement level.

Keywords: *Electronic Service Quality, Mobile Music, Formative, Reflective, PLS*

1   INTRODUCTION

The central premise of this study is to empirically highlight the importance of the proper measurement conceptualization of Information System constructs. Recently, researchers (e.g., Freeze & Robyn, 2007), have highlighted the importance of measurement misspecification in IS research. Measurement misspecification, relates to the improper specification of the directional causality of a construct's measures. Recently, Petter, Straub and Rai (2007) find that the IS literature has serious problems in misspecifications of constructs. Construct misspecification is deleterious in that it leads to Type I and Type II errors. In this study we empirically demonstrate that different measurement conceptualizations can lead to different conclusions concerning the relative importance of beliefs in predicting electronic service quality.

2   BACKGROUND & MODEL DEVELOPMENT

In this study we use second-order measurement specifications in the context of the electronic service quality construct applied to a mobile internet music service. Through cellular phones and personal digital assistants, users gain access to tremendous amount of information and products available on the internet, anywhere and anytime (Chae et al. 2002). Mobile music is included in the mobile entertainment services mix along with mobile gaming, mobile sports and betting, icon downloads, etc. (Macinnes et al. 2002). Maciness et al. state (2002, p.218) that 'mobile entertainment is an example of a new pure e-commerce service that can create substantial value'.

The rationale for choosing the electronic service quality construct builds from the importance of the construct as a major antecedent in building favorable consumer behaviors (e.g., remain loyal, willing to pay price premiums, say positive things and recommend the service to other consumers, etc.)

In the study qualitative research was employed towards investigating the dimensionality of the perceived service quality construct and consecutively a structural equation model linking perceived service quality factors with end user adoption was tested through a quantitative data collection instrument. The findings indicate that seven factors are deemed as important when consumers evaluate a mobile Internet service: interaction, connection, contextual, content, device quality along with

customer service quality and privacy concerns (see Vlachos and Vrechopoulos 2008 for a more detailed discussion of the determinants of electronic service quality and construct operationalizations).

We specifically test three second-order measurement models: the regression-based model, the molar (formative) and molecular measurement models of service quality.

3 MATERIALS & PROCEDURES

This study was conducted in the context of a research consortium of companies (wireless network operators, content and technology providers) that were united so as to design and develop a next generation mobile Internet music service with advanced features. Participants were introduced to the functionality of the mobile Internet service, and to the mobile device that would have to use for accessing the service. Participants were then asked to navigate through the service, and implement some basic use case scenarios (e.g. create a play list, listen to it etc). After experiencing the service they were asked to complete the data collection instrument. The data collection instrument was pre-tested against ten mobile users following the aforementioned procedure. Based on the suggestions of these respondents some vague items were reworded. Field tests were conducted in Greece and 144 respondents participated.

A structural modeling approach was chosen so as to estimate the parameters of the research model. The statistical analysis method chosen for this study is *Partial Least Squares* (PLS). To test the hypothesized relationships and competing configurations, PLS-Graph v.3.00 was utilized. PLS is a powerful second generation multivariate technique for analyzing latent variable structural equation models with multiple indicators. PLS is more appropriate than LISREL type models when sample sizes are small, models are complex and the goal of the research is in explaining variance (Smith and Barclay 1997). PLS estimation makes no distributional assumptions about the sample data. Therefore, for concluding on the significance of parameters estimated bootstrap estimates of standard errors are utilized (Brown and Chin 2004).

4 RESULTS

Assessments of Validity and Reliability

Before testing the significance of the relationships between the latent variables, the measurement model should exhibit a satisfactory level of validity and reliability (Fornell and Larcker 1981). Significance of the parameters estimated was calculated on the basis of 500 bootstrapped samples (Brown and Chin, 2004). We tested for internal consistency, convergent and discriminant validity employing the testing system recommended by Fornell and Larcker (1981). Furthermore based on Hulland's suggestions (Hulland 1999) items with factor loadings less than .50 were not retained. We tested for internal consistency utilizing the composite reliability measure (Fornell and Larcker 1981) that is similar to Cronbach's alpha, but preferred in structural equations modeling, because it estimates consistency on the basis of actual measurement loadings. All measures conform to accepted reliability, convergent validity, and discriminant validity standards (see Vlachos and Vrechopoulos 2008 for more details).

Tests of Second-Order Construct Measurement Specifications: Relative Importance of Factors Influencing Service Quality

The goal of the study is to investigate the impact of construct measurement misspecification at the second-order measurement level, on conclusion concerning relative importance of beliefs. However, consistent with Petter, Straub and Rai (2007) we have given care and empirically tested for the epistemic relationship between the first-order measures and their corresponding constructs. The molar versus molecular orientation for second-order factors translates equally well at the first-order factor level and is referred to as emergent versus latent factors (Chin and Gopal 1995). Based on Jarvis et al. (2003) measures employed are reflective with the possible exception of the content and contextual quality measures (e.g., they do not necessarily co-vary with each other and dropping one of the items

might change the conceptual domain of the construct). Formative indicators "cause" (e.g., they do not necessarily co-vary with each other and dropping one of the items might change the conceptual domain of the construct the latent construct while reflective indicators are "effects" of the latent variable (Bollen, 1989).

