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研究成果報告(精簡版)

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計畫參與人員：碩士班研究生-兼任助理：林心韻、洪巧珊

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Developing an index for online customer satisfaction: Adaptation of American Customer Satisfaction Index

S.-H. Hsu *

Department of Business Administration, Chung-Hua University, No. 707, Sec. 2, WuFu Road, HsinChu, Taiwan 30067, Taiwan, ROC

Abstract

This study proposes an index for online customer satisfaction, which is adapted from an American Customer Satisfaction Index (ACSI). Since online shopping is an experience different in many ways from traditional shopping, a new index for measuring electronic-customer satisfaction index (e-CSI) is required. Thus, this study is the first step towards integrating satisfaction literature to propose an index for online contexts. The e-CSI model was tested in the context of a one month study of Taiwan's largest online retailer (PChome Online) where it was found to significantly predict customer loyalty and overall customer satisfaction. In this study, we found that the satisfaction score of PChome Online is similar to the average for the online retail industry in ACSI. This model also allows the online retailer to understand the specific factors that significantly influence overall customer satisfaction by reading the causal relationship in the e-CSI model and the strategic management map. The partial least squares (PLS) method was used to test the theoretical model and to derive the e-CSI score.
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Keywords: Customer Satisfaction Index; Online satisfaction; E-service quality

1. Introduction

In 1989, the Swedish Customer Satisfaction Barometer (SCSB) was introduced as a tool for companies to assess their efforts in achieving customer satisfaction (Fornell, 1992). The successful experience of the SCSB has inspired the creation of the American Customer Satisfaction Index (ACSI). The ACSI model was built based on two well-established theories – the quality, satisfaction, and performance (QSP) paradigm and Hirschman's (1970) exit-voice theory. The ACSI model measures the cause-and-effect relationship that runs from the antecedents of customer satisfaction level (customer expectation, perceived service quality, and perceived value) to its consequences (customer complaints and customer loyalty) (see Fig. 1). Other similar indices include European Customer Satisfaction Index, the ECSI. Many countries are conducting Customer Satisfaction Index (CSI) studies (see Table 1) because researchers have argued that the CSI can serve as a predictor of companies' profitability and market value (e.g., Anderson, Fornell, & Lehmann, 1994; Anderson, Fornell, & Rust, 1997; Eklof, Hackl, & Westlund, 1999). Moreover, the ideas of a CSI to serve as a national cross-company and cross-industry measurement instrument for customer satisfaction have been accepted as desirable goals for most studies.

However, an index for online customer satisfaction has not been validated and tested. The original CSI focuses on physical settings. Whether the model, and the specific findings of the research on it, can be generalized to online settings needs to be re-examined. Firstly, online shopping conditions differ from in-store shopping conditions: website appearance and fulfillment systems take the place of front-line employees. Secondly, each online transaction involves a number of third parties, such as credit card clearance firms and delivery companies. Finally, the spatial and temporal separation between customers, retailers, and suppliers that is imposed by electronic markets (e.g., there is no immediate gratification from online purchases) creates different challenges for e-businesses. Since online

* Tel.: +886 03 5186049; fax: +886 03 5186546.
E-mail address: spolo@mi.chu.edu.tw

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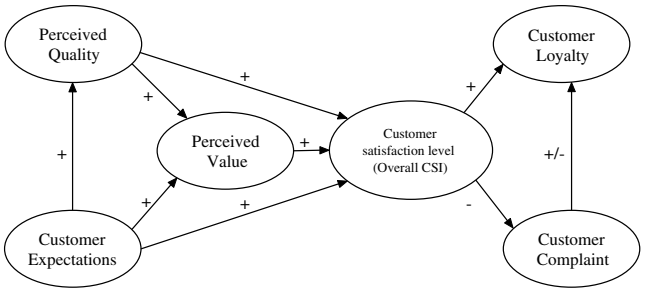

Fig. 1. The ACSI model.

Table 1
Previous customer satisfaction studies

Authors	Country of study	Level of study
Anderson et al. (1994)	Sweden	National level
Bruhn and Grund (2000)		
Fornell (1992)		
Fornell et al. (1996)	America	National level
Gronholdt et al. (2000)	Denmark	Industrial level
Kristensen et al. (2000)		
Martensen et al. (2000)		
Hackl et al. (2000)	Austria	Industrial level

shopping is an experience different in many ways from traditional shopping, a new index for measuring electronic-customer satisfaction index (e-CSI) is required. This study attempts to propose an e-CSI for online environments by adapting the original CSI model. In the following sections, we will introduce the constructs employed in the new e-CSI model.

