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Quality management of B2C e-commerce service based on human factors engineering

Wenming Zuo [a,*], Qiuping Huang [b], Chang Fan [a], Zhenpeng Zhang [a]

[a] *School of Economics & Commerce, South China University of Technology, Guangzhou Higher Education Mega Center, Guangzhou 510006, China*
[b] *School of Business Adminstration, South China University of Technology, Guangzhou 510640, China*

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ABSTRACT

This study investigates business-to-customer (B2C) electronic commerce services from a quality management perspective. We propose a novel quality management approach that is based on human factors engineering to manage e-commerce service quality and operate according to customer needs. First, we screen credible quality requirements and determine their weights by integrating Kano's model with our previous work, including the model of B2C website service quality. Then, we can extract quality characteristics according to image words and credible customer requirements. The weights of the quality characteristics are deduced by refining characteristics through a house of quality reconstruction and mapping customer requirements to characteristics. Finally, based on related theories or viewpoints, the operating practices for quality characteristics entail quantitative output with importance and grades taken into consideration. Our experimental results demonstrate that operating practices can help managers understand e-commerce service quality and have useful implications for companies in the management of e-commerce service quality.

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1. Introduction

E-service is an interactive, content-centered and Internet-based customer service. It is driven by the customer and integrated with related organizational customer support processes and technologies (Ruyter et al. 2001). E-service quality is defined as the extent to which a Web site facilitates efficient and effective shopping, purchasing, and delivery (Parasuraman et al. 2005), and it is also crucial for differentiating among electronic commerce (e-commerce) providers and gaining competitive advantage (Benaroch and Appari 2011, Kim and Lee 2009, Shaaban and Hillston 2009).

Service quality is increasingly recognized as an important aspect of e-commerce (Santos 2003). Without a quality management approach that guarantees quality from its systems, staff and suppliers, a business will not be able to deliver the appropriate level of service quality to satisfy its customers (Cox and Dale 2001). A stream of research has focused more on identifying the dimensions of e-service quality than on discovering which e-service process attributes can help improve quality (Heim and Field 2007, Riel et al. 2001, Su et al. 2008, Santos 2003, Zhang and Prybutok 2005). Research is therefore needed to develop insights into a quality management approach that facilitates operation according to customer satisfaction requirements. Our intent is to identify operating practices for e-service quality that managers may use to improve their operations and ensure high e-service quality.

Forbes (2002) noted that when e-service is properly integrated with the human touch, the resulting synergies create even higher levels of customer satisfaction while maximizing the business value realized from expenditures on both e-service technologies and call center personnel. The study of ergonomics and human factors uses the knowledge of human abilities and limitations to design systems, organizations, jobs, machines, tools and consumer products for safe, efficient and comfortable use (Helander 1997). The applications of ergonomics have evolved over time with the progress of ergonomic knowledge and research and the emergence of new problems around the world (Carayon and Smith 2000). Strawderman and Koubek (2008) improved the evaluation of service quality based on human factors engineering (HFE). They suggested that, by utilizing human factors theories, tools and techniques, service systems can be improved and made more productive, effective, safe and comfortable for employees and customers. The literatures have been aware of the importance of applying

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Abbreviations: B2CS, business to customer electronic commerce service; CQRs, credible quality requirements; EISMB2CWSQ, evaluation indicator system and model of B2C websites service quality; HFE, human factors engineering; HOQ, house of quality; QCs, quality characteristics; QRs, quality requirements; QFD, quality function deployment.

* Corresponding author. Tel.: +86 20 3938 1068; fax: +86 20 3938 2288.
E-mail address: wmzuo@scut.edu.cn (W. Zuo).

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HFE to improve E-service quality, but little literatures have applied the HFE from the perspective of service processes. Shostack (1987) considered that the use of nouns obscures the fundamental nature of services, which are processes instead of objects. This paper fills the gap by identifying customer requirements related to business to customer electronic commerce service (B2CS) processes based on HFE.

Miles et al. (2000) researched the HFE e-commerce framework, which consists of 4 categories of dimensions: front-end, criteria management, comparison support and marketplace. They have only applied HFE to the aspects related to the usage of shopping sites by buyers qualitatively. Vandermerwe (1993) noted that the most successful companies have started to consider the entire customer experience, from the pre- to the post-purchase stages. This paper fills the gap by studying quality management in B2CS by applying HFE to the entire B2CS process quantitatively.

HFE experts usually apply quality function deployment (QFD) to formulate system specifications (Wickens et al. 2004). Chan and Wu (2002) suggested that QFD is a customer-oriented quality management and product development technique originally used for hard products. However, the QFD concept is applicable to soft services as well. Indeed, it was gradually introduced into the service sector to design and develop quality services. Barnes and Vidgen (2000) suggested that QFD might be adopted as a framework for identifying the website qualities demanded by users. They took interactive factors into consideration in subsequent research, improving WebQual 1.0 and proposing WebQual 2.0 (Barnes and Vidgen 2001). Chang et al. (2009) applied QFD to construct an e-commerce website quality model based on the quality requirements of users. The literatures have applied the HFE tool QFD in the service quality research, but little operating practices have been obtained. Based on HFE theories, experts converted user needs and goals into system specifications (Wickens et al. 2004). This paper fills the gap by determining operating practices for the quality management of B2CS according to customer needs by using QFD.

