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Assessing e-commerce systems success: a respecification and validation of the DeLone and McLean model of IS success

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Abstract. *DeLone & McLean (2003) propose an updated information systems (IS) success model and suggest that it can be extended to investigating e-commerce systems success. However, the updated IS success model has not been empirically validated in the context of e-commerce. Further, the existing IS/e-commerce success models have been subject to considerable debate on the 'IS Use' and 'Perceived Usefulness' constructs, and the nomological structure of the updated DeLone and McLean model is somewhat inconsistent with the IS acceptance and marketing literature. Based on the IS and marketing literature, this paper respecifies and validates a multidimensional model for assessing e-commerce systems success. The validated model consists of six dimensions: Information Quality, System Quality, Service Quality, Perceived Value, User Satisfaction and Intention to Reuse. Structural equation modelling techniques were applied to data collected by questionnaire from 240 users of e-commerce systems in Taiwan. The empirical evidence suggests that Intention to Reuse is affected by Perceived Value and User Satisfaction, which, in turn, are influenced by Information Quality, System Quality and Service Quality. The nomological structure of the respecified e-commerce systems success model is concurred with that of the technology acceptance model (TAM) in the IS field and the consumer behaviour models in the traditional business-to-business and retail contexts. The findings of this study provide several important implications for research and practice. This paper concludes by discussing the contributions of this study and the limitations that could be addressed in future studies.*

Keywords: electronic commerce, information systems success, user satisfaction, system use, perceived value, net benefits

1. INTRODUCTION

The measurement of information systems (IS) success or effectiveness has been widely investigated by the IS research community (Counihan *et al*., 2002; Murphy & Simon, 2002;

Shang & Seddon, 2002). Theorists, however, are still grappling with the question of which constructs best measure IS success (Rai *et al*., 2002). DeLone & McLean (1992) comprehensively review the different information system success measures and propose a six-factor IS success model as a taxonomy and framework for measuring the complex dependent variables in IS research. The categories of the taxonomy are System Quality, Information Quality, IS Use, User Satisfaction, Individual Impact and Organizational Impact. DeLone & McLean (1992) do not provide an empirical validation of the model and, in fact, suggest that further development and validation is needed for their model. Since then, several researchers have respecified and tested portions of the DeLone & McLean (1992) model (e.g. Seddon & Kiew, 1994; Seddon, 1997; Molla & Licker, 2001; Rai *et al*., 2002; McGill *et al*., 2003).

In a recent paper, DeLone & McLean (2003) discussed many of the important IS research efforts that apply, validate, challenge and propose enhancements to their original model, and proposed an updated DeLone & McLean (henceforth, 'D&M') IS success model. With the prosperity of e-commerce systems, IS researchers have turned their attention to developing, testing and applying e-commerce systems success measures (Liu & Arnett, 2000; D'Ambra & Rice, 2001; Molla & Licker, 2001; Teo & Choo, 2001; Palmer, 2002). DeLone & McLean (2003) contend that the e-commerce process fits nicely into their updated IS success model and six success dimensions, and encourage others to continue testing and challenging their model. The existing IS/e-commerce success models have been subject to considerable debate on the 'IS Use' and 'Perceived Usefulness' constructs (c.f., Seddon, 1997; Rai *et al*., 2002; DeLone & McLean, 2003). Furthermore, the nomological structure of the updated D&M model is somewhat inconsistent with the IS acceptance and marketing literature. Thus, continued research is needed to develop and test a consistent, comprehensive model of e-commerce systems success.

The main purpose of this study was to respecify and validate a multidimensional e-commerce systems success model based on the IS success and marketing literature (e.g. Zeithaml, 1988; DeLone & McLean, 1992; 2003; Patterson & Spreng, 1997; Seddon, 1997; Cronin *et al*., 2000; Rai *et al*., 2002). This paper is structured as follows. First, this study reviews the development of IS success models, discusses the primary debates on Seddon's (1997) Perceived Usefulness and DeLone & McLean's (1992; 2003) IS Use constructs, and considers the challenges and difficulties facing DeLone & McLean's (2003) model. Second, based on prior studies, a research model of e-commerce systems success and a comprehensive set of hypotheses are proposed. Next, the methods, measures and results of this study are then presented. Finally, the results are discussed in terms of their implications for research and managerial activity.

2. IS SUCCESS MODELS

2.1 The DeLone & McLean (1992) model

DeLone & McLean's (1992) comprehensive review of different IS success measures concludes with a model of interrelationships between six IS success variable categories. The

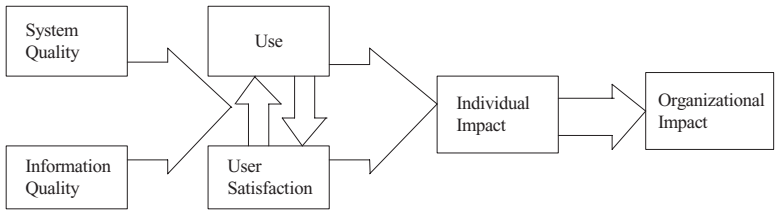


Figure 1. DeLone & McLean's (1992) model.

categories of the taxonomy are System Quality, Information Quality, IS Use, User Satisfaction, Individual Impact and Organization Impact (see Figure 1). The model makes two important contributions to the understanding of IS success. First, it provides a scheme for categorizing the multitude of IS success measures that have been used in the literature. Second, it suggests a model of temporal and causal interdependencies between the categories (Seddon, 1997; McGill *et al*., 2003). Since 1992, a number of studies have undertaken empirical investigations of the multidimensional relationships among the measures of IS success (e.g. Seddon & Kiew, 1994; Goodhue & Thompson, 1995; Etezadi-Amoli & Farhoomand, 1996; Jurison, 1996; Saarinen, 1996; Guimaraes & Igbaria, 1997; Igbaria & Tan, 1997; Rai *et al*., 2002).

2.2 The Seddon (1997) model

Seddon (1997) suggests that the inclusion of both process and causal explanations in DeLone & McLean's (1992) model leads to so many potentially confusing meanings that the value of the model is diminished. He identifies three distinct models intermingled in DeLone & McLean's (1992) model, each reflecting a different interpretation of IS Use. The first model is a process model of IS success that describes the sequence of events relating to an IS; the second model is a representation of the behaviour that manifests as a result of IS success; and the third is a variance model of IS success. Thus, Seddon (1997) points out that IS Use in the DeLone & McLean (1992) model has three possible meanings: (1) an event in a process leading to individual or organizational impact; (2) a dependent variable in variance model of future IS use; and (3) a variable that acts as a proxy for the benefits from use.

Based on DeLone & McLean's (1992) model, Seddon (1997) proposes an alternative model that focuses on the causal (variance) aspects of the interrelationships among the taxonomic categories and separates the variance model of IS success from the variance model of behaviours that occur as a result of IS success. Seddon's IS success model includes three classes of variables: (1) measures of Information Quality and System Quality; (2) general perceptual measures of net benefits of IS use (i.e. Perceived Usefulness and User Satisfaction); and (3) other measures of net benefits of IS use. Seddon (1997) also claims that IS Use is a behaviour, not a success measure, and replaces DeLone & McLean's (1992) IS Use with Perceived Usefulness, which serves as a general perceptual measure of the Net Benefits of IS use, to adapt his model to both volitional and non-volitional usage contexts. Rai *et al*. (2002)

empirically and theoretically assessed DeLone & McLean's (1992) and Seddon's (1997) models of IS success in a quasi-voluntary IS use contexts and found that both models exhibit a reasonable fit with the collected data.

2.3 The updated DeLone & McLean (2003) model

DeLone & McLean (2003) propose an updated D&M IS success model (see Figure 2) and evaluate its usefulness in light of the dramatic changes in IS practice, especially the advent and explosive growth of e-commerce. They agree with Seddon's premise that the combination of variance and process explanations of IS success in one model can be confusing but argue that Seddon's reformulation of the DeLone & McLean (1992) model into two partial variance models (i.e. IS success model and partial behavioural model of IS Use) unduly complicates the success model and defeats the intent of the original model.