We fitted the model one time with formative indicators and one time with effect indicators (Barclay et al., 1995). The analysis indicates the same results between the two measurement specifications, using the established criteria (e.g., variance explained) for testing the performance of a PLS model (Chin and Newsted, 1999).

The relative importance of service evaluation constructs on service quality and behavioral intentions can be determined by comparing the absolute path coefficients between constructs (Chin and Gopal 1995). We test three different measurement specifications: The antecedents/regression-based model, the molar model and the molecular model. A molar approach conceptualizes service quality as an aggregate, formative second-order model. Service quality is postulated as an emergent construct /belief (Chin and Gopal 1995), an "...*aggregate macro presentation of a persons affective response to an object or action)* (Bagozzi 1985, p.43).Essentially, molar service quality resembles the antecedents model of service quality suggested in this study (Dabholkar, Shepherd, and Thorpe 2000). The main difference between them lies in that in the latter, direct overall measures of service quality are used while in the molar service quality is measured using the repeated indicators method (Chin 2002). Figure 1 depicts service quality as a molar attitude.
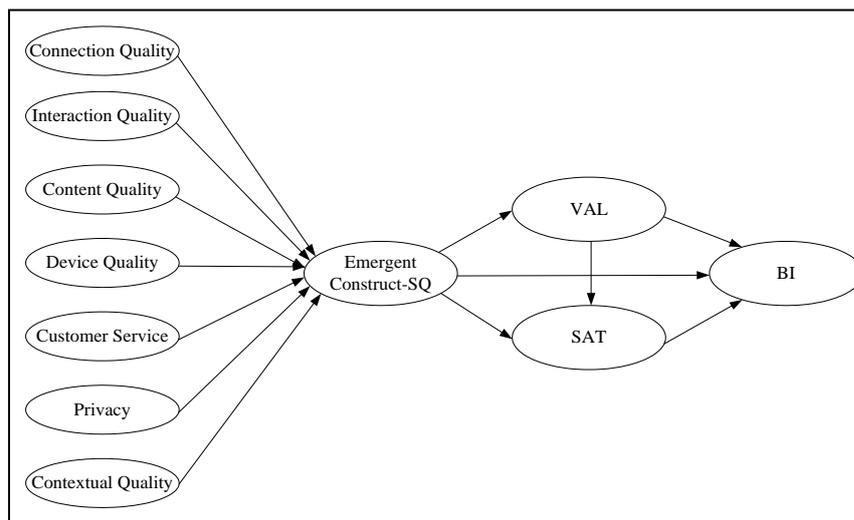

Figure 1. *Service Quality as a Molar Attitude*

Molecular service quality is conceptualized as a micro presentation of a person's affective response to a service (Bagozzi 1985). Compared to the molar approach, service quality, rather than being constructed from the seven factors, it is hypothesized to be a latent variable that is indicated by these first-order factors (Bagozzi, 1985; Chin and Gopal 1995). Figure 2 presents service quality as a molecular attitude. Molecular service quality is also operationalized using the repeated indicators method (Chin 2002).
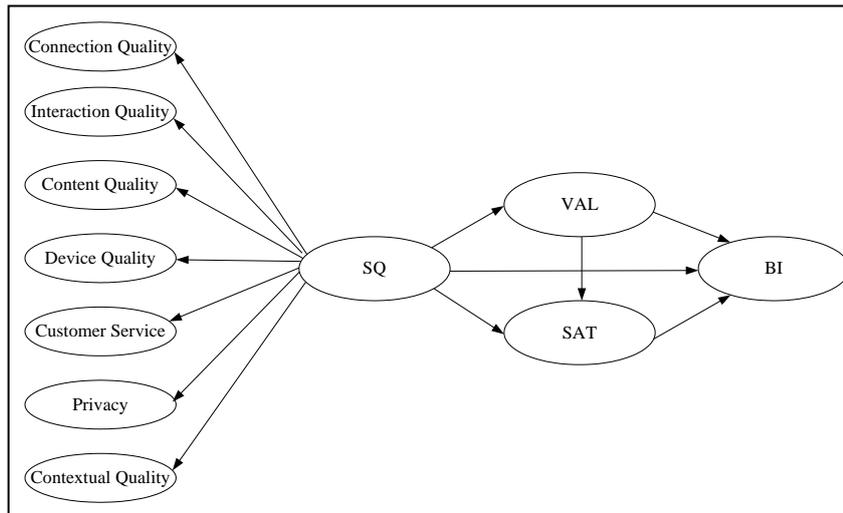
Figure 2. *Service Quality as a Molecular Attitude*

