

A framework to identify factors affecting the performance of third-party B2B e-marketplaces: A seller's perspective

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Abstract This study conducted exploratory research to determine factors affecting the performance of third-party B2B e-marketplaces from a seller's perspective. Building on the relevant literature, ten factors were proposed and mapped into the domain-specific model for e-marketplaces. The performance of e-marketplaces was measured in terms of customer loyalty and trading volume. The proposed model was tested on data from 200 selling companies in Thailand participating in various third-party B2B e-marketplaces. The exploratory factor analysis generated seven factors. Partial least squares structural equation modeling was employed to test the research model. There were three major findings. First, the reputation of e-marketplace and trust in market makers, as well as transaction cost reduction and website usability, had significant effects on customer loyalty. Second, website reliability had a positive impact on trading volume. Finally, the relative advantage and number of buyers had significant effects on both customer loyalty and trading volume. These findings reveal factors previously unreported in the literature on e-marketplaces, and they can be used by practitioners to improve performance.

Keywords B2B e-marketplaces · Performance · Electronic marketplace · Business-to-business · B2B e-commerce

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Introduction

The Internet has significantly changed the manner in which businesses and markets operate throughout the world. Many business-to-business (B2B) models are shifting from legacy systems, which involve the exchange of electronic business documents between application systems (EDI), to open and ubiquitous online platforms that allow buyers and sellers from anywhere in the world to trade on the Web with ease. Today, e-marketplace business models play a crucial role in global business (Alt and Zimmermann 2016; Wang and Cavusoglu 2015).

B2B e-marketplaces are Internet-based inter-organizational trading platforms that aggregate buyers and sellers; facilitate the exchange of information, products, and services; and support transactions between organizations. They serve as intermediaries in B2B e-commerce, the largest form of e-commerce. They create economic value for buyers, sellers/suppliers, industries, and the economy as a whole (Laudon and Traver 2015).

Despite the proliferation of B2B e-marketplaces and their benefits, many e-marketplaces have failed in recent years. One of the major reasons contributing to such failures is the poor performance of B2B e-marketplaces (Wang et al. 2012). On the academic side, e-marketplaces have become an increasingly important field of research since the tremendous rise in the number of e-marketplaces such as Alibaba and Amazon (Alt and Zimmermann 2014). Alt and Klein (2011) and Standing et al. (2010) highlighted the importance of the study of e-marketplaces from a practical perspective. However, a coherent theory of B2B e-marketplace performance does not exist, and little attention has been given to investigating the performance of such e-marketplaces. Previous studies called for more empirical research on B2B e-marketplace performance (Matook 2013; Wang et al. 2012).

In the literature on B2B e-marketplaces, considerable attention has been paid to determinants for adopting and using them

(Loukis et al. 2011; Hadaya 2008; Saprikis and Vlachopoulou 2012). Many studies have focused on critical success factors based primarily on case studies (Johnson 2013; Balocco et al. 2010; Rosenzweig et al. 2011). Several models for assessing the success of B2B e-marketplaces have been developed according to syntheses attained in the literature without empirical verification (Beige and Abdi 2015; Deng and Molla 2008). The findings in these studies have not yet been verified or generalized. Most prevalent studies have focused on buyers (Kim and Ahn 2007; Rao et al. 2007) and market makers—the institutions that operate e-marketplaces (Matook 2013; Wang et al. 2012)—whereas the supply side of B2B e-marketplaces has been largely ignored, despite the crucial role of sellers in the success of e-marketplaces (Janita and Miranda 2013a; Wang and Cavusoglu 2015).

The above literature survey highlights important gaps. The objective of this study is to determine the factors that affect performance of third-party B2B e-marketplaces from the seller's perspective. This study focuses on third-party B2B e-marketplaces, those operated by independent third-party entities, because of the increasing importance of this kind of e-marketplace for small- to medium-sized enterprises (SMEs) and for the growing number of e-commerce marketplaces, and because of the significant increase in the number of SMEs using third-party B2B e-marketplaces (Wang and Cavusoglu 2015). Furthermore, previous works have highlighted the scarcity of research on this kind of e-marketplace (Wang and Cavusoglu 2015; Wang et al. 2012). The research questions that motivate this study are: (1) What are factors influencing the performance of third-party B2B e-marketplaces? (2) What framework can be used as a theoretical foundation to study the performance of third-party B2B e-marketplaces? The findings here reveal factors, hitherto unreported in the literature on e-marketplaces, that can be used by practitioners to improve performance of third-party B2B e-marketplaces.

Literature review

Third-party B2B E-marketplaces

E-marketplaces have three main functions: aggregating and matching buyers and sellers, facilitating such transactions as e-catalogues and auctions, and maintaining institutional infrastructures, such as legal and regulatory frameworks (Bakos 1998). Furthermore, third-party B2B e-marketplaces may also offer value-added services, which supplement the functionality of an e-marketplace, such as transaction-related services (e.g., financial and logistical services) and information-related services (e.g., industry news) (Stockdale and Standing 2003).

The popularity of third-party B2B e-marketplaces is due to their potential benefits to business. A key benefit of third-party B2B e-marketplaces is that they enhance market

efficiency. According to economic theory, market efficiency is gained through market aggregation, which provides buyers with wider sourcing options, sellers with wider market reach, and both with lower transaction cost (Hadaya 2008; Rao et al. 2007). Alibaba, the world's largest B2B e-marketplace, is a very successful example.

There are several well-known third-party B2B e-marketplaces in Thailand. Examples include Thaitrade, Pantavanij, and Nanasupplier. They focus on providing market-oriented functionalities such as e-catalogues, aggregating buyers and sellers, and business matching. Thaitrade and Pantavanij offer a wide range of product categories in various industries including agriculture, apparel, chemical, electrical equipment, food and beverage, machinery, jewelry, etc. Nanasupplier focuses on industrial goods sector, offering a wide range of product categories including automation and electronics, industrial equipment, machinery, etc.

Domain-specific model for E-marketplaces

Schmid and Lindemann (1998) developed a two-dimensional reference model for e-markets (EM-RM) that explains the core elements of an e-market platform and exchange processes among e-market participants. The horizontal dimension describes three phases of market transactions: information phase, agreement phase, and settlement phase, and the vertical dimension consists of four views, namely the business view, transaction view, market service view, and infrastructure view, that integrate different aspects of e-markets. The EM-RM has received recognition as the conceptual architecture for e-marketplaces.

Matook and Vessey (2008) tailored the EM-RM to B2B e-marketplaces and developed a domain-specific model for e-marketplaces (Fig. 1). They described factors related to the four views of e-marketplaces as follows: The business view involves factors capturing the business model, rules, and goals to sustain long-term business operations. The transaction view involves factors focusing on technology-enabled transactions necessary to support the business view and the environment in which e-marketplace transactions occur. The market service view involves factors focusing on service offerings and ways in which e-marketplaces seek to encourage participants to do business. The infrastructure view involves factors capturing IT support for all other views to ensure smooth operation of e-marketplaces.

E-marketplace performance

O'Reilly and Finnegan (2009, 154) defined e-marketplace performance as “the extent to which the electronic marketplace provides and improves value for its owners, how efficient it is in performing its tasks and meeting its objectives, while continuing to innovate, grow and expand.” They

indicated that there are no universally accepted criteria to assess the performance of B2B e-marketplaces. Büyüközkan (2004, 762) defined e-marketplace performance as “the efficiency and effectiveness of actions of an e-marketplace.” A number of factors have been proposed for assessing B2B e-marketplace performance. For example, Wang et al. (2012) used the number of companies participating in the e-marketplace and financial indicators as performance measurements. Matook (2013) identified 16 goals for measuring performance of B2B e-marketplaces; examples are trading volume, customer loyalty, and number of buyers. O’Reilly and Finnegan (2009) proposed trading volume, the number of transactions, adoption levels, and e-marketplace revenues as B2B e-marketplace performance measurements.