Based on prior studies, DeLone & McLean (2003) propose an updated model of IS success by adding 'Service Quality' as a new dimension of IS success model and by grouping all the 'impact' measures into a single impact or benefit category called 'Net Benefits'. Given that system usage continues to be used as a dependent variable in a number of empirical studies (Goodhue & Thompson, 1995; Taylor & Todd, 1995; Guimaraes & Igbaria, 1997; Igbaria & Tan, 1997; Igbaria *et al*., 1997; Gelderman, 1998; Yuthas & Young, 1998; Torkzadeh & Doll, 1999; Rai *et al*., 2002) and takes on new importance in e-commerce success measurements where customer use is voluntary, System Use and alternative 'Intention to Use' are still considered as important measures of IS success in the updated D&M model.

DeLone & McLean (2003) also emphasize that IS success is a multidimensional and interdependent construct, making it necessary to study the interrelationships among those dimensions. As DeLone & McLean (2003) note, within the e-commerce context, customers and suppliers use the systems to make buying or selling decisions and execute business transactions, making the internet a communication and IS phenomenon that lends itself to the updated

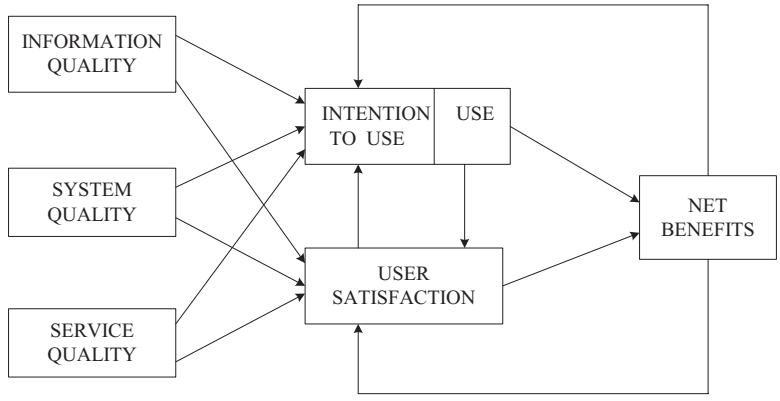


Figure 2. DeLone & McLean's (2003) updated IS success model.

D&M IS success model. Thus, DeLone & McLean (2003) suggest their updated IS success model can be adapted to the measurement challenges of the new e-commerce world.

2.4 Challenges and difficulties facing the updated D&M model

DeLone & McLean (2004) use two case examples to demonstrate how their 2003 updated IS success model can be used to guide the identification and specification of e-commerce systems success metrics. While the updated D&M model is a generic, comprehensive e-commerce systems success model, it suffers from certain difficulties. First, the Net Benefit measure in the model is conceptually too broad to define. As DeLone & McLean (2004) suggest, '[T]he new net benefits construct immediately raises three issues that must be addressed: what qualifies as a benefit? for whom? and at what level of analysis' (p. 32). Thus, when using the updated D&M model, researchers need to clearly and carefully define the stakeholders and the context in which Net Benefits are to be measured (DeLone & McLean, 2004).

Second, DeLone & McLean (2003) argue that Seddon's (1997) reformulation of the DeLone & McLean (1992) model into two partial variance models (i.e. IS success model and partial behavioural model of IS Use) unduly complicates the success model, and thus assert that System Use or Intention to Use is still an important measure of IS success. Given that Systems Use/Intention to Use is included in their updated IS success model, DeLone & McLean (2003; 2004), however, did not attempt to reconcile their model with Seddon's (1997) Perceived Usefulness measure and Davis's (1989) Technology Acceptance Model (TAM) that explains system use behaviour. Thus, there is a need for research to combine the updated D&M model with Seddon's (1997) Perceived Usefulness construct and the IS acceptance/adoption literature to give it the richness in theoretical perspective that it presently lacks.

Third, while DeLone & McLean (2004) propose several e-commerce systems success measures identified in the management information systems (MIS) and marketing literature, the nomological structure of the updated D&M model is not fully consistent with the quality–value–satisfaction–loyalty chain in the marketing and consumer behaviour literature (e.g. Zeithaml, 1988; Patterson & Spreng, 1997; Cronin *et al*., 2000; Parasuraman & Grewal, 2000; Hellier *et al*., 2003; Durvasula *et al*., 2004). Thus, continued research is also required to reconcile the updated D&M model with the marketing research literature.

Finally, the updated D&M model has not yet been empirically validated in the e-commerce environment. As DeLone & McLean (2003) suggest, their updated IS success model should continue to be tested and challenged, especially within the e-commerce context. Based on the MIS and marketing literature, this study attempts to deal with the challenges and difficulties facing the updated D&M model previously mentioned to develop and validate a consistent e-commerce systems success model.

3. RESEARCH MODEL AND HYPOTHESES

The potential of e-commerce technologies has caused many organizations to invest large sums in implementing e-commerce systems. Evaluating the success of e-commerce systems

is thus an important issue for both practitioners and researchers. While IS researchers have proposed several IS and/or e-commerce systems success models, these models are subject to considerable debate on the 'IS Use' and 'Perceived Usefulness' constructs and are inconsistent with the IS acceptance and marketing literature. It is therefore imperative for research to develop or respecify a consistent, comprehensive model of e-commerce systems success based on the previous studies.

3.1 The stakeholder, level of analysis and focus of the e-commerce success model

The majority of researchers agree with DeLone & McLean's (2003) suggestion that Service Quality, properly measured, deserves to be added to System Quality and Information Quality as components of IS success. However, Seddon (1997) argues that DeLone & McLean's (1992) IS Use is a behaviour, not an IS success measure. DeLone & McLean (2003) appear to exclude Seddon's (1997) Perceived Usefulness from their updated model and assert that IS Use/Intention to Use is still an important measure of IS success. In fact, Rai *et al*. (2002) found that both Seddon's (1997) model and DeLone & McLean's (1992) model exhibit a reasonable fit with the collected data. These results imply that System Quality, Information Quality, Service Quality, User Satisfaction, Seddon's Perceived Usefulness, and DeLone & McLean's IS Use/Intention to Use can all be considered adequate measures of IS success.

Despite the multidimensional and contingent nature of IS/e-commerce success, an attempt should be made to significantly reduce the number of measures used to measure IS/e-commerce success so that research results can be compared and findings can be validated (DeLone & McLean, 2003; 2004). Thus, researchers should look first at the cumulative tradition and determine which existing and validated success measures can be used in the e-commerce context (DeLone & McLean, 2004). Furthermore, different players or stakeholders may have different opinions as to what constitutes a benefit to them (Seddon *et al*., 1999; DeLone & McLean, 2003). DeLone & McLean (2004) also suggest that selection of e-commerce success dimensions and Net Benefits measures should be contingent on the objectives and the context of the empirical research.

Consequently, following the suggestions of previous researchers on model contingency and parsimony, this study focuses on the e-commerce system proprietors as the stakeholders, measures the success/Net Benefits variables from the consumer perspective, and employs the six existing IS success measures – Information Quality, System Quality, Service Quality, Perceived Usefulness, User Satisfaction and IS Use/Intention to Use – to respecify and validate a model of e-commerce systems success rather than developing additional 'Net Benefits' measures as described in the updated D&M model. This does not mean that there is no need to develop or incorporate additional Net Benefits measures in the e-commerce success model in future studies. Instead, the focus of this study is to reconcile the updated D&M model with Seddon's (1997) Perceived Usefulness measure, Davis's (1989) TAM and the marketing literature. In fact, DeLone & McLean (2004) suggest that future e-commerce studies should include additional Net Benefits measures (e.g. increased sales per customer) and not be content to collect only surrogate measures.

3.2 The scope of Net Benefits in the e-commerce success model

Seddon (1997) and DeLone & McLean (2003) seem to have come to a compromise on the use of 'Net Benefits' as an IS success measure. As noted earlier, Seddon (1997) proposes two constructs – Perceived Usefulness and User Satisfaction – to serve as general perceptual measures of Net Benefits of IS use. In addition to the quality measures of IS success, DeLone & McLean (2003) present three dimensions – User Satisfaction, System Use/Intention to Use and Net Benefits – that serve as IS success measures.