The experience of successful e-businesses shows that satisfaction with the quality of service determines the success or failure of an e-commerce enterprise (Reichheld & Schefter, 2000; Santos, 2003), although price was initially considered to be the key driver for the success of e-businesses. Pan, Ratchford, and Shankar (2002) studied 105 online retailers and found that price dispersion is still persistent. This suggests that online markets are not especially competitive from a pricing perspective. Brynjolfsson and Smith (2000) also find that customers are willing to pay premium prices for books from online retailers that they have dealt with previously. One possible explanation is that customer satisfaction with service quality other than price influence online customers' buying decisions. When a customer experiences poor service from an online retailer, he/she stops buying products from it, and immediately disseminates the negative information to many potential customers. This means that e-service quality (e-SQ) should be the differentiating strategy for e-businesses. Zeithaml, Parasuraman, and Malhotra (2002), therefore, suggest that companies must shift their e-business focus from transactions to e-SQ. A good e-SQ company emphasizes correctly processing the order and invoice, responding to customer queries and complaints promptly, accurately delivering goods to the customer's home, properly dealing with returned goods, and maintaining its Web site well. These elements should form the bedrock of a successful e-business. However, the extant SQ literature is dominated by people-delivered services. Researchers argue that, to apply to the online context, traditional SQ needs to be modified. Some dimensions (e.g., empathy) are not relevant to online settings, whereas new dimensions (e.g., ease of navigation) must be incorporated (Cox & Dale, 2001; Li, Tan, & Xie, 2002). As the level of customer satisfaction is determined by the service quality (Fornell, 1992; Martensen, Gronholdt, & Kristensen, 2000), this study employs the findings of e-SQ to substitute for traditional service quality, which was the original construct in the ACSI model.

In the conventional ACSI model, researchers have found that the construct of customer expectation does not have a significant impact on the customer satisfaction level (e.g., Johnson, Gustafsson, Andreassen, Lervik, & Cha, 2001; Martensen et al., 2000). Researchers, therefore, suggested that the construct of customer expectation be removed from the CSI model. We suggest substituting the construct of trust for that of customer expectation in the online setting. Trust is important in all economic activities. This is even more the case with e-commerce, because customers do not deal directly with the company's staff and cannot judge whether a vender is trustworthy (Reichheld & Schefter, 2000; Urban, Sultan, & Qualls, 2000). Thus, the importance of trust in e-commerce cannot be overestimated (Gefen, Karahanna, & Straub, 2003a). The lack of physical access and the time lag between the purchase and delivery of products make online customers sensitive to an online vender's service quality and trustworthiness. Hence, this study utilizes e-SQ and trust as antecedents to online customer satisfaction.

In terms of consequences of customer satisfaction, customer satisfaction is believed to affect customer loyalty. Customer satisfaction mediates the relationship between perceived quality and customer loyalty. Customer loyalty is considered to be important because of its positive effect on long-term profitability. According to Reichheld and Schefter (2000), acquiring customers on the Internet is enormously expensive, and unless those customers stick around and make a lot of repeat purchases over the years, profits will remain elusive. As a result, it is crucial for online companies to create a loyal customer base. However, few companies seem to succeed in creating e-loyalty, and little is known about the mechanisms involved in generating it (Ribbink, Liljander, & Streukens, 2004). This study proposes that trust and customer satisfaction are important antecedents of loyalty.

This research presents important theoretical and practical contributions. On the theoretical side, we propose and empirically test an e-CSI model, which is a modified version of the ACSI model. On the practical side, this model can serve as an on-line diagnostic tool to suggest why customers are satisfied or dissatisfied; whether a company's complaints handling procedure is effective; how to improve customer satisfaction; how effective efforts at improving

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customer satisfaction have been met; and where a company stands on customer satisfaction relative to its competitors. The partial least squares (PLS) method was used to test the theoretical model and to derive the e-CSI score. The e-CSI model was tested in the context of a one month study of Taiwan's largest online retailer where it was found to significantly predict customer loyalty and overall customer satisfaction.

The organization of this study is as follows. In Section 2, we propose an e-CSI model for online retailers. In Section 3, the way in which the sample was derived and the definitions of measures are given. In Section 4, to demonstrate the model's applicability, we analyze its results. Finally, we conclude with a discussion and provide directions for future research.

2. e-CSI model

Fig. 2 shows the e-CSI model. It focuses on three key antecedents of customer satisfaction level (trust, e-SQ, and perceived value) and two consequences of customer satisfaction level (customer complaints and customer loyalty). The e-CSI model is adapted from the ACSI model, where customer expectation is replaced by trust and service quality is replaced by e-SQ, and one additional relationship is introduced (from trust to customer loyalty).

2.1. E-CSI antecedents

2.1.1. E-SQ

E-SQ has been recognized as an important factor in e-commerce (Santos, 2003), because customers still suffer from low levels of service quality. For example, customers cannot complete transactions, encounter a bad link, discover no phone number is included on the website and products are not delivered on time. Price may be important in initially attracting customers, but if a company does not provide good service, customers will not come back (Reibstein, 2002). For this reason, Zeithaml et al. (2002) suggest that companies must focus on e-SQ.