Critical success factors

Bullen and Rockart (1981, 7) defined critical success factors (CSFs) as “the limited number of areas in which satisfactory results will ensure successful competitive performance for the individual, department, or organization.” Past research has indicated that performance and CSFs are correlated and has applied CSFs to measure website performance (Lee and Morrison 2010) and e-commerce success (Gide and Wu 2006). Many studies have identified CSFs for B2B e-marketplaces, such as critical mass, reputation, trust, and rich content (Balocco et al. 2010; Johnson 2013).

Website evaluation

A website is a gateway and the primary infrastructure of a third-party B2B e-marketplace. Website performance influences customer satisfaction and purchase decisions (Bai

et al. 2008; Loiacono et al. 2007). Many approaches to and criteria for evaluating websites have been proposed. However, to date there is no universally accepted approach for website evaluation (Chiou et al. 2010). Since a third-party B2B e-marketplace is also a web-based information system, relationships determined for website evaluation in general can be applied to third-party B2B e-marketplaces.

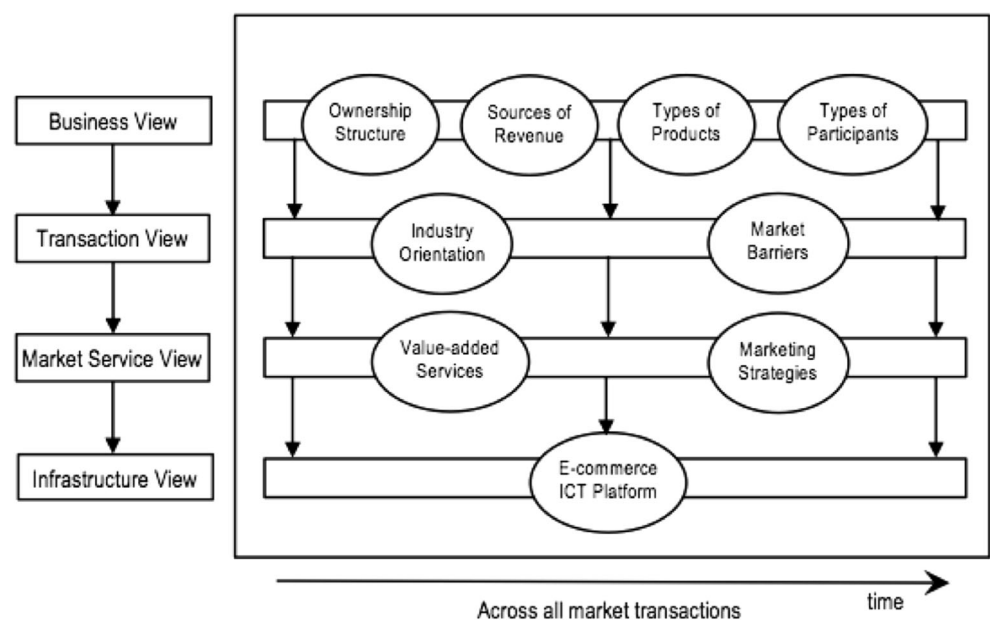
Trust concepts

Trust is a crucial factor from relationship theories that may play a role in the success/failure of an e-marketplace. Trust is viewed in various ways depending on the context. Luhmann (1979) distinguishes between personal trust, based on familiarity, and system trust or trust in the reliable functioning of certain systems. Previous studies (Hong and Cho 2011; Pavlou and Gefen 2004) viewed trust in an e-marketplace context as consisting of two categories: intermediary trust and seller trust. They emphasized the key role of the intermedidiary in an e-marketplace in building a trustworthy trading environment as a whole.

Conceptual model

This study extends the study of [blindref] and uses its framework for conceptualizing and validating factors affecting the performance of third-party B2B e-marketplaces. The conceptual model was developed by integrating B2B e-marketplace framework, trust concepts, CSFs, and website evaluation studies. To simplify the conceptual model, this study followed Matook’s (2013) approach by using the domain-specific model of e-marketplaces (Matook and Vessey 2008)—consisted of the four views namely business view, transaction view, market

Fig. 1 The domain-specific model for e-marketplaces



service view, and infrastructure view—as the meta-model for this study.

An initial pool of factors relating to the performance of B2B e-marketplaces was derived from the literature; this pool of factors was then analyzed to combine sub-attributes into higher level factors. The candidate list of factors covered various perspectives of a third-party B2B e-marketplace. Each factor was then mapped into the most relevant corresponding view of the model. Finally, based on the most frequent citations of the factors in the literature and the results of interviews with experts, ten factors were proposed to contribute to the performance of third-party B2B e-marketplaces.

The choice to categorize the proposed factors along the four views of the domain-specific model of e-marketplaces was inspired by Matook and Vessey (2008) and Matook (2013), who used the same views to explore types of B2B e-marketplaces and to group performance measures for B2B e-marketplaces, respectively. Furthermore, the four views of the model comprehensively cover the essential perspectives of B2B e-marketplaces. These reasons underscore the relevance of taking the domain-specific model of e-marketplaces as a theoretical model for development of the conceptual model.

Figure 2 presents the conceptual model of this study. The business view had two factors: relative advantage and the number of buyers and sellers. The transaction view had one factor: transaction cost reduction. The market service view had three factors: functionality and value-added service, reputation of the e-marketplace (EM), and trust in market makers. The infrastructure view had four factors: website usability, website reliability, quality of information, and security and privacy. Lastly, the performance view, added by the authors, contained two factors: trading volume and customer loyalty.

These two performance factors, trading volume and customer loyalty, were chosen based on the aforementioned definition of B2B e-marketplace performance proposed by O'Reilly and Finnegan (2009); they aim to measure objective and subjective perspectives of performance, respectively. Furthermore, these factors represent the short-term goal (i.e. trading volume) and long-term goal (i.e. customer loyalty) of e-marketplaces (Hong and Cho 2011). Trading volume and customer loyalty were chosen because of their importance to the successful running and long-term viability of any business (Kumar et al. 2011), including B2B e-marketplaces (Janita and Miranda 2013b; Matook 2013; O'Reilly and Finnegan 2009). Although the concepts of customer loyalty and performance were viewed as separate concepts in previous research (Chaudhuri and Holbrook 2001; Hallowell 1996), several studies have used customer loyalty as a performance indicator (Agostini and Nosella 2016; Ramanathan 2011; Ramanathan et al. 2012). Ramanathan (2011) considered customer loyalty

as an indication of organization's performance in winning a customer in an e-commerce context. Agostini and Nosella (2016) also incorporated customer loyalty as a performance indicator in the B2B context.

The importance of the proposed factors based on the literature are described below.