Both User Satisfaction and System Use/Intention to Use *appear* to be excluded from Net Benefits in the updated D&M model (see Figure 2). However, some of the Net Benefit measures suggested by DeLone & McLean (2004) are similar to their suggested User Satisfaction and System Use measures. For example, they suggest that e-Loyalty/Repeat Purchase can be used to measure User Satisfaction and that Length of Stay can be used to measure System Use. However, on the other hand, they also suggest that both Customer Loyalty, similar to e-Loyalty/Repeat Purchase, and Stickiness, similar to Length of Stay, are organizational Net Benefits measures. This implies that both System Use and User Satisfaction in the updated D&M model are also forms of Net Benefits measures/surrogates. In fact, Seddon (1997) has suggested that User Satisfaction and Perceived Usefulness (a substitute for System Use) are general perception measures of Net Benefits.

Integrating Seddon's (1997) and DeLone & McLean's (2003; 2004) viewpoints, this study asserts that Perceived Usefulness, User Satisfaction and System Use/Intention to Use are all Net Benefits measures/surrogates in the context of e-commerce. Thus, the Net Benefits construct in the updated D&M model should be used to represent *other* IS impact or benefit measures than User Satisfaction, Perceived Usefulness and System Use/Intention to Use, which can be developed based on research objectives.

3.3 Perceived Usefulness vs. Perceived Value

The Seddon (1997) model shows User Satisfaction as being dependent on six variables (i.e. System Quality, Information Quality, Perceived Usefulness, Net Benefits to Individuals, Net Benefits to Organizations and Net Benefits to Society). Also, User Satisfaction and Perceived Usefulness are both likely to be conceptually closer to the notion of Net Benefits than the other measures. However, User Satisfaction taps a wider range of needs, costs and benefits of information technology (IT) use than Perceived Usefulness. As Seddon (1997) note, '[F]or instance a very cheap old computer may still be *useful* for word processing but many people would not be satisfied with it. So satisfaction must involve the weighing up of a wider range of factors than mere usefulness' (p. 249). He also suggests that continued research is needed to search for a more comprehensive or reliable measure of Net Benefits than Perceived Usefulness and User Satisfaction.

Recently, '[B]oth managers and marketing scientists have begun focusing on the hitherto ignored role of customer value as a key strategic variable to help explain repeat purchase

behavior, brand loyalty and relationship commitment' (Patterson & Spreng, 1997, p. 416). Perceived Value is frequently conceptualized as involving a consumer's assessment of the ratio of Perceived Quality and Perceived Sacrifice (Zeithaml, 1988; Monroe, 1990). Perceived Sacrifice is influenced by both perceived monetary price and perceived non-monetary price (Zeithaml, 1988). Bolton & Drew (1991) suggest that Perceived Value is a richer measure of customers' overall evaluation of a service than perceived service quality. According to Parasuraman & Grewal (2000), Perceived Value is a function of a 'get' component – i.e. the benefits a buyer derives from a seller's offering – and a 'give' component – i.e. the buyer's monetary and non-monetary costs of acquiring the offering.

Thus, Perceived Value involves a tradeoff between give and get components. Perceived Usefulness, however, only taps the get component. Similar to User Satisfaction, Perceived Value taps a wider range of costs and benefits of e-commerce systems use than Perceived Usefulness. The current study therefore replaces Perceived Usefulness with Perceived Value, considering it a more comprehensive and reliable measure of *Net Benefits* in an e-commerce context. Both theoretical reasoning and empirical research provide evidence that Perceived Value and Satisfaction tap difference dimensions (Eggert & Ulaga, 2002). To prevent conceptual ambiguities, Perceived Value should be conceptualized and measured as a cognitive construct (Patterson & Spreng, 1997), while Satisfaction is best being conceptualized as an affective variable (Oliver, 1996). Furthermore, in the post-use situation, a customer having a first-hand experience with the e-commerce system is able to form value and satisfaction evaluations, but not in the pre-use situation. This study therefore captures value perception and satisfaction in a post-use situation.

3.4 Intention to Reuse

In order to avoid the difficulties in interpreting the multidimensional aspects of System Use, DeLone & McLean (2003) suggest that Intention to Use may be a worthwhile alternative measure in some contexts. Karahanna *et al*. (1999) and Agarwal & Prasad (1997) have demonstrated that initial system usage and intentions of future use can differ. Studies in several industries have indicated that the cost of retaining an existing customer is only about 10% of the cost of acquiring a new customer (Wikipedia, 2006). This study suggests that customer intention of *future* use should be a closer measure of system success/Net Benefits than customer *initial* or *current* usage of system in an e-commerce context.

Therefore, this study employs 'Intention to Reuse' as a measure of e-commerce systems success to simplify the closed-loop relationships between Use, Satisfaction and Intention to Use, as depicted in the updated D&M model. The construct of 'Intention to Reuse' is conceptually similar to the construct of Customer Loyalty in the marketing area, which is also suggested as an organizational Net Benefits measure by DeLone & McLean (2004). Based on the marketing literature, Intention to Reuse can be defined as the favourable attitude of the customer towards an e-commerce system that results in repeat use/purchase behaviour (Assael, 1992; Keller, 1993; Anderson & Srinivasan, 2003).

3.5 A research model of e-commerce systems success

Based on the previous discussions, this study proposes a comprehensive, multidimensional research model of e-commerce systems success (see Figure 3), which suggests that Information Quality, System Quality, Service Quality, Perceived Value, User Satisfaction and Intention to Reuse are the success variables of e-commerce systems.

It is worth noting that Molla & Licker (2001) also propose an e-commerce success model based on the DeLone & McLean (1992) model of IS success. Molla & Licker's model consists of six success variables: E-commerce System Quality, Content Quality, Use, Customer E-commerce Satisfaction, Support and Service, and Trust. In fact, E-commerce System Quality, Content Quality and Customer E-commerce Satisfaction in Molla & Licker's model are conceptually equivalent to System Quality, Information Quality and User Satisfaction, respectively, in my proposed model. In addition, Support and Service and Trust in Molla & Licker's model are fully captured by the Service Quality construct as described in the current research model.

Before DeLone & McLean (2003) proposed the updated IS success model, Pitt *et al*. (1995) had extended the application of Service Quality in IS by placing Service Quality in the conventional DeLone & McLean (1992) IS success model. This extension is also adopted by the updated D&M model and can be adapted to an e-commerce context (DeLone & McLean, 2003). Based on prior research on Service Quality and IS Service Quality (e.g. Parasuraman *et al*., 1985; 1988; Kettinger & Lee, 1994; Kettinger *et al*., 1995; Pitt *et al*., 1995), Wang & Tang (2003) suggest that E-Commerce Service Quality is also a multidimensional construct, which includes the dimensions of reliability, responsiveness, assurance and empathy. Assurance is originally defined as the knowledge and courtesy of employees and their ability to convey trust and confidence (Parasuraman *et al*., 1988), and thus is conceptually similar to the Trust construct proposed by Molla & Licker (2001).

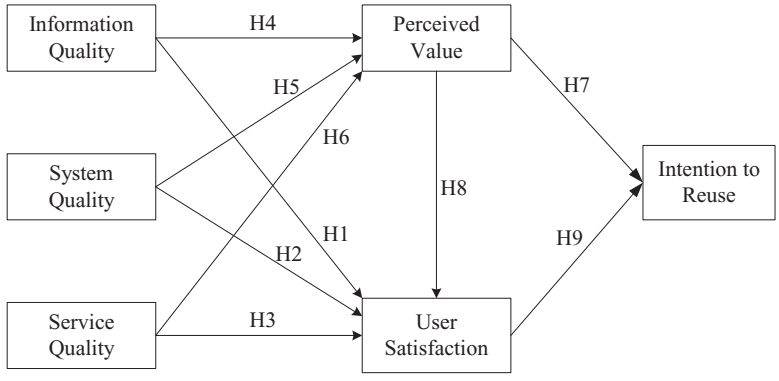


Figure 3. The research model of e-commerce systems success.