Academic research has made progress in several areas concerning e-SQ, particularly in defining what e-SQ is, identifying its underlying dimensions, and determining how it can be conceptualized and measured (Luarn & Lin, 2003; Yang, Cai, Zhou, & Zhou, 2005). By definition, service quality can be judged by all encounters with a service firm (Parasuraman, Zeithaml, & Berry, 1985). Given the lack of human interaction in Internet shopping, a customer's experience with an online retailer is largely built upon his/her interactions with its Web site. Thus, e-SQ is defined broadly to encompass all phases of a customer's interactions *with a Web site*, including all cues and encounters that occur before, during, and after the transactions. Customers perceive the service as an overall process and outcome (van Riel, Liljander, & Jurriens, 2001). The traditional SQ literature is dominated by people-delivered services. Thus, its results cannot be directly extended to e-SQ contexts (Li et al., 2002). For example, traditional measures of SERVQUAL (service quality) do not consider such factors as ease of navigation, site aesthetics, and security. Also, some traditional aspects of SERVQUAL may not be as important in the context of e-businesses. For instance, many consumers do not necessarily expect to encounter much "empathy" in an online environment, except when they have questions or problems (Zeithaml et al., 2002). Several new measures therefore have been devised to address this (e.g., .comQ and WebQual). In particular, Zeithaml et al. (2002) did a literature review on e-SQ and suggest that its dimensions should include (1) information availability and content, (2) ease of use or usability, (3) privacy/security, (4) graphic style, and (5) fulfillment. These dimensions form the core of e-SQ. Although researchers may use different constructs, in essence, they are quite similar to those proposed by Zeithaml et al. (2002). An introduction to the five dimensions follows.

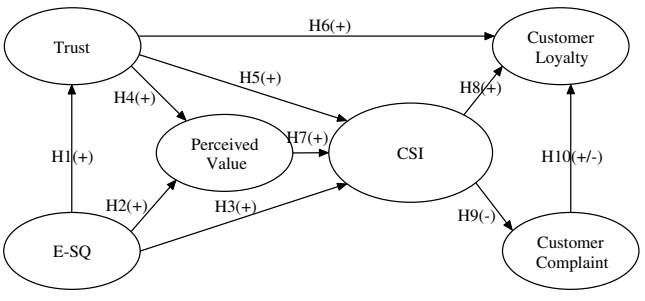

Fig. 2. The e-CSI model.

(1) Information availability and content. Information is an important resource for online consumers, because they can obtain it directly from a Web site rather than having to go through salespeople in an offline store. DeLone and McLean (1992) highlight that the importance of information includes its relevance, timeliness (e.g., a continuous update), and accuracy (e.g., a detailed product description and transparent price information).
(2) *Ease of use*: Ease of use appears to be important, because Internet-based transactions are complex and intimidating for many customers. It involves ease of navigation, intuitiveness, user interface, and search facilities that minimize customer effort in online shopping (Yang et al., 2005). Lohse and Spiller (1998) find that as much as 61% of sales and 7% of traffic could be explained by product list navigation, which helps customers discover related items and other useful information. Iwarrden, Wiele, Ball, and Millen (2004) also suggest that many customers abandon their shopping carts on the Internet because they are frustrated with the design of the Web site.
(3) *Privacy/security*: In the absence of face-to-face contact, people need a lot of reassurance before they will

hand over personal details. Moreover, consumers with no Internet shopping experience simply do not believe that there is sufficient security in the payment systems. As Web sites often collect a variety of sensitive personal information, privacy involves the protection of that information and security involves the protection of users from the risk of fraud and financial loss through the use of their credit cards (Zeithaml et al., 2002). It has long been argued that online security and privacy are consumers' major concerns when they decide whether or not to engage in electronic transactions.

(4) *Graphic style*: Web sites often contain texts, graphics, and multimedia to compensate for the inherent constraints of online shopping. Graphic style involves such issues as color, layout, print size, and so on. Iwarrden et al. (2004) suggest that the need to have an attractive Web site is paramount.

(5) *Fulfillment/reliability*: An online company must understand that e-business involves not only the front-end process (e.g., the design of the website), but also back-end processes (e.g., order fulfillment, delivery, and returns). A poor back-end process can frustrate online customers and keep them from shopping again. Fulfillment involves such back-end processes as on-time delivery, correctness of order fulfillment, billing accuracy, and Web connection speed.

Service quality has been considered to be one of the primary drivers of customer satisfaction (Anderson & Sullivan, 1993; Kristensen, Martensen, & Gronholdt, 2000; Martensen et al., 2000). In a similar vein, researchers view e-SQ as an antecedent of customer satisfaction (Ribbink et al., 2004). e-SQ is expected to have a positive effect on trust and perceived value, because favorable service can increase a customer's trust in a service provider and enhance his/her perception of what is received (Fornell, Johnson, Anderson, Cha, & Bryant, 1996). We therefore hypothesize the following.