Customer loyalty

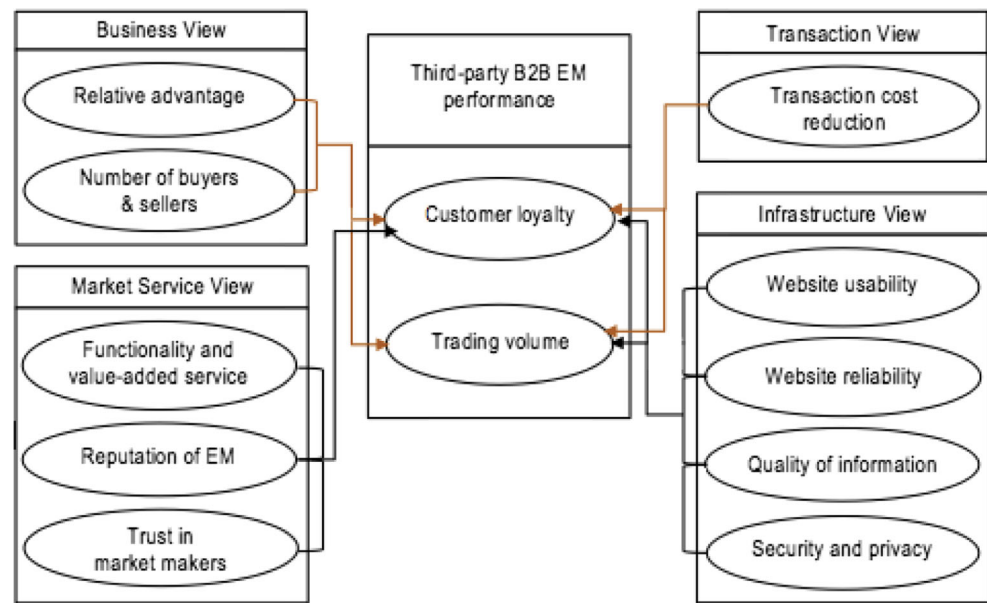
Rauyruen and Miller (2007, 23) conceptualized customer loyalty in the B2B context as a composite concept combining both behavioral and attitudinal loyalty. They defined behavioral loyalty as “the willingness of average business customers to repurchase the service and the product of the service provider and maintain a relationship with the service provider/supplier,” and attitudinal loyalty as “the level of a customer's psychological attachments and attitudinal advocacy towards the service provider/supplier.” Pan et al. (2012, 150) stated that “customer loyalty is a company's most enduring asset.” Customer loyalty is a main goal of almost every profit-oriented business (Gefen 2002, 39). It generates superior long-term profits (Rauyruen and Miller 2007). Because of the importance of customer loyalty as highlighted in many studies, this study used it as a perceptual measure of e-marketplace performance.

Trading volume

Past studies have indicated that the number and volume of transactions traded on a B2B e-marketplace is critical to its success (Fairchild et al. 2004; Brunn et al. 2002). O'Reilly and Finnegan (2009) used trading volume and the number of transactions to evaluate e-marketplace performance. Kym et al. (2001) suggested two indices from a financial perspective for the assessment of e-marketplace performance: the increase in number of trades, and sales revenue growth in the e-marketplace. Thus, this study uses the number of trades and sales revenue through e-marketplaces as objective performance measures.

Relative advantage

Joo and Kim (2004, 99) defined relative advantage as “the degree to which an e-marketplace is perceived as being better than the current method.” The recognition of the advantages to be gained from e-marketplaces is important to the participation of SMEs in e-marketplaces and, thus, in their success (Stockdale and Standing 2004). Past research has indicated that relative advantage leads to profitability (Zhai 2010; Harrington and Ruppel 1999). Lee and Kim (2007) confirmed a positive relationship between relative advantage and the success of implementation of an information system.

Fig. 2 The conceptual model

Number of buyers and sellers

Buyers and sellers are sources of revenue that generate positive cash flow and profits for B2B e-marketplaces (Johnson 2013). Achieving a critical mass of participants is an essential strategy that leads to a high volume of transactions in an e-marketplace (Brunn et al. 2002; Johnson 2013). Furthermore, having a large number of buyers and sellers to trade in the e-marketplace builds positive network externalities, because the increase in the number of participants in the e-marketplace increases the value that it provides to its participants (Brunn et al. 2002).

Transaction cost reduction

Transaction costs are those associated with transaction processes in conducting business. According to transaction cost economics, the principal role of e-marketplaces is to reduce transaction costs (Bunduchi 2008). Prior studies have indicated the crucial role that B2B e-marketplaces play in reducing transaction costs, especially search costs, which refers to the costs spent identifying trading partners (Benslimane et al. 2005; Bunduchi 2008; Stockdale and Standing 2004). This study focused on search costs, excluding other transaction costs such as contracting costs and monitoring costs because previous research (Wang and Cavusoglu 2015) and the results from interviews with practitioners indicated that sellers use third-party B2B e-marketplaces as tools for increasing sales and expanding market reach rather than as platforms for coordinating with partners. Once a trading partner is identified via the e-marketplace, other subsequent transaction activities such as negotiation and fulfillment can be partially done online or offline (i.e. directly between the

seller and buyer). Therefore, this study focused on search costs, which are the main transaction costs relevant in the third-party B2B e-marketplace context.

Functionality and value-added service

The major role of a B2B e-marketplace is to provide its members with the appropriate level of functionality and value-added services that meet users' needs in order to help them improve efficiency (O'Reilly and Finnegan, 2005; Saprikis and Vlachopoulou 2012). Wang et al. (2012) found that breadth of service contributes to e-marketplace performance. Janita and Miranda (2013a) found positive relationships between value-added services and loyalty.

Reputation of e-marketplace

Reputation is defined as "the extent to which Web users recognize an e-marketplace as famous and good" (Kim and Ahn 2005, 196). Johnson (2013) advocated that the strategy that e-marketplaces use in branding and promoting themselves has a significant impact on gaining a critical mass of participants. Past research has indicated that corporate reputation has a positive effect on financial performance and loyalty (Caruana and Ewing 2010; Keh and Xie 2009).

Trust in market makers

Trust is a fundamental principle of every business relationships. This study focused on trust in market maker (i.e. intermediary) which corresponds to personal trust because past research (Hong and Cho 2011; Pavlou and Gefen 2004) found that trust in intermediary engenders buyers' trust in the

community of sellers in e-marketplaces, which in turn influences buyers' purchase behavior. Following Kim and Ahn (2007), trust in market makers is defined as the perceived benevolence and integrity of the market makers in transaction. Benevolence focuses on the extent to which market makers act in the client's best interest; integrity refers to the trustworthiness of the market makers offering the service.

Website usability

On the basis of previous research (Lee and Kozar 2012), e-marketplace website usability is defined as the extent to which a website can be used by customers to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified third-party B2B e-marketplace service context. Lee and Kozar (2012) affirmed that website usability is a fundamental component of overall user experience, and hence is pivotal to the success of an e-business. Chiou et al. (2010) posited that website usability is among the most important factors for determining website quality. Casaló et al. (2008) and Flavián et al. (2006) found an indirect effect of usability on loyalty through satisfaction.

Quality of information

Quality of information refers to "the quality of content of the website and the suitability of the information for the user's purpose" (Chakraborty et al. 2005, 424). Johnson (2013) highlighted that B2B e-marketplaces must provide content-rich websites that fulfill traders' business needs. Sellers need e-marketplaces to provide information regarding products and prices to buyers. Useful information helps traders make informed decisions. Chakraborty et al. (2005) noted that information quality is seen as a key antecedent of website effectiveness.

Website reliability

Website reliability refers to the correct technical functioning of websites, particularly the extent to which a website is available, accessible, and functioning correctly (Papadomichelaki and Mentzas 2012; Zeithaml 2002). Previous research has indicated that website reliability is an important determinant of e-service quality (Madu and Madu 2002), website quality (Zalatar 2012), and information system success (Garcia-Smith and Effken 2013). Papadomichelaki and Mentzas (2012) suggested that the availability of websites can be achieved by ensuring 24/7 accessibility and a high loading speed.