In order to achieve the model parsimony and comparability suggested by DeLone & McLean (2003; 2004), this study argues that Molla & Licker's (2001) Trust construct is merely one dimension of Service Quality, not a new system success measure. Also, Intention to Reuse (i.e., Customer Loyalty) in the research model is conceptually closer to the notion of Net Benefits than customer *current* Use (Molla & Licker, 2001). The next section elaborates on the theory base and derives the hypotheses.

3.6 Hypotheses

The hypothesized relationships between User Satisfaction and the three quality variables are based on the theoretical and empirical work reported by DeLone & McLean (2003; 2004). Several prior studies in the field of marketing also suggest that Perceived Quality, Information Quality and Service Quality are antecedents of overall customer satisfaction (e.g. Spreng *et al*., 1996; Cronin *et al*., 2000; Hellier *et al*., 2003; Durvasula *et al*., 2004; Lewis & Soureli, 2006). Thus, this study tests the following hypotheses:

H1: Information Quality will positively affect User Satisfaction in the e-commerce context.

H2: System Quality will positively affect User Satisfaction in the e-commerce context.

H3: Service Quality will positively affect User Satisfaction in the e-commerce context.

Prior studies explicitly model Perceived Quality as a direct antecedent of Perceived Value (Teas & Agarwal, 2000), which in turn is a direct driver of Intention to Reuse/Repurchase (Bolton & Drew, 1991; Patterson & Spreng, 1997; Cronin *et al*., 2000). Also, cumulative insights from prior studies support the general notion that Perceived Value contributes to Customer Loyalty (e.g. Dodds *et al*., 1991; Grewal *et al*., 1998; Voss *et al*., 1998; Parasuraman & Grewal, 2000). As Anderson & Srinivasan (2003) suggest, when Perceived Value is low, customers will be more inclined to switch to competing businesses in order to increase Perceived Value, thus contributing a decline in Loyalty (Intention to Reuse/Repurchase). The quality–value–loyalty linkage is consistent with prior work on consumer behaviour (Zeithaml, 1988; Dodds *et al*., 1991; Patterson & Spreng, 1997; Cronin *et al*., 2000; Durvasula *et al*., 2004). Parasuraman & Grewal (2000) also suggest that the quality–value–loyalty chain is an issue in need of more empirical research. Therefore, this study tests the following hypotheses:

H4: Information Quality will positively affect Perceived Value in the e-commerce context.

H5: System Quality will positively affect Perceived Value in the e-commerce context.

H6: Service Quality will positively affect Perceived Value in the e-commerce context.

H7: Perceived Value will positively affect Intention to Reuse in the e-commerce context.

The service management literature argues that customer satisfaction is the result of customer perception of value received (Fornell *et al*., 1996; Hallowell, 1996; Cronin *et al*., 2000). Perceived Value is considered 'a cognitive-based construct which captures any benefit-

sacrifice discrepancy in much the same way disconfirmation does for variations between expectations and perceived performance' (Patterson & Spreng, 1997, p. 421). However, Satisfaction is primarily an affective evaluative response (Oliver, 1992). Adapting Bagozzi's (1992) appraisal → emotional response → coping framework (Gotlieb *et al*., 1994) to an e-commerce context suggests that the cognitively oriented value appraisal precedes the affectively oriented satisfaction response (e.g. Anderson & Sullivan, 1993; Anderson *et al*., 1994; Patterson & Spreng, 1997; Cronin *et al*., 2000). There also exists empirical support for the effect of Perceived Value on User Satisfaction (Eggert & Ulaga, 2002; Lam *et al*., 2004; Yang & Peterson, 2004; Caruana & Fenech, 2005; Lin & Wang, 2006). Thus, the following hypothesis is tested:

H8: Perceived Value will positively affect User Satisfaction in the e-commerce context.

As DeLone & McLean (2003) suggest, positive experience with 'Use' will lead to greater 'User Satisfaction'. Similarly, increased 'User Satisfaction' will lead to increased 'Intention to Use' and thus 'Use'. In order to simplify the closed-loop relationships between Use, Satisfaction and Intention to Use, this study proposes that increased User Satisfaction will lead to increased Intention to Reuse in the post-use situation. The satisfaction–reuse linkage is also consistent with prior work on user behaviour in the field of MIS (e.g. Wang, 2003a; Lin & Wang, 2006). In the marketing research area, Satisfaction is a consumer's post-purchase evaluation and affective response to the overall product or service experience (Oliver, 1992). It is widely accepted among researchers as a strong predictor for behavioural variables such as repurchase intentions and word of mouth (Eggert & Ulaga, 2002). Anderson & Srinivasan (2003) suggest that 'a dissatisfied customer is more likely to search for information on alternatives and more likely to yield to competitor overtures than is a satisfied customer' (p. 125). Furthermore, past research has indicated that Satisfaction is a reliable predictor of Intention to Reuse/Repurchase (LaBarbera & Mazursky, 1983; Bitner, 1990; Patterson & Spreng, 1997; Cronin *et al*., 2000; Wang *et al*., 2001; Eggert & Ulaga, 2002; Lam *et al*., 2004; Carpenter & Fairhurst, 2005). Therefore, this study tests the following hypothesis:

H9: User Satisfaction will positively affect Intention to Reuse in the e-commerce context.

4. RESEARCH DESIGN AND METHOD

4.1 Measures of the constructs

To ensure the content validity of the scales, the items selected must represent the concept about which generalizations are to be made. Therefore, items selected for the constructs were mainly adopted from prior studies to ensure content validity. As previous measures of the constructs were developed mainly for the traditional IS context, they also need to be adapted to the e-commerce context.

While System Quality is a multidimensional construct, there may not be a generic, consistent measure of System Quality in the MIS literature. Previous researchers usually suggest different dimensions to measure System Quality (c.f., Saarinen, 1996; Li, 1997; Liu & Arnett, 2000; Molla & Licker, 2001; McKinney *et al*., 2002; Rai *et al*., 2002; DeLone & McLean, 2003; Heo & Han, 2003; McGill *et al*., 2003). Based on the previous literature (Pitt *et al*., 1995; Katerattanakul & Siau, 1999; Zhang *et al*., 2000) McKinney *et al*. (2002) use content quality and content-delivery mechanism quality to represent Information Quality and System Quality, respectively. This concept is in line with Davis (1989), who suggests, based on Swanson's (1987) channel disposition model, that Information Quality parallels Perceived Usefulness and access quality (similar to content-delivery mechanism quality/System Quality) parallels Perceived Ease of Use. Thus, this study used Ease of Use to measure System Quality. Saarinen (1996) suggests that high System Quality requires a good user interface and, in the long run, flexibility, allowing changes in the processing styles and adaptation to new requirements. This also implies that Ease of Use/user friendliness is an important measuring facet of System Quality. The intent of this study is not to explore the complex multidimensional nature of the System Quality construct. Thus, it is justified and appropriate to adopt Ease of Use as System Quality measures to simplify the construct measures. Two items selected from previous System Quality/Ease of Use measures (Doll & Torkzadeh, 1988; Rai *et al*., 2002) and adapted to specify the e-commerce system were used to measure System Quality in this study. That is, the items 'the system is user friendly' and 'the system is easy to use' in the previous System Quality measures were changed to 'the e-commerce system is user friendly' and 'the e-commerce system is easy to use', respectively.

Following the same method, four items for the Information Quality construct were adopted from Doll & Torkzadeh (1988) to capture the three attributes of Information Quality of an e-commerce system: content, accuracy and timeliness. Six items selected from Wang & Tang's (2003) EC-SERVQUAL scale were used to measure the multidimensional Service Quality construct. Perceived Value was measured by three-item measures adopted from Dodds *et al*. (1991). Traditionally, User Satisfaction has been measured *indirectly* through Information Quality, System Quality, Service Quality and other variables (c.f., Bailey & Pearson, 1983; Ives *et al*., 1983; Doll & Torkzadeh, 1988; Doll *et al*., 1994; Kettinger & Lee, 1994; Rai *et al*., 2002). However, the concept of e-commerce systems success has been refined, based on the DeLone & McLean (2003) and Seddon (1997) models of IS success, to develop the causal relationship between indirect measures of User Satisfaction (i.e. System Quality, Information Quality and Service Quality) and overall level of User Satisfaction. Thus, the items used to measure User Satisfaction were taken from the previous measures of overall user/Web customer satisfaction (e.g. Doll & Torkzadeh, 1988; Palvia, 1996; Wang *et al*., 2001; Rai *et al*., 2002). Intention to Reuse was measured by three items adopted from the previous applications of TAM (e.g. Moon & Kim, 2001; Hong *et al*., 2001). Each item was adapted to specifically reference e-commerce systems. Likert scales (1~7), with anchors ranging from 'strongly disagree' to 'strongly agree' were used for all questions. After pre-testing the measures, these items were further modified to fit the e-commerce context studied. The Appendix lists the items used in this study.