Matzler and Hinterhuber (1998) suggested that one of the benefits of combining QFD with Kano's method for understanding customer-defined quality is a deeper understanding of customer requirements and concerns. Tan and Pawitra (2001) integrated SERVQUAL (Parasuraman et al. 1988) and Kano's model into QFD to extend the study of service excellence. They suggested that Kano's model and SERVQUAL can be integrated into QFD to better understand consumer needs. Parasuraman and Zeithaml who proposed the classic SERVQUAL service quality evaluation tool (Parasuraman et al. 1988), worked with Malhotra to generate a tool called E-S-QUAL that evaluates electronic service quality (Parasuraman et al. 2005). In these literatures, the conceptual model of integrating service quality evaluation model and Kano's model into QFD have only been defined. This paper fills the gap by reporting on empirical research integrating the evaluation indicator system and model of business-to-customer (B2C) websites service quality (EISMB2CWSQ) (Zuo et al. 2010) and Kano's model with QFD to obtain credible quality requirements (CQRs) of customers and ultimately define operating practices.

The remainder of this paper is organized as follows. Section 2 describes the novel quality management approach. We apply this approach to B2CS and discuss our findings in Section 3. The final section discusses the conclusions and significance of our research.

2. The novel quality management approach

2.1. Obtaining the CQRs of B2CS

As described above, based on HFE, we integrate EISMB2CWSQ and Kano's model with QFD to obtain CQRs following the framework shown in Fig. 1.

Based on EISMB2CWSQ, initial quality requirements (QRs) made by customers are extracted according to items in EISMB2CWSQ. The initial EISMB2CWSQ items are determined by consulting experts, based on summaries of related research (Zuo et al. 2010). According to HFE and human factor experts, product and system design should be user-centered. The objective is to identify the system design that meets user needs, not to design a system that requires users to make adjustments (Wickens et al. 2004). We define the dominant B2CS image words to help customers directly propose questions and expectations. After the 5W1H requirement investigation, we capture original data through a VOC table. Then, the entire user requirement structure is summarized by the KJ grouping method.

After the initial QRs are obtained, we continue to apply Kano's model to screen QRs that significantly affect user satisfaction (Kano et al. 1984). Screening QRs with Kano's model requires three steps: designing a questionnaire according to QRs, collecting and analyzing data and screening QRs according to Table 1 (Matzler and Hinterhuber 1998).

The classification of requirements alone cannot improve customer satisfaction. Therefore, Berger et al. (1993) defined a customer satisfaction (CS) coefficient to improve product or service quality.

$$a = (A + O)/(A + O + M + I) \quad (1)$$

$$b = (O + M)/(A + O + M + I) \times (-1) \quad (2)$$

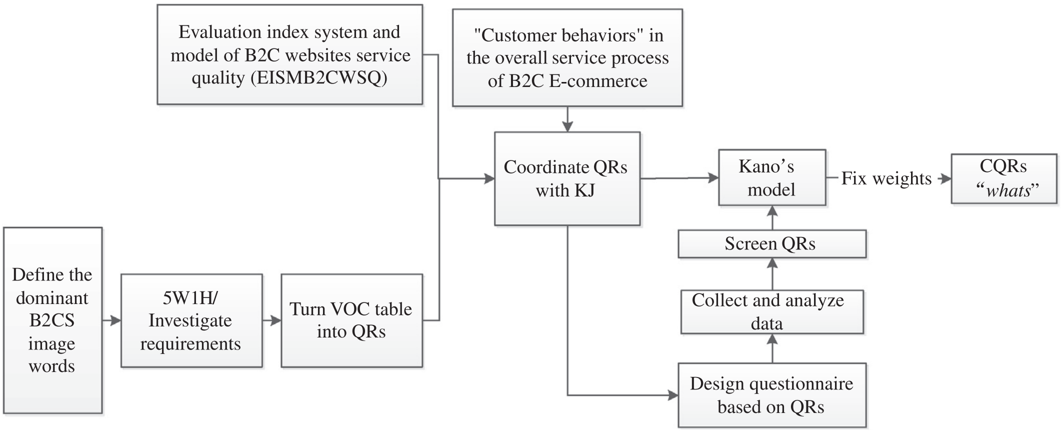
Evaluation index system and model of B2C websites service quality (EISMB2CWSQ)
"Customer behaviors" in the overall service process of B2C E-commerce
Coordinate QRs with KJ
Kano's model
Fix weights
CQRs "whats"
Screen QRs
Collect and analyze data
Design questionnaire based on QRs
Define the dominant B2CS image words
5W1H/ Investigate requirements
Turn VOC table into QRs

Fig. 1. Framework for obtaining CQRs based on HFE.

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