Security and privacy

Security and privacy refer to the degree to which a site is safe from intrusion and can protect personal and transaction-

related information of users (Chakraborty et al. 2002; Parasuraman et al. 2005). Security and privacy are crucial for online trading (Chong et al. 2011), customer retention (Park and Kim 2003), and the e-marketplace context (Lancastre and Lages 2006). Tarafdar and Zhang (2008) advocated that security promotes loyalty.

The above discussion led to the development of research hypotheses underlying the theoretical model and they were later tested as described next.

Research methodology

Measurement development

In order to ensure content validity, an initial pool of measurement items was generated based on the relevant literature. Where available, measurement items that had been verified in the literature were adapted. The initial items were adjusted to reflect the specific context of this research. All new measures were developed following standard psychometric scale development procedures (Bagozzi and Phillips 1982; Pavlou 2002). First, the domain of the relevant construct was specified. Second, the measurement items were developed based on the conceptual definition. Third, the items were refined on the basis of pretest and pilot test of the survey instrument. All factors, except trading volume, were measured by a multi-item five-point Likert scale. Trading volume was objectively measured by the number of trades and sales revenue through e-marketplaces. Reflective scales were used for all factors.

Despite the potential benefits of reverse coded items, such as the prevention of response bias, particularly inattention and acquiescence, this study did not use them because this practice can be vulnerable to response inconsistencies or misresponses, which can reduce the reliability of the scales and result in unexpected factor structures (Van Sonderen et al. 2013; Weijters et al. 2013). Furthermore, Van Sonderen et al. (2013) found that the use of reversed items does not prevent response bias. Therefore, this study avoided response bias by instead presenting a random mix of items from several scales "Scale-related Pet-Peeves" n.d.).

To assess the content validity of the measurement scales, a preliminary questionnaire was reviewed by seven reviewers (one practitioner and six academics). The reviewers were selected on the basis of their experience in and knowledge of B2B e-marketplaces and e-commerce. They were asked to examine and comment on the degree of relevance of the items as a measure of their respective factors, format, and clarity. The questionnaire was then modified on the basis of their suggestions. The questionnaire consisted of two parts. The first part contained questions about respondent demographics, and the second part consisted of measures of the proposed factors.

Pilot study

A pilot study was conducted in order to ensure that the instruments demonstrate the appropriate levels of reliability, validity, and clarity (Balaban et al. 2013). An online survey was employed to collect data. With the assistance of Thaitrade, invitation e-mails were sent to the registered members of the e-marketplace. The target respondents were managers in charge of marketing/sales in B2B e-marketplaces. In the e-mail, the objectives of the research and a hyperlink to the online questionnaire were provided. A total of 30 responses from 30 selling companies were obtained. The response rate was 10.1%. An initial reliability assessment of the instruments was performed. The coefficient alpha values of all factors ranged from 0.713 to 0.937, exceeding the conventional minimum of 0.70 (Hair et al. 2006). Therefore, all scales exhibited acceptable reliability. Furthermore, the item-to-total correlation of each item was examined. Two items, RELI3 and USAB3, had an item-total correlation of less than 0.4 (Hair et al. 1998). Thus, the wording of these two items was revised to improve clarity. In addition, some minor revisions were made to the items designed to collect the respondents' demographics, in order to improve comprehension. The final version of the measurement instrument is presented in Appendix 1.

Data collection

The target population of the survey was Thailand-based selling companies that had been using third-party B2B e-marketplaces for at least a year. With the assistance of Thaitrade and Pantavanij, invitation e-mails were sent to the registered members in the e-marketplaces. The target respondents were managing directors or managers in charge of marketing/sales in B2B e-marketplaces. To increase the response rate, telephone calls were made to obtain potential respondents' agreement to participate in the survey. The telephone calls were made to Thai gold suppliers of Alibaba, and seller members of Nanasupplier, Pantavanij, and Thaitrade. Formal invitation e-mails were sent to those who accepted the invitation. In the e-mail, the objectives of the research and a hyperlink to the online questionnaire were provided. Respondents were assured that the results would be reported in aggregate to guarantee their anonymity. One respondent per firm participated in the study. A total of 200 usable responses were obtained (an 11.2% response rate). This response rate was in line with that of similar studies (Hadaya 2008 (10.9%); Rao et al. 2007 (11.9%); Saprikis and Vlachopoulou 2012 (10.2%)) and is considered acceptable according to Wade and Nevo (2005). A descriptive statistical analysis of the responses and factor analysis were conducted using SPSS 17.0.

Demographic analysis

Appendix 2 shows the respondent demographics. Almost half of the respondents were owners/directors/CEOs (46.5%) and had 1–3 years of experience trading in B2B e-marketplaces (55.0%). Half of the seller companies were in wholesale (51.0%), and 47.0% were in manufacturing. The respondents traded in a range of industries, including industrial equipment (17.4%) and agriculture (6.3%). Most companies (80.5%) were small (<50 employees) and participated in more than one e-marketplace. The e-marketplace they used the most was Alibaba (43.5%), followed by Nanasupplier (31.0%).

Non-response bias was assessed through comparisons between early (first-week) and late respondents by considering the respondents' job title, experience, and firm size using the chi-squared test. The results revealed no significant difference between the two groups. Therefore, this study was not affected by a significant non-response bias.

Harman's one-factor test was conducted to check for common method bias (Hartono et al. 2014). The results of unrotated principal component analysis for all measurement items showed that the combined nine factors accounted for 73.10% of the total variance, while the first factor explained 34.67% of the total variance. No general factor accounted for >50% of variance. These results indicated that common method bias was not a concern in this study.

Assessment of measurement models

Unidimensionality of measurement

The unidimensionality of the measurement was assessed using exploratory factor analysis (EFA). Principal axis factoring with promax rotation was performed on the 29 items that measured independent constructs. The Kaiser–Meyer–Olkin measure of sampling adequacy had a value of 0.895, exceeding the minimum value of 0.5, which indicates acceptable sampling adequacy (Hair et al. 2006). The Bartlett test of sphericity indicated high significance ($p = 0.000$).

The number of selected factors was determined by the number of factors with an eigenvalue exceeding 1.0. Items were retained if (1) they recorded a value of 0.40, which is considered practically significant for 200 or more responses related to a factor (Hair et al. 2006), (2) they did not record a value greater than 0.40 on two factors, and (3) their reliability analysis indicated an item-to-total correlation of greater than 0.40 (Wolfenbarger and Gilly 2003). The results showed a reasonable level of unidimensionality. Almost all measurement items recorded significant values for only one factor. Two items that measured the number of sellers (SELLER) and usability (USAB3) were eliminated because of low values of factor loadings. The item-to-total correlations of all items

ranged from 0.540 to 0.839. Finally, seven factors were extracted, with 72.34% of the total variance explained.

The results of EFA (Table 1) indicated that pairs of measures should be treated as single factors. This applied to three pairs of measures: viz., relative advantage and number of buyers, reputation of e-marketplace and trust in market makers, and transaction cost reduction and website usability. We combined each respective pair into a single factor. For the other measures, the items loaded on their hypothesized factors. Finally, the seven factors were labeled as follows: 1) relative advantage and number of buyers, 2) transaction cost reduction and website usability, 3) functionality and value-added service, 4) reputation of e-marketplace and trust in market makers, 5) quality of information, 6) website reliability, and 7) security and privacy.