4.2 Data collection procedure

Data used to test the research model were gathered from a sample of users of various e-commerce applications. To increase the generalizability of the results, the respondents were spread across 12 popular e-commerce categories: computer hardware/software, consumer electronics, books, music, videos, clothes, cosmetics, toys, tourism services, auction, stock trading and online banking. Data were gathered from a quota sample of 240 respondents from five organizations in Taiwan, with an equal quota of 20 responses from each category of e-commerce systems. Respondents were first asked whether they had ever used the above-mentioned e-commerce systems; if they replied in the affirmative, they were asked to participate in the survey. The questionnaire requested the respondents to recall the last time they used e-commerce systems and to answer the remaining questions accordingly. Respondents were asked to write down the name of the last e-commerce system they used and were instructed in the questionnaire to answer the questions by assessing that system. For each question, respondents were asked to circle the response which best described their level of agreement. Respondents ranged from 18 to 47 years of age (mean = 24 years). Approximately, 54% of the respondents were male, and 46% were female. 57 percent had completed at least one college or university degree.

5. RESULTS

5.1 Measurement model

A first-order confirmatory factor analysis using LISREL 8.3 was conducted to test the measurement model. The similarity of the original and model-reproduced covariance matrix is referred to as the fit of the model. Six common model-fit measures were used to assess the model's overall goodness of fit: the ratio of χ^2 to degrees-of-freedom (*df*), adjusted goodness-of-fit index (AGFI), non-normalized fit index (NNFI), comparative fit index (CFI), incremental fit index (IFI) and root mean square error of approximation (RMSEA). As shown in Table 1, all the model-fit indices exceeded their respective common acceptance levels suggested by previous

Table 1. Fit indices for measurement and structural models

Fit indices	Recommended value	Measurement model	Structural model
χ^2/df	≤3.00	1.25	1.87
AGFI	≥0.80	0.89	0.85
NNFI	≥0.90	0.96	0.92
CFI	≥0.90	0.97	0.93
IFI	≥0.90	0.97	0.93
RMSEA	≤0.08	0.03	0.06

AGFI, adjusted goodness-of-fit index; NNFI, non-normalized fit index; CFI, comparative fit index; IFI, incremental fit index; RMSEA, root mean square error of approximation.

Table 2. Reliability, average variance extracted and discriminant validity

Factor	Composite reliability	Information quality	System quality	Service quality	Perceived value	User satisfaction	Intention to reuse
Information Quality	0.81	0.51					
System Quality	0.82	0.37	0.70				
Service Quality	0.86	0.19	0.18	0.51			
Perceived Value	0.83	0.29	0.28	0.24	0.62		
User Satisfaction	0.87	0.40	0.37	0.35	0.59	0.74	
Intention to Reuse	0.89	0.31	0.27	0.37	0.58	0.64	0.68

Diagonal elements are the average variance extracted. Off-diagonal elements are the shared variance.

research, thus demonstrating that the measurement model exhibited a fairly good fit with the data collected ($\chi^2 = 218.16$ with $df = 174$, AGFI = 0.89, NNFI = 0.96, CFI = 0.97, IFI = 0.97, RMSEA = 0.03). Therefore, this study could proceed to evaluate the psychometric properties of the measurement model in terms of reliability, convergent validity and discriminant validity.

Reliability and convergent validity of the factors were estimated by composite reliability and average variance extracted (see Table 2). The composite reliabilities can be calculated as follows: (square of the summation of the factor loadings)/{(square of the summation of the factor loadings) + (summation of error variables)}. The interpretation of the resultant coefficient is similar to that of Cronbach's alpha, except that it also takes into account the actual factor loadings rather than assuming that each item is equally weighted in the composite load determination. Composite reliability for all the factors in the measurement model was above 0.80. The average extracted variances were all above the recommended 0.50 level (Hair *et al*., 1992), which meant that more than one-half of the variances observed in the items were accounted for by their hypothesized factors. Convergent validity can also be evaluated by examining the factor loadings from the confirmatory factor analysis (see Table 3). Following Hair *et al*.'s (1992) recommendation, factor loadings greater than 0.50 were considered to be very significant. All of the factor loadings of the items in the research model were greater than 0.60. Thus, all factors in the measurement model had adequate reliability and convergent validity.

To examine discriminant validity, this study compared the shared variances between factors with the average variance extracted of the individual factors (Fornell & Larcker, 1981). This analysis indicated that the shared variances between factors were lower than the average variance extracted of the individual factors, confirming discriminant validity (see Table 2). In summary, the measurement model demonstrated adequate reliability, convergent validity and discriminant validity.

5.2 Structural model

A similar set of fit indices was used to examine the structural model (see Table 1). Comparison of all fit indices with their corresponding recommended values provided evidence of a good

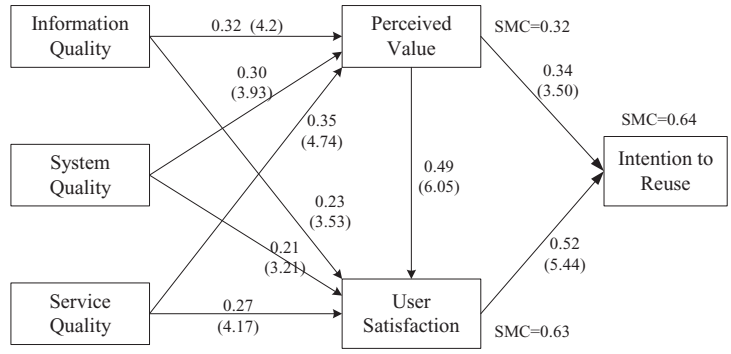
Table 3. Factorloadings, *t* values and error terms

Construct and item	Factor loading	*t* value	Error terms
Information Quality			
IQ1	0.70	*	0.51
IQ2	0.69	9.24	0.52
IQ3	0.72	9.53	0.48
IQ4	0.74	9.74	0.45
System Quality			
SQ1	0.85	*	0.29
SQ2	0.83	10.99	0.31
Service Quality			
SV1	0.72	*	0.48
SV2	0.75	10.73	0.44
SV3	0.68	9.84	0.53
SV4	0.70	10.02	0.52
SV5	0.73	10.48	0.47
SV6	0.72	10.33	0.48
Perceived Value			
PV1	0.80	*	0.36
PV2	0.81	12.79	0.34
PV3	0.76	11.91	0.43
User Satisfaction			
US1	0.88	*	0.31
US2	0.84	13.88	0.37
US3	0.87	15.03	0.28
Intention to Reuse			
IR1	0.83	*	0.23
IR2	0.80	17.02	0.29
IR3	0.85	17.86	0.25

**t* values for these parameters were not available because they were fixed for scaling purposes.

model fit ($\chi^2 = 335.86$ with $df = 180$, AGFI = 0.85, NNFI = 0.92, CFI = 0.93, IFI = 0.93, RMSEA = 0.06). Thus, this study could proceed to examine the path coefficients of the structural model.

Properties of the causal paths including standardized path coefficients, *t*-values and variance explained for each equation in the hypothesized model were presented in Figure 4. As expected, Information Quality, System Quality and Service Quality all had significant positive influences on both Perceived Value and User Satisfaction. Thus, H1, H2, H3, H4, H5 and H6 were supported ($\gamma = 0.23$, 0.21, 0.27, 0.32, 0.30 and 0.35, respectively). Service Quality exhibited a stronger effect than Information Quality and System Quality in influencing both Perceived Value and User Satisfaction. In addition, the effects of Perceived Value on User Satisfaction and Intention to Reuse were also significant. H7 and H8 were supported ($\beta = 0.34$



Note: t-values for standardized path coefficients are described in parentheses.