Hypothesis 1. The level of e-SQ is positively associated with the level of perceived trust.

Hypothesis 2. The level of e-SQ is positively associated with the level of perceived value.

Hypothesis 3. The level of e-SQ is positively associated with the level of customer satisfaction.

2.1.2. Trust

Purchasing online is considered to be more risky and uncertain than traditional shopping, because business is conducted at a distance. Customers cannot look a sales clerk in the eye; they cannot physically check the quality of a product before making a purchase; there is no immediate gratification from online purchases; and they cannot monitor the safety of sending sensitive information over the Internet (Reichheld & Schefter, 2000). As a result, online vendors can easily take advantage of online consumers through unfair pricing, the conveyance of inaccurate information, violations of privacy, and the unauthorized use of credit card information (Jarvenpaa & Tractinsky, 1999). A customer's perceived trust in a site can affect his/her willingness to take the risk of buying something that he/she cannot physically inspect. Thus, the role of trust is important in an e-commerce setting (Papadopoulou, Andreou, Kanellis, & Martakos, 2001; Urban et al., 2000). Lack of trust is one of the most frequently cited reasons for consumers not to make purchases from online shops (Lee & Turban, 2001).

Trust is proposed as an important antecedent of loyalty (Chiou, 2004; Reichheld, 2001), because it helps initially to attract new online customers and later to retain existing ones (Gefen et al., 2003a). Consumers' perceived trust can also influence their overall satisfaction (Chiou, 2004), because trust is an important factor in consumer outcome evaluation. Trust not only directly affects loyalty and satisfaction levels, but it also affects them indirectly through perceived value (Chiou, 2004). Perceived trust in an online vender can create value by providing relational benefits that are derived from interaction, thus reducing the uncertainty of the exchange. Accordingly, trust is expected to have a positive impact on perceived value, customer satisfaction levels, and customer loyalty. We hypothesize

Hypothesis 4. The level of perceived trust is positively associated with the level of perceived value.

Hypothesis 5. The level of perceived trust is positively associated with the level of customer satisfaction.

Hypothesis 6. The level of perceived trust is positively associated with the level of customer loyalty.

2.1.3. Perceived value

Parasuraman, Zeithaml, and Berry (1988) define perceived value as the consumer's overall assessment of the utility of a product, based on perceptions of what is received and what is given. It is the trade-off between a received benefit (i.e., the benefits that a buyer derives from a seller's offering) and a cost (i.e., the buyer's monetary and non-monetary costs in acquiring the offering). The importance of perceived value in e-commerce stems from the fact that it is easy to compare product features and prices online (Anderson & Srinivasan, 2003). Past research has shown that perceived value is an important antecedent of overall satisfaction (Chiou, 2004; Fornell et al., 1996). Moreover, adding perceived value to the CSI model increases the comparability of results across firms, industries, and sectors, because price information is added into the model (Anderson & Fornell, 2000).

Hypothesis 7. The level of perceived value is positively associated with the level of customer satisfaction.

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2.2. E-CSI consequences

2.2.1. Loyalty

Customer loyalty has been defined as a "deeply held commitment to rebuy or repatronize a preferred product/service consistently in the future" (Oliver, 1999). This general definition also applies to e-loyalty. Loyal customers visit a Web site more frequently than newly acquired customers do, and they can be served at a reduced operating cost. As is the case with in-store shopping, customer behavior becomes routine after a while. Once an online customer has become accustomed to shopping at a particular site, his/her buying decision process becomes habitual (Alba & Hutchinson, 1987). Even better, because it is relatively easy for an online store to extend its range of products, such habitual behavior will prompt online customers to consolidate their purchases in one primary store. In addition, loyal customers are more likely to provide free word-of-mouth advertising. The combination of all of these economic factors means that the value of loyalty is often greater on the Internet than it is in the physical world (Reichheld & Schefter, 2000).

Customer satisfaction is widely recognized as a key influence in the formation of consumers' future purchase intentions (Taylor & Baker, 1994). Satisfied customers are more likely to tell others of their favorable experience and, thus, engage in positive word-of-mouth advertising (File & Prince, 1992). We, therefore, expect to see a positive relationship between customer satisfaction level and customer loyalty. We hypothesize

Hypothesis 8. The level of customer satisfaction is positively associated with the level of customer loyalty.

2.2.2. Complaints

A complaint can be defined as a conflict between the customer and the organization. Fornell et al. (1996) argue that the immediate consequence of increased customer satisfaction is a decrease in customer complaints and, hence, suggest that the relationship between customer satisfaction level and customer complaints should be negative.