The EFA results suggested that, while relative advantage and number of buyers, transaction cost reduction and website usability, as well as reputation and trust, may be conceptually

distinct, they are not empirically different. The link between relative advantage and numbers of buyers may lie in the fact that a large number of buyers participating in B2B e-marketplace increase the likelihood of sales, and it is considered as an advantage of B2B e-marketplace participation for sellers (Hadaya 2008; Saprikis and Vlachopoulou 2012). The link between transaction cost reduction and website usability is in line with Wagner et al.'s (2014) suggestion that website usability has important implications for organizations, such as reduced costs. The link between reputation and trust may be because they are closely interrelated as trust was considered in the context of vendor reputation in the previous research (Jarvenpaa et al. 1999). These implications may drive the links between those factors in this investigation.

Next, the research model was analyzed using PLS-SEM (SmartPLS 3 (Ringle et al. 2015)) because PLS-SEM is appropriated for testing the causal model and testing theories in the early stages of development (Hair et al. 2017; Seol et al. 2016).

Table 1 Results of factor analysis

	Factor						
	1	2	3	4	5	6	7
READ2	.986						
READ3	.959						
READ1	.813						
BUYER	.678						
USAB2		.822					
USAB1		.795					
TRCO3		.636					
TRCO2		.485					
TRCO1		.423					
REPU2			.974				
REPU3			.818				
REPU1			.455				
TRUS1			.441				
TRUS3			.420				
TRUS2			.410				
INFO1				.984			
INFO2				.816			
INFO3				.787			
RELI2					.782		
RELI1					.694		
RELI3					.601		
FUNC2						.978	
FUNC3						.870	
FUNC1						.514	
SEPR1							.761
SEPR3							.750
SEPR2							.748

Only loadings exceeding .40 are displayed.

Reliability and validity

Reliability and validity of the factors were evaluated; Table 2 shows the results. All criteria met the standards recommended by Hair et al. (2017). The composite reliability and Cronbach's alpha for all the factors in the measurement model were above the 0.7 threshold excluding trading volume, which had a Cronbach's alpha value below 0.7 (0.635). This might have been because trading volume has two measurement items, as Cronbach's alpha tends to increase with the number of items (Thong 1999). The average variance extracted (AVE) values for all factors exceeded the 0.5 threshold. Furthermore, all items had loadings (see Appendix 3) above the threshold value of 0.707 except two items, TRCO1 (0.658) and REPU1 (0.646). According to Janita and Miranda (2013b, 819), the values greater than 0.6 were considered acceptable since the scales were developed and used for causal modeling applied to different context, and all item loadings were significant; thereby, these two items were retained. Thus, the convergent validity for the measurement model is acceptable. To examine discriminant validity, the Fornell–Larcker criterion and the cross-loadings were evaluated; the results were satisfactory (see Appendixs 4 and 5). Therefore, overall the measurement models were deemed to have sufficient reliability and validity.

Refinement of research model and development of hypotheses

Based on the results of EFA, the conceptual model was refined as shown in Fig. 3, and the following hypotheses were developed.

Table 2 Measurement results

Factor	Composite Reliability	Cronbach's Alpha	AVE
Relative advantage and number of buyers	0.927	0.895	0.762
Transaction cost reduction and website usability	0.850	0.780	0.533
Functionality and value-added service	0.893	0.830	0.736
Reputation of e-marketplace and trust in market makers	0.898	0.864	0.596
Quality of information	0.939	0.903	0.837
Website reliability	0.903	0.841	0.756
Security and privacy	0.895	0.825	0.740
Customer loyalty	0.889	0.814	0.727
Trading volume	0.810	0.635	0.682

- H1: The relative advantage and number of buyers relates positively to e-marketplace performance [(H1a) customer loyalty, (H1b) trading volume].
- H2: Transaction cost reduction and website usability relates positively to e-marketplace performance [(H2a) customer loyalty, (H2b) trading volume].
- H3: Satisfaction with functionalities and value-added services offered by the e-marketplace relates positively to e-marketplace performance [(H3a) customer loyalty, (H3b) trading volume].
- H4: The reputation of an e-marketplace and trust in market makers relates positively to e-marketplace performance [(H4a) customer loyalty, (H4b) trading volume].
- H5: The quality of information relates positively to e-marketplace performance [(H5a) customer loyalty, (H5b) trading volume].
- H6: Website reliability relates positively to e-marketplace performance [(H6a) customer loyalty, (H6b) trading volume].
- H7: Security and privacy relates positively to e-marketplace performance [(H7a) customer loyalty, (H7b) trading volume].

Results

Estimation of path coefficients can be subjected to biases if factors are highly correlated. To assess collinearity, Hair et al. (2014) recommended considering a variance inflation factor (VIF) of over 5 as indicative of collinearity. In this study, the VIF values ranged from 1.260 to 2.700. Therefore, there was no evidence of significant collinearity among the predictors.

The coefficient of determination (R^2) is a measure of a model's predictive accuracy. R^2 values of 0.67, 0.33, and 0.19 are considered substantial, moderate, and weak, respectively (Chin 1998). The results showed that customer loyalty had an R^2 value of 0.400, indicating a moderate degree of predictive accuracy, whereas the prediction of trading volume

was comparatively weaker ($R^2 = 0.164$); however, it exceeded the 10% recommended benchmark (Cohen 1988). Thus, the refined model explained 40% of the variance of customer loyalty and 16.4% of the variance of trading volume.

The Stone–Geisser criterion Q^2 values, which measure predictive relevance of dependent constructs by means of cross-validated redundancy, were obtained by running blindfolding procedures. Q^2 values greater than zero for a certain dependent construct imply that its explanatory variables provide acceptable predictive relevance (Hair et al. 2014). The test results showed positive values for both customer loyalty ($Q^2 = 0.254$) and trading volume ($Q^2 = 0.059$), thus indicating the model's predictive relevance. Overall, the results showed that the quality of the structural model was acceptable.

To test the hypotheses, a bootstrapping procedure using 5000 resamples was performed to assess the statistical significance of path coefficients of the relationship hypothesized between factors. The key advantage of bootstrapping in applied research is that the statistical assumptions on which the method depends are rather nonrestrictive, which is important since empirical data often do not meet restrictive assumption, which in turn influences the ability to make valid statistical inferences from the data (Streukens and Leroi-Werelds 2016). The hypothesized relationships between constructs were considered to be supported if the corresponding path coefficients had the proposed sign and were significant at a level of $p < 0.05$. Table 3 and Fig. 4 show the results of the hypothesis testing.