Figure 4. Hypotheses testing results.

Table 4. The direct, indirect and total effect of variables depicted

	Direct effect			Indirect effect			Total effect		
	Perceived Value	User Satisfaction	Intention to Reuse	Perceived Value	User Satisfaction	Intention to Reuse	Perceived Value	User Satisfaction	Intention to Reuse
Information Quality	0.32	0.23			0.16	0.31	0.32	0.39	0.31
System Quality	0.30	0.21			0.15	0.29	0.30	0.36	0.29
Service Quality	0.35	0.27			0.17	0.35	0.35	0.47	0.35
Perceived Value		0.49	0.34			0.25		0.49	0.59
User Satisfaction			0.52						0.52

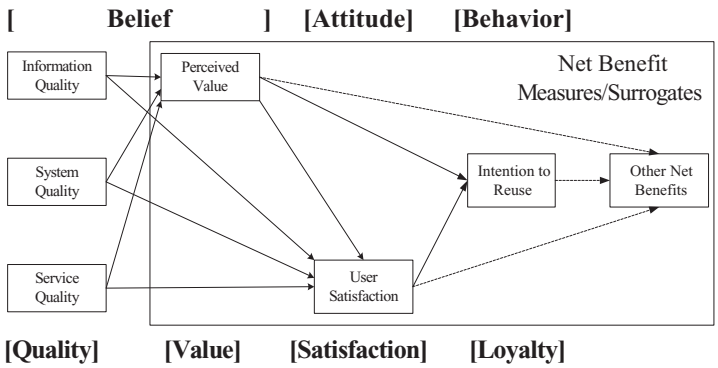
and 0.49, respectively). Finally, User Satisfaction appeared to be a significant determinant of Intention to Reuse. H9 was supported ($\beta = 0.52$).

Altogether, this model accounted for 64% of the variance in Intention to Reuse, with User Satisfaction exerting the strongest direct effect on Intention to Reuse than the other determinants within the model. Sixty-three percent of the variance in User Satisfaction was explained by Information Quality, System Quality, Service Quality and Perceived Value, while 32% of the variance in Perceived Value was explained by Information Quality, System Quality and Service Quality. The direct and total effect of User Satisfaction on Intention to Reuse was 0.52. However, the total effect of Perceived Value on Intention to Reuse was 0.59. Perceived Value, despite showing a weaker direct effect than User Satisfaction on Intention to Reuse, exhibited a stronger total effect on Intention to Reuse than that of User Satisfaction. Among the three quality-related constructs, Service Quality had the strongest total effect on Intention to Reuse. The direct, indirect, and total effects of Information Quality, System Quality, Service Quality, Perceived Value and User Satisfaction on Intention to Reuse were summarized in Table 4.

6. A RESPECIFIED E-COMMERCE SYSTEMS SUCCESS MODEL

This study presented and validated a research model of e-commerce systems success based on the previous IS success models and marketing studies to capture the multidimensional and interdependent nature of e-commerce systems success measures. Information Quality, System Quality, Service Quality, Perceived Value, User Satisfaction and Intention to Reuse were found to be valid measures of e-commerce system success. Following previous discussions in Section 3.2, Perceived Value (a substitute for Perceived Usefulness), User Satisfaction and Intention to Reuse (a substitute for System Use/Intention to Use) are all considered to be forms of Net Benefits measures/surrogates. Thus, the scope of the Net Benefits construct in the updated D&M model was respecified, and a new construct, Other Net Benefits, was also proposed to represent IS impact or benefit measures (e.g. increased sales per customer) other than User Satisfaction, Perceived Value and Intention to Reuse, which can be developed based on research objectives in future studies.

Figure 5 indicates the respecified e-commerce systems success model in which Other Net Benefits can be measured on at least four levels: individual, group, organizational and industry (DeLone & McLean, 2004). Taking the organizational level as an example, the ultimate success/Net Benefits measure of an e-commerce system may be its net profit rather than its levels of User Satisfaction, Perceived Value and Customer Loyalty (Intention to Reuse). Thus, User Satisfaction, Perceived Value and Intention to Reuse may have potential influences on Other Net Benefits (e.g. net profit and market share) in the respecified model. In fact, marketing researchers have continued to test the effects of Perceived Value, Satisfaction and Loyalty (Intention to Reuse) on Other Net Benefits measures, such as market share and profitability in the traditional marketing context (e.g. Buchanan & Gilles, 1990; Rust & Zahorik, 1993; Anderson *et al*., 1994; Roger, 1996; Bernhardt *et al*., 2000; Yeung & Ennew, 2000; Chaudhuri & Holbrook, 2001). Future researchers could incorporate Other Net



Note: The dashed paths have not been validated by this study.

Figure 5. The respecified e-commerce systems success model.

Benefits measures in their research models and empirically investigate the relationships among system success measures in the context of e-commerce.

7. IMPLICATIONS FOR RESEARCH

7.1 E-commerce systems success model and TAM

The validated e-commerce success model consists of three classes of variables: beliefs, attitudes and behaviours. Information Quality, System Quality, Service Quality and Perceived Value represent beliefs, measures of User Satisfaction represent attitudes, and Intention to Reuse focuses on behavioural measures. The results support the belief–attitude–behaviour chain (see Figure 5), as suggested by the TAM (Davis, 1989; Davis *et al*., 1989) or the Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). TAM adapted from the TRA suggests that the Use of an information system is determined by user Intention to Use the system, which in turn is determined by user Perceived Usefulness and Attitude Towards Using the system. Attitudes Towards Usage are influenced by Perceived Ease of Use and Perceived Usefulness. Perceived Ease of Use has also a direct influence on Perceived Usefulness. Both Perceived Usefulness and Perceived Ease of Use are influenced by external variables. Consistent with the validated e-commerce success model, TAM also consists of three categories of variables: beliefs (i.e. Perceived Usefulness and Perceived Ease of Use), attitudes (i.e. Attitude Towards Usage) and behaviours (i.e. Intention to Use and System Use).

TAM focuses on *expectations* of net benefits from future IS use, while the IS/e-commerce success model focuses on net *realized* benefits associated with IS use. Namely, TAM is an *ex ante* perspective, while IS/e-commerce success model is an *ex post* perspective. Thus, the nomological structure of the two models should be consistent (i.e. belief–attitude–behaviour chain). It is worth noting that this study uses Perceived Ease of Use to measure System Quality and successfully replaces Perceived Usefulness with Perceived Value in the e-commerce success model. If we exclude Information Quality and Service Quality from the e-commerce success model (see Figure 5), the constructs in the e-commerce success model can be conceptually mapped onto those in the TAM. Thus, based on these findings, this study revises the TAM by replacing Perceived Usefulness with Perceived Value to make it more consistent with the proposed e-commerce systems success model (see Figure 6).

In fact, many users display reluctance to use, or even abandon, a for-fee information system in the context of e-commerce even if it is *useful* for them. For example, when Napster was forced to charge customers for the use of its file-sharing service, users of the free services were not satisfied with the charge and abandoned the service, driving Napster into bankruptcy (Turban *et al*., 2006). This phenomenon may decrease the power of TAM in explaining and predicting user acceptance of chargeable information systems, which have become very popular in the context of electronic/mobile commerce. This is because Perceived Usefulness in TAM only captures the perceived benefit component but omits the

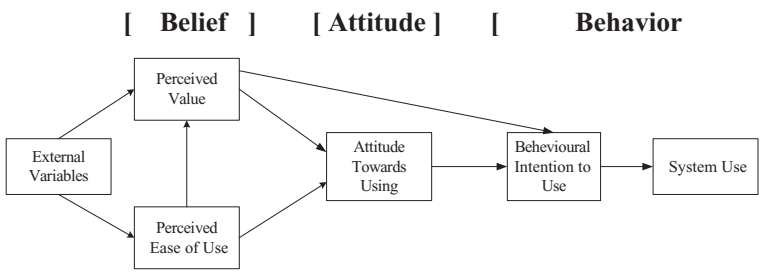


Figure 6. The revised Technology Acceptance Model.

perceived sacrifice component in the psychological process of user acceptance of IT. However, Perceived Value taps a wider range of costs and benefits of IT application usage than Perceived Usefulness.