The relationship between the level of customer complaints and the level of customer loyalty depends on the efficacy of a firm's complaint-handling capabilities. If the relationship between the level of customer complaints and the level of customer loyalty is positive, then the firm is successfully turning complaining customers into loyal customers and vice versa (Fornell, 1992). We hypothesize

Hypothesis 9. The level of customer satisfaction is negatively associated with the level of customer complaint.

Hypothesis 10. If the relationship between the level of customer complaints and the level of customer loyalty is positive, then the firm is successfully turning complaining customers into loyal customers and vice versa.

3. Methods

3.1. Research site and data collection

The setting for the study was PChome Online[1] shopping mall from May to June 2006. PChome Online is the largest online retailer in Taiwan; its monthly revenue exceeded NT$2 billion in August 2004, and it sells more than 400,000 products, including consumer electronics, computers, books, music, etc. PChome Online's growth in sales demonstrates the value of its online model. All data came from survey respondents had purchased a product from PChome Online before. After a new purchase is made, a banner ad requests buyers to complete a survey. After deleting cases with ambiguous values out of the 266 respondents, we obtained a final sample of 208 customers.

3.2. Measures

A survey was designed to tap into the proposed e-CSI model. Whenever possible, previously tested questions were used. In particular, in order to compare the results of e-CSI and ACSI, we employed most of the questionnaires from the ACSI study. In designing the questionnaire, a 10-point Likert scale (strongly disagree to strongly agree) was used to reduce the statistical problem of extreme skewness (Fornell, 1992). A preliminary survey was tested with 15 customers. We then refined the script according to their comments. The format and content of the questionnaire were also pre-tested on doctoral students and faculties who are familiar with the issue of e-business.

e-SQ was measured by 13 items. We sought to identify the characteristics of e-SQ by referring to its dimensions (information, ease of use, privacy, graphics, and fulfillment) in focus groups. The major purpose of these focus groups, three of which were convened, was to identify the factors that are salient to customers in evaluating e-SQ. The participants of the groups were undergraduate students of a major university. They were asked to discuss and then identify which attributes were most important to them in selecting a store to buy from. Based on the previous survey questions and the results of the focus groups, a list of 13 items were identified. Information availability and content were measured by (1) up-to-date information and (2) relevant information of value to the customer. Fulfillment was measured by (1) on-time delivery, (2) correctness of order fulfillment, (3) Web connection speed, (4) returns process for unsatisfactory or defective products, and (5) performance of the customer service department. Ease of use was measured by (1) logical layout of the product list and (2) search facilities. Security/privacy was measured by (1) proper use of personal information and (2) confidentiality of customer information. Graphic style

[1] http://shopping.pchome.com.tw/.

was measured by (1) the attractiveness of the Web site and (2) its professional appearance.

To investigate trust, we adopted the Gefen, Karahanna, and Straub (2003b) questions and reworded them to fit our online retailer context as (1) "PChome Online cares about customers" and (2) "PChome Online is trustworthy."

Perceived value refers to the perceived level of product quality relative to the price paid, and it was measured by (1) price relative to quality and (2) quality relative to price (Fornell et al., 1996).

The customer satisfaction level represents a cumulative evaluation of a firm's offerings. It is a fundamental indicator of a firm's past, current, and future performance, instead of specific transactional information about a particular product or service encounter. It was operationalized through three survey measures: (1) an overall rating of satisfaction, (2) the degree to which performance falls short of or exceeds expectations, and (3) the rating of performance relative to the customer's ideal good or service (Fornell et al., 1996).

Customers may feel dissatisfied with a specific transaction and have complaints about PChome Online. In our questionnaire, customer complaints were measured by whether a customer had complained either formally or informally when they were dissatisfied with the company (Fornell et al., 1996).

To measure customer loyalty, we operationalized it through two survey measures: (1) customers' intention to recommend to others and (2) "I try to use PChome Online's website whenever I need to make a purchase" (Srinivasan, Anderson, & Ponnavolu, 2002).

4. Results

The research model was tested using PLS, a structural equation modeling technique that is well suited to highly complex predictive models (Wold, 1985). PLS has several strengths that made it appropriate for this study, including its ability to handle both reflective and formative constructs, and the nonnormality of the data, and the limited sample size (Hsu, Chen, & Hsieh, 2006). As a by-product of the PLS design, the estimated weights can be used to construct index scores. These scores represent a uniform and comparable system of measurement that allows for systematic benchmarking over time and across firms.

In a PLS estimation, the user needs to specify indicators as formative or reflective of their latent constructs. Reflective items represent the effects of the construct under study. Formative measures are items that cause the construct under study. Because e-SQ involves five different dimensions, we treated the indicators as formative for e-SQ. Other constructs have reflective relationships with their indicators.