The path analysis shows that the relative advantage and number of buyers, transaction cost reduction and website usability, and reputation of e-marketplace and trust in market makers had positive and significant effects on customer loyalty. Reputation of e-marketplace and trust in market makers had the greatest effect ($\beta = 0.298$, $p < 0.01$), followed by transaction cost reduction and website usability ($\beta = 0.274$, $p < 0.01$) and relative advantage and number of buyers ($\beta = 0.228$, $p < 0.01$). Therefore, H1a, H2a, and H4a were supported. The relative advantage and number of buyers and

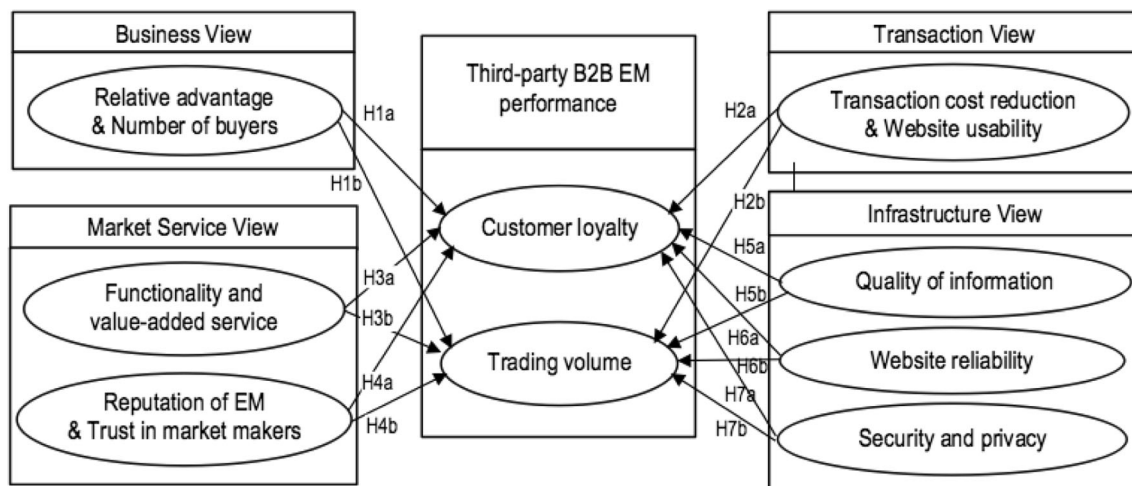


Fig. 3 The refined research model

the website reliability were found to positively affect trading volume, with path coefficients of 0.392 ($p < 0.001$) and 0.203 ($p < 0.05$), respectively, hence supporting H1b and H6b. The remaining relationships in the model were not found to be significant.

To seek additional insights into factors affecting the performance of third-party B2B e-marketplaces, follow-up interviews with eight respondents participating in the main study were conducted. The results suggested five additional factors that could affect the performance of third-party B2B e-marketplaces: (1) economic recession due to the political instability and the recent global economic downturn (six sellers), (2) the ability of the e-marketplace to protect sellers and buyers from the opportunistic behavior of other market participants (six sellers), (3) good marketing (five sellers), (4)

product prices (three sellers), and (5) a multi-lingual website (two sellers).

Discussion and conclusions

The empirical results indicated four key findings. First, the relative advantage and number of buyers revealed significant effects on the performance of third-party B2B e-marketplaces, in terms of both customer loyalty and trading volume. These findings suggested that the basic requirement for inducing selling firms to become loyal customers of B2B e-marketplaces is to give the sellers wider market reach by having a large number of buyers to trade through the e-marketplace and maximize the relative advantages that sellers

Table 3 Results of hypothesis testing

Hypothesis	Relationship	Path coefficient	Result
H1a	Relative advantage and number of buyers -> Loyalty	0.228**	Supported
H1b	Relative advantage and number of buyers -> Trading volume	0.392***	Supported
H2a	Transaction cost reduction and website usability -> Loyalty	0.274**	Supported
H2b	Transaction cost reduction and website usability -> Trading volume	0.117	Not supported
H3a	Functionality and value-added service -> Loyalty	-0.116	Not supported
H3b	Functionality and value-added service -> Trading volume	-0.040	Not supported
H4a	Reputation of e-marketplace and trust in market makers -> Loyalty	0.298**	Supported
H4b	Reputation of e-marketplace and trust in market makers -> Trading volume	-0.184	Not supported
H5a	Quality of information -> Loyalty	-0.056	Not supported
H5b	Quality of information -> Trading volume	-0.124	Not supported
H6a	Website reliability -> Loyalty	0.123	Not supported
H6b	Website reliability -> Trading volume	0.203*	Supported
H7a	Security and privacy -> Loyalty	-0.021	Not supported
H7b	Security and privacy -> Trading volume	0.019	Not supported

* significant at $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

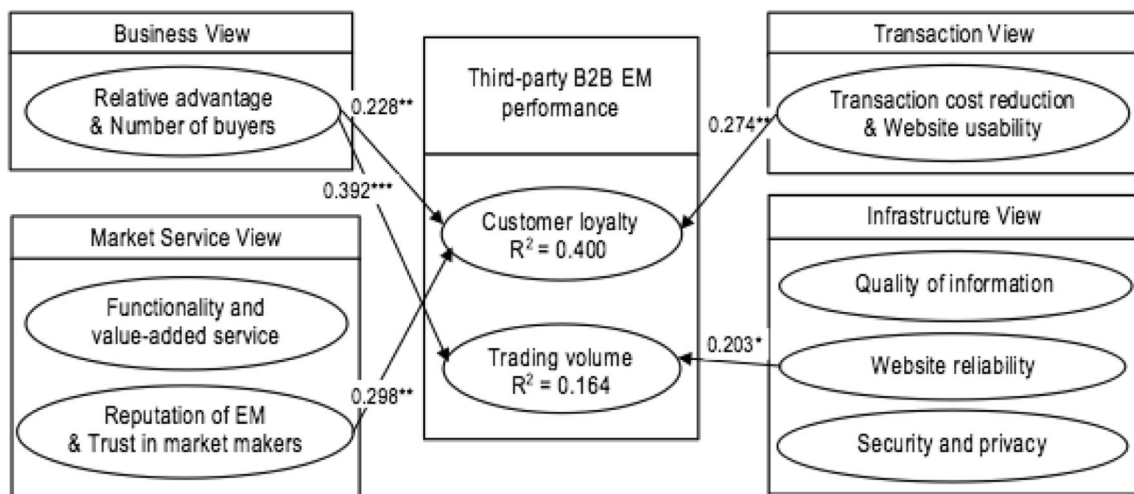


Fig. 4 Results of the structural analysis

gain from participation. Second, this study found that the use of third-party B2B e-marketplaces reduced transaction costs for sellers, especially search costs, and transaction cost reduction and website usability had significant effects on customer loyalty. These findings indicated a “facilitating transactions” orientation in the function of e-marketplaces. Moreover, the findings complemented past research findings by Liang and Huang (1998) that confirmed the significant role that transaction costs play in e-commerce preference. However, this finding contradicted findings by Casaló et al. (2008), who found that website usability did not directly affect customer loyalty but rather had an indirect effect through consumer satisfaction in B2C context. This was probably because sellers’ interactions with B2B e-marketplace websites are more complicated than buyers’ interaction with B2C websites. Therefore, website usability is important to the seller experience in third-party B2B e-marketplaces. Third, the reputation of e-marketplace and trust in market makers had a significant impact on customer loyalty. This was consistent with the findings of Casaló et al. (2008) that confirmed the positive and significant effect of reputation on online loyalty in the context of B2C. Furthermore, the influence of trust in market makers on customer loyalty agreed with the study by Hong and Cho (2011), which targeted trust in B2C e-marketplaces. Fourth, website reliability had a positive impact on trading volume. These results suggest that building a usable and reliable website is important to the performance of third-party B2B e-marketplaces.

However, the results showed that functionality and value-added service, quality of information, and security and privacy did not significantly contribute to the performance of third-party B2B e-marketplaces. This might be because the majority of B2B e-marketplaces participating in this study focus more on providing aggregation and business matching, and less on offering value-added services. Therefore, selling firms might simply have used those key services of B2B e-marketplaces,

and thus sellers might have been less concerned about value-added services and the retention of sensitive information in e-marketplaces; hence, the impact of these factors was not significant. These results were consistent with findings by Caruana and Ewing (2010), whereby security and privacy had no effect on online loyalty in the B2C context, and by Fairchild et al. (2004), whereby the value-added functionality of B2B e-marketplaces was insufficient to contribute significantly to the establishment of a critical mass. On the other hand, these results contradict Janita and Miranda (2013a), who found a significant impact of security, information usefulness, and value-added services on client loyalty.