Justifying and validating the revised TAM needs to be further addressed in future studies to provide a more developed theoretical foundation for IS acceptance and success. Previous research on TAM focuses mainly on the extension of TAM by adding one or more additional independent constructs to increase the explained variance in usage intention/behaviour (e.g. Mathieson *et al*., 2001; Moon & Kim, 2001; Gefen *et al*., 2003; Venkatesh *et al*., 2003; Wang, 2003b; Carter & Bélanger, 2005; Wang *et al*., 2006). The increase in explanatory power of these extended TAMs comes at the cost of an increase in model complexity. However, the revised TAM proposed by this study may have more explanatory power than the original TAM while maintaining the same level of parsimony as the original TAM.

7.2 E-commerce systems success model and marketing literature

Perceived Value is introduced to the respecified e-commerce systems success model as an intervening success measure, which mediates the effects of Information Quality, System Quality, and Service Quality on User Satisfaction and Intention to Reuse. With the advent and development of e-commerce systems, measuring affective satisfaction variables continues to be of importance. Also, the inclusion of the Perceived Value construct in the model of e-commerce systems success provides a richer portrayal of the dynamics surrounding quality measures, customer-perceived value, satisfaction evaluation and repeat use intentions. The results indicate that people continuously use an e-commerce system because they perceive it as valuable to themselves and feel satisfied with its quality. As mentioned earlier, Perceived Value is defined as a belief (cognitive) measure of net realized benefits, while User Satisfaction is an attitude (affective) one. The findings of this study confirm Bagozzi's (1992) suggestion that cognitive evaluations precede emotional responses. This research also confirms that User Satisfaction and Perceived Value are complementary yet distinct constructs (Woodruff & Gardial, 1996; Woodruff, 1997) and that Perceived Value is partially mediated through User Satisfaction in influencing Intention to Reuse/Repurchase (c.f., Cronin *et al*., 2000; Lam *et al*., 2004; Caruana & Fenech, 2005; Lin & Wang, 2006).

The nomological structure of the validated e-commerce success model (see Figure 5) is consistent with the quality → value → satisfaction → loyalty, quality → value → loyalty and quality → satisfaction → loyalty linkages, as proposed by marketing research literature (e.g. Zeithaml, 1988; Patterson & Spreng, 1997; Cronin *et al*., 2000; Parasuraman & Grewal, 2000; Hellier *et al*., 2003; Durvasula *et al*., 2004). In the traditional business-to-business context, previous marketing research has modelled the relationship between four key post-purchase constructs: Perceived Quality/Performance, Customer Perceived Value, Customer Satisfaction and Repurchase Intentions, in a causal path framework (e.g. Patterson & Spreng, 1997; Eggert & Ulaga, 2002; Lam *et al*., 2004). In the brick-and-mortar retail context, the causal relationship from Perceived Quality, Perceived Value, Customer Satisfaction to Repurchase Intention has also been proposed by prior marketing studies (e.g. Cronin *et al*., 2000; Hellier *et al*., 2003; Durvasula *et al*., 2004). As noted earlier, marketing researchers have continued to test the effects of Perceived Value, Satisfaction, and Loyalty (Intention to Reuse/Repurchase) on Other Net Benefit measures such as market share and profitability in the traditional marketing context (e.g. Buchanan & Gilles, 1990; Rust & Zahorik, 1993; Anderson *et al*., 1994; Roger, 1996; Bernhardt *et al*., 2000; Chaudhuri & Holbrook, 2001). These findings suggest that the nomological structure of the proposed success model in the e-commerce context (i.e. quality → value → satisfaction → loyalty → other net benefits) is consistent with that of the marketing and consumer behaviour models in the traditional business-to-business and retail contexts, and that the effects of Perceived Value, User Satisfaction and Intention to Reuse on Other Net Benefits, as depicted in the respecified e-commerce success model, still need to be addressed in future studies. This study has successfully reconciled the e-commerce success model with the marketing and IS acceptance literature.

Service Quality was added in the updated DeLone & McLean (2003) model and thus far has received little empirical investigation. This study provides empirical evidence that Information Quality, System Quality, and Service Quality can influence Intention to Reuse through Perceived Value and User Satisfaction. Previous research in the marketing area has suggested that both Perceived Quality and Perceived Sacrifice are antecedents of Perceived Value (Zeithaml, 1988; Dodds *et al*., 1991; Cronin *et al*., 2000; Teas & Agarwal, 2000). However, this study only incorporates Perceived Quality measures (i.e. Information Quality, System Quality and Service Quality) in the respecified e-commerce success model. Thus, future research could be conducted to investigate whether or not Perceived Sacrifice should be incorporated into the respecified e-commerce success model.

In summary, the substitution of Perceived Value for Perceived Usefulness, the collapsing of Use and Intention to Use into Intention to Reuse, and the respecification of the scope of Net Benefits measures/surrogates achieve a parsimonious, comprehensive e-commerce systems success model, which is also consistent with the IS acceptance and marketing literature. Researchers can use the respecified model as the foundation for developing comprehensive e-commerce systems success measures, exploring relationships between the proposed success measures and comparing different empirical studies concerning e-commerce success models.

8. IMPLICATIONS FOR PRACTICE

This research also provides several implications for e-commerce management. According to the validated model, Intention to Reuse was considered a closer measure of the e-commerce systems success than the other five success measures. As customer retention and customer relationship management take on more priority, customer loyalty creation has become a core source of competitive advantage. Reichheld & Sasser (1990) also claim that a 5% improvement in customer retention can cause an increase in profitability of between 25 and 85% depending on the industry. Thus, e-commerce managers should pay close attention to the development of and changes in the Intention to Reuse/Customer Loyalty. Customer Loyalty should develop if the formation of Perceived Quality, Perceived Value and Satisfaction is appropriately managed. Thus, management attention might more fruitfully focus on the 'development' of these internal psychological processes. In order to increase Intention to Reuse, e-commerce systems proprietors need to develop e-commerce systems with good Information Quality, System Quality and Service Quality, which can positively influence Perceived Value, User Satisfaction and then Intention to Reuse.

The findings of this study also emphasize the importance of Perceived Value as a strategic objective in the e-commerce success measurement and management. In current practice, e-commerce managers predominantly rely on satisfaction and quality measurement to develop and implement e-commerce strategies. However, the results of this study suggest that it is important for management to track changes in both the User Satisfaction and Perceived Value levels, because User Satisfaction does not totally mediate the influence of Perceived Value on Intention to Reuse (Figure 4). E-commerce managers who only consider the possible effect of quality-improvement initiatives on customer satisfaction will omit value dimensions customers desire if they do not also consider the effect of such strategies on the perceived value attributed to their e-commerce systems by their customers. Further, as organizations shift more resources from acquiring customers to retaining customers, customer value dimensions that drive customer satisfaction and loyalty take on added importance (Woodruff, 1997). Thus, to better understand e-commerce systems success and consumer behaviour, managers should take into consideration both cognitive and affective variables (i.e. Perceived Quality, Perceived Value and Satisfaction).

In the long run, customers may look at the perceived value of continuing an e-business relationship with their current seller vs. the perceived benefits and costs of switching to another seller (Anderson & Srinivasan, 2003). Thus, to remain in a competitive advantage, e-commerce managers should spend their effort on improving the value perceived by customers to discourage the customers from switching to competitors. In addition, an e-commerce company should identify its strengths and weaknesses on the customer value components relative to its competitors. The relative ratio of perceived quality to perceived price that appears in the customer-perceived value calculation tells companies where their strengths and weaknesses lie (Lam *et al*., 2004). To improve customer-perceived value, e-commerce managers, on the one hand, need to improve information, system and service quality, and on the other hand must determine an acceptable price range for their customers. Customers may not only

refrain from purchasing when the price is too high, but may also become suspicious of quality (Patterson & Spreng, 1997).