Before we proceeded, we tested the adequacy of our measurement model by looking at: (1) individual item reliabilities, (2) the convergent validity of the measures associated with individual constructs, and (3) discriminate validity. First, in PLS, item reliabilities are assessed by examining loadings (see Table 2). All loadings of the reflective indicators exceeded the recommended threshold of 0.7 (Carmines and Zeller, 1979). In the case of formative measures, all item measures can be independent of one another, because they are viewed as items that create the construct. Thus, high loadings are not necessarily true, and reliability assessments such as Cronbach's alpha are not applicable. Under this situation, Chin (1998) suggests that the weight of each item be used to assess how much it contributes to the overall factor.

Second, to assess the convergent validity of constructs, researchers using PLS report the internal consistency and discriminant validity. In order to assess the convergent validity of constructs, researchers using PLS report the internal consistency measure that was developed by Fornell and Lacker (1981), and which is similar to Cronbach's

Table 2
Measurement variables used in e-CSI model

	Weights
e-SQ	
Formative indicators	
Relevance and value of information to the customer	0.11
Up-to-date information	0.04
On-time delivery	0.17
Correctness of order fulfillment	0.22
Web connection speed	0.15
Returns process for unsatisfactory or defective products	0.09
Performance of customer service	0.29
Logical layout of product list	0.02
Search facilities	0.02
Proper use of personal information	0.05
Confidentiality of customer information	0.03
Attractiveness of the Web site	0.17
Professional appearance of the Web site	0.12
	Loadings
Trust	
Reflective indicators, internal consistency = 0.95	
PChome Online cares about customers	0.95
PChome Online is trustworthy	0.95
Perceived value	
Reflective indicators, internal consistency = 0.94	
Rating of quality given price	0.94
Rating of price given quality	0.95
Overall CSI	
Reflective indicators, internal consistency = 0.96	
Overall satisfaction	0.94
Satisfaction level compared with expectation	0.93
Satisfaction level compared with an ideal online retailer	0.94
Customer complaints	
Reflective indicators, internal consistency = 1	
Has the customer complained either formally or informally about the product or service?	1
Customer loyalty	
Reflective indicators, internal consistency = 0.97	
Customers' intention to recommend to others	0.95
I try to use PChome Online's website whenever I need to make a purchase	0.95

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Table 3
Discriminant validity

Latent variables	1	2	3	4	5	6
1. E-SQ	0.83[a]					
2. Trust	0.75	0.97				
3. Perceived value	0.86	0.72	0.94			
4. Overall CSI	0.80	0.73	0.81	0.93		
5. Customer complaint	−0.22	−0.25	−0.23	−0.28	1	
6. Customer loyalty	0.73	0.68	0.72	0.82	−0.25	0.97

[a] Diagonal elements in bold are square roots of average variance extracted.

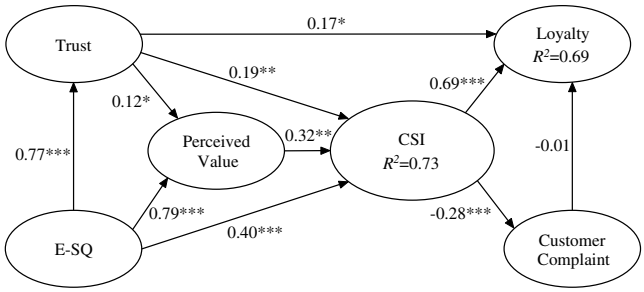

Fig. 3. Path estimates of the e-CSI model ($^{+}p < 0.1$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$).

alpha. However, Fornell and Lacker argue that their measure is more appropriate than Cronbach's alpha, because it uses the item loadings obtained with the causal model. Table 2 lists the internal consistency of each reflective construct. All internal consistency reliability measures were above the recommended level of 0.70 (Nunnally, 1978).

To assess discriminant validity, Fornell and Lacker (1981) suggest the use of Average Variance Extracted (AVE), which should be greater than the variances shared between the constructs. Discriminant validity is an assessment of the extent to which a construct of interest differs from other constructs. The comparison can be made in a correlation matrix (see Table 3), including the correlations between different constructs in the off-diagonal elements of the matrix, and the square roots of the AVE for each of the constructs along the diagonal. For adequate discriminant validity, the diagonal elements should be greater than the off-diagonal elements in the corresponding rows and columns. After examining the results, we found that except for e-SQ against perceived value, all other constructs have adequate discriminant validity. Although not perfect, the level of fit seems sufficient to proceed with an assessment of the structural equation models.