Theoretical contributions

This study contributes to the literature by building a theoretical model to explain the performance of third-party B2B e-marketplaces from the seller’s perspective. It identifies important factors affecting performance that have not been empirically confirmed in the B2B e-marketplace literature to date. These factors will add to discussions on how and to what extent the characteristics of e-marketplaces affect performance. Furthermore, a novel feature of this research is the integration of the B2B e-marketplace reference model, trust concepts, CSFs, and website evaluation studies to explain the performance of B2B e-marketplaces, which proved useful. Finally, this study developed reliable and valid measurement instruments for the concepts concerning B2B e-marketplace performance. These scales add to extant literature by providing a basis for further theoretical development.

Managerial implications

The findings have implications for practitioners. First, e-marketplaces should focus on improving the reputation of the e-marketplace and trust in market makers, and on

continually communicating with customers. This would help the e-marketplace become an investment of choice and attract new participants while retaining existing customers. Second, it is imperative for market makers to focus on having a large number of buyers in order to maximize the relative advantages customers gain from participation and to exploit positive network externalities. Especially, when approaching sellers, market makers should stress the opportunity for reaching an increased number of buyers, and thus increase sales and profits. Third, the findings signal the importance to market makers that their ability to help participants reduce transaction costs is vital. Therefore, market makers should focus on providing functionality and services that would lower transaction costs including good website usability. Forth, the findings suggest two website characteristics: website reliability and usability, that could be sufficient characteristics of website design to improve user experience and confidence in users, which lead to better performance. Fifth, managers can use the proposed scale to measure and improve e-marketplace services to better meet users' needs. Last, the findings offer guidelines to sellers for choosing e-marketplaces to participate in.

Limitations and future research

This study has certain limitations. First, the respondents were limited to Thailand-based selling companies; the results may

not generalize to other countries with different cultures or industry structures. Second, this investigation focused on the seller's perspective. Third, the relative low level of R^2 (0.164) and Q^2 (0.059) obtained for trading volume indicated weak explanatory power. These levels show that there are other factors that may affect trading volume. In addition, the alpha coefficient for trading volume (0.635) was lower than 0.7. However, its composite reliability (0.81) exceeded the recommended value and several studies indicated that a Cronbach's alpha of >0.60 is generally considered acceptable (Seol et al. 2016, p. 745; Cyr 2008, p. 58). The generality of the model regarding trading volume will require additional research.

These limitations indicate avenues for further study. First, replication in other countries to compare results across cultures is important to enhance the generalizability of the findings. Second, it is worthwhile to continue identifying factors on the buyer's side and/or conduct comparative research on the difference between a buyer's and a seller's perspective on e-marketplace performance. Future research on the impact of factors derived from the follow-up interviews will make a valuable contribution to the understanding of e-marketplace performance. Finally, it is worthwhile to examine interrelationships between the concepts proposed in the model. For example, previous research has demonstrated the influence of trust on transaction cost reduction (Dyer and Chu 2003), trust on relative advantage (Choudhury and Karahanna 2008), and privacy and security on trust (Riquelme and Román 2014).

Appendix 1

Table 4 Measures and sources

Measure	Source
Relative advantage	Self-developed based on Chong and Shafaghi (2009), Hadaya (2008), Le et al. (2004), Rao et al. (2007)
Compare to the traditional channel, how useful is the e-marketplace for your firm...	
READ1 ...to increase sales volume.	
READ2 ...to increase customer base.	
READ3 ...as online marketing/trade channel.	Adapted from Saprikis and Vlachopoulou (2012)
Number of buyers and sellers	
BUYER How important is the number of buyers participating in the e-marketplace for your firm?	
SELLER How important is the number of sellers participating in the e-marketplace for your firm?	Self-developed based on Benslimane et al. (2005), Bunduchi (2008), Chang and Wong (2010), Stockdale and Standing (2004)
Transaction cost reduction	
How much effect (increase/decrease) does the use of e-marketplace has on transaction costs in terms of...	
TRCO1 ...money associated with searching/reaching buyers?	
TRCO2 ...time associated with searching/reaching buyers?	
TRCO3 How easy/difficult do you find the use of B2B e-marketplace for you to identify/reach buyers?	
Reputation of e-marketplace	

Table 4 (continued)

Measure	Source	
REPU1	How do you perceive the reputation (good/bad) of the e-marketplace in the market?	Adapted from Casaló et al. (2008), Kim and Ahn (2007), Koufaris and Hampton-Sosa (2004)
REPU2	How famous/notorious do you think the e-marketplace is in the market?	
REPU3	How do you perceive the image of e-marketplace in the market?	
Trust in market makers		Adapted from Kim and Ahn (2007), Kim et al. (2008), Hong and Cho (2011)
How much do you think market makers...		
TRUS1	...keep your best interests?	
TRUS2	...is trustworthy?	
TRUS3	...keep promises related to transaction policies?	
Functionality and value-added service		Adapted from Janita and Miranda (2013a), Saprikis and Vlachopoulou (2012)
Are you satisfied with...		
FUNC1	...functionalities and services provided by the e-marketplace?	
FUNC2	...value-added services provided by the e-marketplace?	
FUNC3	... a variety of the provided functionalities and value-added services?	
Website usability		Adapted from Chakraborty et al. (2005), Kim and Ahn (2007), Flavián et al. (2006), Elling et al. (2012)
USAB1	How easy/difficult do you find the website for you to use?	
USAB2	How easy/difficult do you find the website for you to navigate and find what you want?	
USAB3	How effective is the search function of the website to help you find the right information quickly?	
Website reliability		Adapted from Garcia-Smith and Effken (2013), Loiacono et al. (2007), Papadomichelaki and Mentzas (2012), Parasuraman et al. (2005)
RELI1	I can access and use services of the website anytime I want.	
RELI2	The website loads quickly.	
RELI3	The website functions properly, no technical problems or system crashes.	
Quality of information		Adapted from Janita and Miranda (2013a), Loiacono et al. (2007)
INFO1	The e-marketplace website provides sufficient information about sellers, products and services.	
INFO2	The website content is clear, concise, easy to understand, and well organized.	
INFO3	The information on the website is pretty much what I need to carry out my tasks.	
Security and privacy		Adapted from Corbitt et al. (2003), Loiacono et al. (2007), Wolfenbarger and Gilly (2003)
SEPR1	Do you think that your privacy is securely protected at this site?	
SEPR2	Do you think that your transactions with the e-marketplace website are safe?	
SEPR3	Do you think that the e-marketplace website has adequate security features?	
Customer loyalty		Adapted from Janita and Miranda (2013b), Kim and Niehm (2009), Ribbink et al. (2004)
LOY1	The information I transmit to others about the e-marketplace is always positive.	
LOY2	I have no intention of changing e-marketplace.	
LOY3	I intend to continue using this e-marketplace.	
Trading volume		Self-developed based on Fairchild et al. (2004), Kym et al. (2001)
Trade	The average annual number of trades through the e-marketplace.	
Sales	The average annual sales revenue through the e-marketplace.	