The findings clearly support that the total effects of Service Quality on Perceived Value, User Satisfaction, and Intention to Reuse were substantially greater than those of System Quality and Information Quality (see Table 4). That is, beliefs about Service Quality, within the e-commerce context, are more dominant than beliefs about System Quality and Information Quality in shaping Perceived Value, User Satisfaction and Intention to Reuse. This means that achieving a sustainable competitive advantage in the electronic marketplace will be very difficult with just superior System Quality and Information Quality. Also, Service Quality is much more difficult for competitors to copy effectively than Information Quality and System Quality.

This empirical result also emphasizes the importance of assuming a multidimensional, interdependent analytical approach. It is imperative for management to put emphasis on various system success aspects. Information Quality, System Quality and Service Quality belong to the system development aspect, while Perceived Value, User Satisfaction and Intention to Reuse belong to the Net Benefits facet. There is a growing interest in pushing beyond the system development factors of conducting an electronic business to a better understanding of the Net Benefits dimensions. Establishing strategies to improve only one success variable is therefore an incomplete strategy if the effects of the others are not considered. This study encourages e-commerce managers to include measures of Information Quality, System Quality, Service Quality, Perceived Value, User Satisfaction and Intention to Reuse into their present valuation techniques of e-commerce systems success.

Likewise, the empirical findings suggest that e-commerce systems success models that consider only direct effects are likely to result in incomplete assessments of the systems success. The evaluation of e-commerce strategies should incorporate the direct and indirect effects of Information Quality, System Quality, Service Quality, Perceived Value, and Satisfaction on Intention to Reuse and Other Net Benefits measures. It is therefore imperative for management to understand what drives the e-commerce success variables, how they are linked and how they contribute to e-commerce system's final Net Benefits. The respecified e-commerce success model proposed by this study provides e-commerce practitioners with a comprehensive model that unravels the intricate relationship between the key e-commerce success variables.

To achieve market leadership, e-commerce proprietors require a broader set of measuring instruments to evaluate and monitor the change in the e-commerce success variables. The current study provides reliable and valid measures of these variables. As the concise success measures with good psychometric properties are periodically administered to a representative set of customers, e-commerce system proprietors can accurately measure the current levels of the success variables and take the necessary corrective actions to improve them.

9. LIMITATIONS AND FUTURE RESEARCH

This empirical study has several limitations that can be addressed in the future research. First, investigation of e-commerce systems success model is relatively new to e-commerce

researchers. The discussed findings and their implications were obtained from one single study that examined some particular e-commerce categories and targeted a specific consumer group in Taiwan. Thus, caution needs to be taken when generalizing the findings and discussion to other e-commerce categories (e.g. business-to-business e-commerce) or user groups. This study utilized only individuals from Taiwan and thus, the results are limited to Asian/Collectivist cultures. An interesting piece of future research would be to rerun this study in a Western/Individualist culture. Thus, it is imperative to validate the proposed model with different user populations in different cultural contexts. A cross-cultural validation using a large sample gathered elsewhere is required for greater generalization of the proposed model.

Second, this study did not validate the indirect and direct effects of Information Quality, System Quality, Service Quality, Perceived Value, User Satisfaction and Intention to Reuse on Other Net Benefits measures, as depicted in the respecified e-commerce success model. Developing and testing closer 'Net Benefits' measures on the firm level (e.g. market share, return on investment and net profit) is a useful direction to further examine the validity of the respecified model.

Third, cumulative insights from prior studies support the general notion that Perceived Value is determined by Perceived Quality and Perceived Sacrifice (e.g. Zeithaml, 1988; Cronin *et al*., 2000). Thus, the inclusion of Perceived Sacrifice or Perceived Price in the respecified success model is also an important issue in need of theoretical reasoning and systematic empirical research.

Fourth, this study limited the measurement of System Quality to Ease of Use. In fact, the System Quality measures should include multiple dimensions such as availability, reliability, usability, response time, interactivity, adaptability and navigation (McKinney *et al*., 2002; DeLone & McLean, 2003). As mentioned earlier, there may not be a generic, consistent measure of System Quality in the MIS literature. Future research is required to establish a valid and reliable multidimensional measure of the System Quality construct and use it to retest the proposed model.

Fifth, this study assumed that all of the constructs in the research model are reflective constructs and thus used reflective measures to measure them. However, some of the proposed constructs may be formative constructs, such as Service Quality, Systems Quality and Information Quality. Misspecification of constructs as formative or reflective can create measurement errors, which in turn affects the structural model (Jarvis *et al*., 2003). Thus, future studies should also consider the relationships between the constructs and the measures as hypotheses that need to be evaluated in addition to the structural paths (Edwards & Bagozzi, 2000).

Sixth, this study merely developed and validated an e-commerce system success model using e-commerce proprietors as stakeholders and using customer perspective as the level of analysis. Future research may develop e-commerce systems success models using other stakeholders and levels of analysis.

Seventh, the use of self-report scales to measure study variables suggests the possibility of a common method bias for some of the results. Future research should employ both objective and subjective measures, and examine the correspondence (or lack thereof) between them.

Finally, this study was conducted with a snapshot research approach. Additional research efforts are needed to evaluate the validity of the investigated model. Longitudinal evidence might enhance our understanding of the causality and interrelationships between e-commerce systems success variables.

10. CONCLUSIONS

This research was in response to the call for continuous challenge and test of IS success models, especially within the e-commerce context (Rai *et al*., 2002; DeLone & McLean, 2003). Based on the previous IS success models and marketing research literature, this study presented and validated a comprehensive, multidimensional model of e-commerce systems success, which consists of six success measures: Information Quality, System Quality, Service Quality, Perceived Value, User Satisfaction and Intention to Reuse. The empirical evidence suggested that Intention to Reuse an e-commerce system was affected by Perceived Value and User Satisfaction, which, in turn, were influenced by Information Quality, System Quality and Service Quality.

The contributions of this study to e-commerce success research are fivefold. First, this study successfully respecified and validated the DeLone & McLean (2003) model by including Seddon's Perceived Usefulness to the model, replacing Perceived Usefulness with Perceived Value, collapsing Use and Intention to Use into Intention to Reuse, respecifying the scope of Net Benefits measures/surrogates, and providing empirical support for part of the respecified model. Second, the introduction of the concept of Perceived Value to the e-commerce systems success model provided a richer portrayal of the dynamics surrounding Information Quality, System Quality, Service Quality, Perceived Value, User Satisfaction and Intention to Reuse. Third, this study reconciled the respecified e-commerce success model with Seddon's (1997) Perceived Usefulness measure, DeLone & McLean's (2003) Use/Intention to Use construct and Davis's (1989) TAM. Accordingly, a revised TAM was also proposed by this study. Fourth, the nomological structure of the respecified success model in the e-commerce context was concurred with that of the marketing and consumer behaviour models in the traditional business-to-business and retail contexts. Finally, this study provided empirical support for the new variable of Service Quality in the updated D&M model. I encourage future researchers to continue challenging and testing the respecified e-commerce systems success model and the revised TAM.

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Biography

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APPENDIX

Measuring Items Used in this Study

Information Quality

IQ1 The e-commerce system provides the precise information you need.
IQ2 The information content meets your needs.
IQ3 You feel the output is reliable.
IQ4 The e-commerce system provides up-to-date information.

System Quality

SQ1 The e-commerce system is user friendly.
SQ2 The e-commerce system is easy to use.

Service Quality

SV1 When you have a problem, the e-commerce system service shows a sincere interest in solving it.
SV2 The e-commerce system service is always willing to help you.
SV3 You feel safe in your transactions with the e-commerce system service in terms of security and privacy protection.
SV4 The e-commerce system service has the knowledge to answer your questions.
SV5 The e-commerce system service gives you individual attention.
SV6 The e-commerce system service understands your specific needs.

Perceived Value

PV1 The product/service of the e-commerce system is a good value for money.
PV2 The price of the product/service of the e-commerce system is acceptable.
PV3 The product/service of the e-commerce system is considered to be a good buy.

User Satisfaction

US1 You are satisfied with this e-commerce system.
US2 The e-commerce system is of high quality.
US3 The e-commerce system has met your expectations.

Intention to Reuse

IR1 Assuming that you have access to the e-commerce system, you intend to reuse it.
IR2 You will reuse the e-commerce system in the future.
IR3 You will frequently use the e-commerce system in the future.