4.1. Structural equation model

Having established confidence in our measurement model, we examined the main effects. The test of the structural equation model includes an estimation of the path coefficients and R^2 values. The path coefficients indicate the strengths of the relationships between the dependent and independent variables, and R^2 values represent the amount of variance explained by the independent variables. The overall model explained 73% of the variance in customer satisfaction. In addition, the model explained 69% of the variance in customer loyalty. Considering the fact that a number of factors might affect these construct, the amount of variance explained by this model is good enough, which adds support to the theoretical soundness. Using LVPLS version 1.8 (Lohmoller, 1981), we determine the path coefficients. To further test the path significance, we employed jackknife methods. All of the path estimates are statistically significant, except for that running from customer complaint to customer loyalty (see Fig. 3).

To realize the efficacy of a firm's complaint-handling capability, we examined the path relationship between customer complaint and customer loyalty. The path coefficient from customer complaint to customer loyalty is negative, and it is not statistically significant ($\beta = -0.01$, p n.s.). This implies that PChome Online was not effectively handling customer complaints, which meant that complaining customers did not turn into loyal ones.

Customer satisfaction had a positive effect on customer loyalty ($\beta = 0.69$, $p < 0.001$) and a negative effect on customer complaint ($\beta = -0.28$, $p < 0.001$). Therefore, hypothesis 8 and 9 were supported. Trust was found to be positively associated with customer loyalty ($\beta = 0.17$, $p < 0.05$), customer satisfaction ($\beta = 0.19$, $p < 0.01$), and perceived value ($\beta = 0.12$, $p < 0.05$). Thus, hypothesis 4, 5 and 6 were supported. Perceived value had a positive effect on customer satisfaction ($\beta = 0.32$, $p < 0.01$). Hypothesis 7 was supported. E-SQ showed a positive effect on trust ($\beta = 0.77$, $p < 0.001$), perceived value ($\beta = 0.79$, $p < 0.001$), and customer satisfaction ($\beta = 0.40$, $p < 0.001$). Hypothesis 1, 2 and 3 were therefore confirmed.

To examine the effects of antecedent constructs on overall e-CSI, we look at the total effect of each construct (e.g., the total effect of trust on overall e-CSI = [trust on overall e-CSI] + [trust on perceived value] × [perceived value on overall e-CSI]). The total effects of e-SQ, trust, and perceived value on overall e-CSI are 0.83, 0.23, and 0.32, respectively. Accordingly, e-SQ has the greatest impact on overall CSI.

The R^2 values for overall CSI and customer loyalty are 0.73 and 0.69, which is similar to the results of the ACSI study.[2] The CSI score[3] was 80.9 (transformed to a 0- to 100-point scale to facilitate comparisons), which is similar to the average for the online retail industry in the United States in 2005[4] (CSI score = 81).

[2] The average R^2 values of overall CSI and loyalty are 0.75 and 0.36 in the ACSI study (see Fornell et al., 1996).

[3] The formula of the CSI score is, CSI score $= \frac{\sum_{i=1}^{3} w_i \bar{x}_i - \sum_{i=1}^{3} w_i}{9 \sum_{i=1}^{3} w_i} \times 100$, where w_i are the weights.

[4] The ACSI score for the online retailing industry can be obtained at: http://www.theacsi.org/fourth_quarter.htm.

4.2. Strategic management map

To examine the relative importance of each quality attribute, we build a strategic management map. Based on the results presented in the strategic management map, managers can prioritize areas for improvement. To build a strategic management map, we need to determine how much each quality attribute contributes to the e-SQ and the scores of the quality attributes (Hsu, Chen, & Hsueh, 2006). Although it is not easy to estimate the contributions of quality attributes (Yang, 2003), PLS provides these sets of estimates. A strategic management map consists of four quadrants: "do better", "keep up", "education", and "no change" areas (see Fig. 4). Managers can determine the size of each quadrant strategically based on a company's strategy and resources. For example, if a company has only limited resources and wants to identify the most critical items for improvement, it can shrink the size of the "do better" area by setting a high-threshold value on estimated weights (i.e., how much each quality attribute contributes to the e-SQ) and setting a low-threshold value on scores (i.e., the scores of the quality attributes).

The quality attributes in the "do better" quadrant (performance of customer service, correctness of order fulfillment, attractiveness of the website, and on-time delivery) need the most attention from managers. These quality attributes are very important when companies achieve low performance. Improvement in this quadrant would have the highest positive impact. The quality attributes in the "keep up" quadrant (Web connection speed) should be well maintained. These quality attributes are important for achieving high performance. However, lessening effort in this quadrant would have a significant negative impact. In addition, companies should try to educate their customers about the factors in the "education" quadrant (relevance and value of information, proper use of personal information, and attractiveness of the Web site). Although companies can perform well in this quadrant, these quality attributes are not critically important. Through active and persuasive education about the importance of these factors, companies can turn these quality attributes into competitive advantages. Finally, the quality attributes in the "no change" quadrant (up-to-date information, returns process, logical layout of the product list, professional appearance of the website, and search facilities) should receive the least attention from managers. Improving the quality attributes in this quadrant has the least positive effect.