Regarding the antecedents/regression-based model of service quality it seems that the most important factor for consumers when evaluating the overall superiority of the service experienced is content quality, namely the multimedia and the amount of information and content provided by the service (b=.32). The next most important factor influencing service quality perceptions is contextual quality (b=.28) that is the ability of providing a customized serviced anywhere and anytime. Device quality (b=.21) and connection quality (b=.19) follow in order of significance. Privacy protection was deemed the least important in between the constructs that had significant paths on service quality. Contrary with the majority of the extant literature the interaction quality construct (Chae et al. 2002; Parasuraman, Zeithaml, and Malhotra 2000; Parasuraman, Zeithaml, and Malhotra 2005; Wolfinbarger and Gilly 2003,) was not deemed as important. The people-oriented customer service construct manifested by willing and helpful customer service personnel is also deemed as unimportant. Perceived service quality, satisfaction and value have marginally the same effect on behavioral intentions. However service quality is deemed as more important, followed by satisfaction (b=.30) and value perceptions (b=.27).

There is poor convergence between the three models indicating that IS researchers should carefully elaborate on the causal directionality linking first and second-order measurement models. Regarding the effects on service quality, the antecedents/regression-based model suggests content quality to be the most important, while the molar and molecular models place contextual quality and interaction quality first in order of importance correspondingly. It is important to note that while the antecedents model postulates interaction quality and customer service as statistically insignificant, the molar and molecular posit these two constructs as important. These results may be attributed to lowered multi-co-linearity levels inherent in the molar conceptualization (Chin and Gopal, 1995) Regarding the relative importance of evaluation constructs on behavioral intentions, the three models are in partial consensus. The molar and molecular approaches are in rank-order agreement while the (e.g., major service quality outcomes) model coincides with the other two in the importance of service quality, but postulates satisfaction as more important than value (see Table 1). The antecedents and molar models on the other hand both conceptualize service quality as an aggregate construct and their in between differing results (see Table 5) can be attributed to the indicators used to measure service quality. In the antecedents model we use two global measures of quality, while in the molar as suggested by Chin (2002) we utilize the method of repeated indicators, meaning that the twenty-one indicators used to measure the seven antecedent constructs are used to measure service quality too.

Antecedents Model	Molar Model	Molecular Model

Content Quality (.32)	Contextual Quality (.30)	Interaction Quality (.77)
Contextual Quality (.277)	Device Quality (.26)	Contextual Quality (.73)
Device Quality (.21)	Content Quality (.26)	Connection Quality (.67)
Connection Quality (.19)	Interaction Quality (.23)	Content Quality (.59)
Privacy (.15)	Connection Quality (.20)	Device Quality (.55)
Interaction Quality (n.s.)	Privacy (.20)	Privacy (.52)
Customer Service (n.s.)	Customer Service (.15)	Customer Service (.47)
Service Quality (.30)	Service Quality (.32)	Service Quality (.32)
Satisfaction (.30)	Perceived Value (.29)	Perceived Value (.29)
Perceived Value (.27)	Satisfaction (.26)	Satisfaction (.26)
R^2=.547	R^2=.547	R^2=.549

Table 1. *Relative Importance of Constructs in BetweenDiffering Service Quality Operationalizations*

5   CONCLUSIONS

The service quality literature seems to favor the antecedents/regression-based model, though more research is needed so as to compare these differing conceptualizations and corresponding operationalizations of service quality. In a research setting similar to the one used in this study, Dabholkar (1996) models service quality as a second-order construct with seven formative first order factors. Wolfinbarger and Gilly (2003) as well as Brady and Cronin (2003) conceptualize service quality as a second and third-order construct correspondingly, positing lower order factors as service quality antecedents. They measure perceived service quality using overall measures and the more theory-oriented covariance based structural equation modeling approach. Additionally, Dabholkar, Shepherd and Thorpe (2000) empirically demonstrated the superiority of the antecedents model compared to the components/molecular model in terms of explaining behavioral intentions. Combining the results of the present study with results from the traditional service quality literature it seems that the molar model of service quality (or its measurement variant, the antecedents model), is theoretically and empirically more appropriate to use in future IS evaluation studies involving electronic service quality measures. All in all, the study results in line with Chin and Gopal (1995) and Petter, Straub and Rai (2007) seem to provide some empirical evidence that IS researchers need to consider whether the particular item measures (or constructs at a second-order level) form the emergent first-order factor or are reflective, tapping into a latent first-order factor. It is of great importance for the future of IS that scholars specify IS constructs based on theoretical considerations and then use empirical procedures to validate these considerations.

This research is not without limitations. First, data stem from a single mobile internet service, namely mobile music, meaning that we cannot claim generalizibility beyond this research setting. Further, in this study we use PLS-based structural equation modeling. Future research should investigate whether the results would be the same if one uses LISREL-based structural equation modeling.

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