Appendix 2

Table 5 Respondent profile

Characteristics	Percent
Position	
Managing director/CEO	46.5
Manager	29.0
Marketing/Sales Officer	24.5
Years of respondent participation in e-marketplaces	
1–3	55.0
4–6	28.0
7–9	9.5
> 9	7.5
Number of employees	
1–50	80.5
51–200	15.0
> 200	4.5
Annual revenue (million baht)	
< 1	13.5
1–50	64.5
51–200	13.5
201–400	5.5
> 400	3.0
Years of e-marketplace entry	
1–3	64.5
4–6	23.0
7–9	8.5
> 9	4.0
Most used e-marketplace	
Alibaba	43.5
Nanasupplier	31.0
Pantavanij	17.0
ThaiTrade	6.0
HKTDC	1.5
B2BThai	1.0
Business type	
Wholesale	51.0
Manufacturing	47.0
Service	2.0
Industry group	
Machinery/Industrial equipment	17.4
Chemicals, Plastics	15.8
Electrical/Electronic appliance	14.1
Construction	8.2
Food, Beverage	6.9
Iron, Steel	6.6
Agriculture	6.3
Apparel, Textiles, Accessories	6.3
Gift, Premiums, Furniture	5.6

Table 5 (continued)

Characteristics	Percent
Health, Beauty	5.3
Auto, Transportation	3.9
Jewellery	3.6

Appendix 3

Table 6 Indicator reliability

Factor	Item	Loading	t-Value	Cronbach alpha
Relative advantage and number of buyers	READ1	0.884	48.667	0.895
	READ2	0.914	56.951	
	READ3	0.913	64.048	
	BUYER	0.773	20.463	
Transaction cost reduction and website usability	TRCO1	0.658	10.305	0.780
	TRCO2	0.708	11.611	
	TRCO3	0.750	18.072	
	USAB1	0.739	12.825	
	USAB2	0.788	17.935	
Functionality and value added service	FUNC1	0.904	37.601	0.830
	FUNC2	0.813	13.386	
	FUNC3	0.854	16.525	
Reputation of e-marketplace and trust in market makers	REPU1	0.646	10.518	0.864
	REPU2	0.745	14.120	
	REPU3	0.726	15.659	
	TRUS1	0.828	32.141	
	TRUS2	0.853	26.596	
	TRUS3	0.812	20.596	
Quality of information	INFO1	0.911	43.174	0.903
	INFO2	0.926	60.293	
	INFO3	0.908	41.054	
Website reliability	RELI1	0.912	55.847	0.841
	RELI2	0.882	26.636	
	RELI3	0.812	17.179	
Security and privacy	SEPR1	0.828	6.981	0.825
	SEPR2	0.883	8.371	
	SEPR3	0.868	8.031	
Customer loyalty	LOY1	0.855	35.776	0.814
	LOY2	0.821	16.354	
	LOY3	0.881	42.094	
Trading volume	Trade	0.853	10.525	0.635
	Sales	0.798	7.964	

Appendix 4

Table 7 Factor intercorrelations

	1	2	3	4	5	6	7	8	9
1. Relative advantage and buyers	0.873								
2. Functionality and value-added service	0.564	0.858							
3. Quality of information	0.311	0.444	0.915						
4. Reputation of e-marketplace and trust in market makers	0.559	0.663	0.562	0.772					
5. Security and privacy	0.233	0.270	0.354	0.347	0.860				
6. Transaction cost reduction and website usability	0.465	0.551	0.538	0.620	0.250	0.730			
7. Website reliability	0.353	0.509	0.590	0.569	0.329	0.400	0.870		
8. Customer loyalty	0.478	0.394	0.344	0.550	0.194	0.515	0.384	0.853	
9. Trading volume	0.359	0.177	0.066	0.134	0.088	0.182	0.196	0.332	0.826

The diagonal elements (in bold) are the square root of the AVEs

According to the Fornell–Larcker criterion, the square root of the AVE of each factor should be greater than its highest correlation with any other factor in the model

Appendix 5

Table 8 Cross loadings (an item's loading on its respective factor is higher than that on all its cross-loadings with other factors)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
READ1	0.884	0.493	0.264	0.521	0.167	0.455	0.311	0.461	0.353
READ2	0.914	0.518	0.289	0.494	0.246	0.442	0.294	0.392	0.302
READ3	0.913	0.516	0.288	0.489	0.215	0.409	0.326	0.464	0.299
BUYER	0.773	0.441	0.244	0.444	0.191	0.302	0.300	0.335	0.294
FUNC1	0.576	0.904	0.416	0.670	0.217	0.553	0.476	0.446	0.192
FUNC2	0.385	0.813	0.307	0.420	0.196	0.404	0.345	0.222	0.148
FUNC3	0.438	0.854	0.402	0.555	0.297	0.418	0.471	0.274	0.094
INFO1	0.252	0.389	0.911	0.519	0.309	0.445	0.526	0.276	-0.011
INFO2	0.278	0.399	0.926	0.530	0.268	0.484	0.584	0.357	0.065
INFO3	0.319	0.429	0.908	0.493	0.400	0.542	0.501	0.300	0.115
REPU1	0.388	0.437	0.372	0.646	0.200	0.338	0.469	0.274	0.089
REPU2	0.336	0.406	0.506	0.745	0.265	0.474	0.470	0.356	0.106
REPU3	0.327	0.417	0.462	0.726	0.373	0.436	0.468	0.377	0.080
TRUS1	0.518	0.580	0.397	0.828	0.220	0.498	0.379	0.506	0.156
TRUS2	0.469	0.594	0.460	0.853	0.269	0.527	0.489	0.476	0.060
TRUS3	0.508	0.590	0.437	0.812	0.294	0.557	0.423	0.490	0.119
SEPR1	0.205	0.208	0.247	0.338	0.828	0.172	0.174	0.152	0.056
SEPR2	0.198	0.253	0.268	0.291	0.883	0.250	0.277	0.191	0.083
SEPR3	0.200	0.232	0.404	0.273	0.868	0.214	0.395	0.152	0.084
TRCO1	0.408	0.400	0.271	0.385	0.089	0.658	0.150	0.355	0.085
TRCO2	0.458	0.395	0.298	0.469	0.024	0.708	0.244	0.371	0.130
TRCO3	0.342	0.373	0.385	0.463	0.221	0.750	0.268	0.417	0.179
USAB1	0.215	0.392	0.444	0.445	0.269	0.739	0.367	0.335	0.130
USAB2	0.272	0.454	0.556	0.492	0.299	0.788	0.423	0.391	0.132
RELI1	0.327	0.492	0.509	0.512	0.311	0.334	0.912	0.385	0.197
RELI2	0.316	0.472	0.522	0.503	0.277	0.392	0.882	0.324	0.216
RELI3	0.270	0.338	0.522	0.471	0.269	0.316	0.812	0.278	0.070

Table 8 (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
LOY1	0.440	0.363	0.295	0.480	0.258	0.462	0.302	0.855	0.259
LOY2	0.291	0.221	0.255	0.377	0.071	0.382	0.272	0.821	0.244
LOY3	0.468	0.398	0.321	0.531	0.150	0.464	0.394	0.881	0.336
Trade	0.300	0.117	0.057	0.041	0.072	0.095	0.165	0.246	0.853
Sales	0.293	0.181	0.052	0.191	0.073	0.215	0.159	0.307	0.798

(1) relative advantage and number of buyers, (2) functionality and value-added service, (3) quality of information, (4) reputation of e-marketplace and trust in market makers, (5) security and privacy, (6) transaction cost reduction and website usability, (7) website reliability, (8) customer loyalty, and (9) trading volume

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