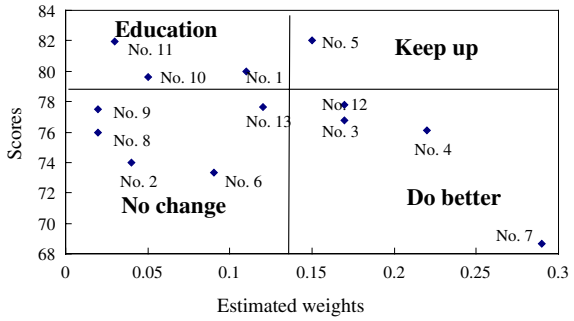

Fig. 4. Strategic management map. *Note*: No. 1 refers to the relevance and value of information, No. 2 refers to up-to-date information, No. 3 refers to on-time delivery, No. 4 refers to correctness of order fulfillment, No. 5 refers to Web connection speed, No. 6 refers to the returns process, No. 7 refers to performance of customer service, No. 8 refers to logical layout of product list, No. 9 refers to search facilities, No. 10 refers to proper use of personal information, No. 11 refers to confidentiality of customer information, No. 12 refers to attractiveness of the website, and No. 13 refers to the professional appearance of the website.

It is interesting to note that three of the four quality attributes belong to the fulfillment dimension. This suggests that the online retail should focus more on the fulfillment aspects to improve customer satisfaction. This finding coincides with previous research which indicated fulfillment ratings were the strongest predictor of customer satisfaction (Wolfinbarger & Gilly, 2001). Ariely and Carmon (2000) also contend that the fulfillment aspects of the purchase process might play a greater role than the level of information that is provided or the amount of choice that is available to the consumer.

5. Conclusion and future research directions

This study proposes an e-CSI model, which is adapted from an ACSI model. It is the first step towards integrating satisfaction literature to propose an index for online contexts. The results of an e-CSI can be compared with findings of ACSI. In this study, we found that the satisfaction score of PChome Online is similar to the average for the online retail industry in ACSI. This model also allows the online retailer to understand the specific factors that significantly influence overall customer satisfaction by reading the causal relationship in the e-CSI model and the strategic management map.

According to some commentators, the ability of online shoppers to obtain in-depth price comparisons and switch retailers at the click of a mouse would inevitably lead to a frictionless market in which only the price leaders would survive. However, price is not the only factor that determines the success or failure of an e-business. Online companies that attempt to attract consumers by offering the lowest price may attract the most price-sensitive and least loyal customer, who is likely to go to another site next time if it happens to offer a lower price (Reibstein, 2002). Moreover, the experience of successful e-businesses shows that satisfaction with service quality determines the success or failure of e-commerce. This study further confirms that customer satisfaction is the leading factor that determines online customers' loyalty ($\beta = 0.69$, $p < 0.001$). We believe that customer satisfaction is even more important in the online context, because some online intermediaries (e.g., Epinion.com) provide platforms for consumers to post their reviews of online retailers. More and more customers will read these reviews before they make a purchase. One customer's negative experience with a certain retailer can

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be disseminated among many potential consumers, which is not the case in traditional shopping environments. Thus, understanding the factors that influence online customer satisfaction is of great importance to e-businesses.

Trust makes a positive impact on customer loyalty, customer satisfaction, and perceived value. When customers cannot physically examine the quality of a product or service, they have a higher level of uncertainty about the purchase outcome and more hesitation in making the purchase. Trust can decrease the perceived risk of using a service. The results suggest that a trustworthy image is a critical asset to influence customer willingness to take part in e-commerce.

The results also suggest that e-SQ may be more important than other factors (e.g., trust and perceived value) in determining customer satisfaction. To deliver superior service quality, an online business must first understand how customers perceive and evaluate its service quality. The strategic management map can be used to help determine how to improve e-SQ. Specific areas in which the online retailers' improvement can have a significant impact include the performance of customer service, the correctness of order fulfillment, the attractiveness of the Web site, and on-time delivery. That is, the online retailer must answer customers' complaints and queries properly, process orders accurately, deliver products on time, and improve the appearance of the site.

Wolfinbarger and Gilly (2001) suggest that the first opportunity to cement customers to an online brand comes when they have a problem with the order; customer loyalty increases substantially when online vendors are willing and able to solve a situation quickly. McCollough and Bharadwaj (1992) refer to such a situation (in which effective recovery leads to higher customer loyalty than if no problem had occurred) as the "paradox of service recovery". Thus, an investment in complaint handling can help to build customer commitment. The online retailer should improve its customer complaint handling, so that dissatisfied customers will turn into loyal customers.

The greatest deficiency of this study is that the findings are based on a one-site sampling scheme, which limits their generalizability. However, this deficiency notwithstanding, this study provides important theoretical and practical contributions.

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