B2C e-Commerce Success: a Test and Validation of a Revised Conceptual Model

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Abstract: Since the advent of the Internet, B2C e-Commerce has grown substantially across the globe. Whilst much research has examined factors influencing adoption of e-commerce, not as many studies have investigated the post-adoption phenomenon of success. Those studies that have investigated IS success and the extensions required to accommodate e-commerce have mainly been conceptual. Few have attempted to test and validate the models empirically. The purpose of this study was to fill this gap. By drawing from the technology acceptance model, expectation-confirmation theory and IS success theory, a revised conceptual model was derived. The model and relationships were tested and validated using data gathered from 166 online consumers in South Africa. 7 interrelated dimensions of B2C e-commerce success were confirmed, namely service quality, system quality, information quality, trust, perceived usefulness, user satisfaction and continuance intentions. Direct relationships between dimensions were identified. These showed that user intentions to continue using an online retail site are directly influenced by perceived usefulness, user satisfaction and system quality. User satisfaction is directly influenced by service quality and perceived usefulness, whilst perceived usefulness is directly influenced by trust and information quality. Trust in the online retailer is directly influenced by service quality and system quality. The implications of these and other findings are discussed.

Keywords: IS success; e-commerce success; B2C e-commerce; DeLone and McLean

1. Introduction

E-commerce is generally accepted as being a sub-set of e-business (Kim et al., 2006; Pavic et al., 2007). E-business activities and applications range from simple email to e-enabled supply chain management (Fusilier & Durlabhji, 2003; Parker & Castleman, 2007). E-commerce on the other hand is more narrowly defined in terms of the purchasing and selling products or services through the medium of the Internet (Grandon & Pearson, 2004). Business-to-consumer (B2C) e-commerce, the focus of this paper, refers specifically to the activity in which consumers buy products or services using the Internet medium (Pavlou & Fygenson, 2006).

Despite the dot-com failures of the 2000s, B2C e-commerce has continued to grow steadily (Van Slyke et al., 2004). This growth has occurred not only in the developed countries, but in the developing as well, resulting in an increasingly global community of online shoppers (Cyr et al., 2004). South Africa is no exception in this regard. Goldstuck (2002, 2004) and World Wide Worx (2006) have reported consistent increases in South African online retail sales revenue (excluding airline tickets) over the past few years, rising from R 162 million in 2001 to R 514 million in 2005. This is indicative of a relatively healthy B2C e-commerce environment, which is even healthier if sales of airline tickets are also considered (World Wide Worx, 2006). Companies are making large investments in e-commerce applications but are hard pressed to evaluate the success of their e-commerce systems (DeLone & McLean, 2003). This growth in e-commerce is the reason behind recent attempts to measure the success of e-commerce.

Much of the discussion on B2C e-commerce success has been based on earlier research on IS success by DeLone & McLean (1992). An example of this is the e-commerce success model developed by Molla & Licker (2001). Grounding conceptualizations of e-commerce success in IS literature is perfectly valid given that for all intents and purposes B2C e-commerce systems are information systems that have been extended for direct use by consumers (DeLone & McLean, 2004; Garrity et al., 2005; Pather et al., 2004). There is often a lack of conceptual clarity as to the theoretical basis for relationships between dimensions of B2C e-commerce success this being as a result of the conceptual weaknesses in the foundational IS success models (Seddon, 1997). Establishing the basis for these relationships and clarifying their nature is therefore an important endeavour (DeLone & McLean, 2003, 2004). There have been surprisingly few attempts at empirically validating and testing models of B2C e-commerce success such as that developed by Molla & Licker (2001) and DeLone & McLean (2003).

Alternative e-commerce success models have been suggested. Torkzadeh & Dillhon (2002) identified a set of success factors for e-commerce. Unlike Molla & Licker (2001) and DeLone & Mclean (2003), no relationships between factors were identified. Garrity et al. (2005) too developed an e-commerce success model, but this tended to view success primarily in terms of dimensions of satisfaction. Quaddus & Achjari

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(2005) developed an e-commerce success framework that reflected an organizational perspective. In this study, a customer perspective was being sought, and so the DeLone & McLean (2003) model and its variants were deemed to provide a more appropriate base.

The overall purpose of the study was to test and validate a revised conceptual model of B2C e-commerce success. The detailed objectives were to:

- Re-examine the relationships between key dimensions of B2C e-commerce success in the light of established theories, and to develop a revised model;
- Empirically validate and test the model using data gathered from a sample of online consumers in South Africa;
- Add to the body of knowledge on B2C e-commerce in South Africa. Whilst there have been several major South African academic studies examining e-commerce success from an organizational perspective (Molla, 2002; Pather et al., 2006), few have investigated the consumer perspective. An exception is De Villiers & Van Der Merwe (2001). This study will build on the work of De Villiers & Van Der Merwe (2001).

In the next section, the conceptual background of the study is laid out and the research model is developed. The research methodology is then outlined. The data analysis and results are reported before these results are discussed and implications drawn. The limitations of the study are noted and ideas for further research put forward. Finally the paper is concluded.

2. Conceptual background

Theory in the field of IS success has stemmed primarily from the seminal work of DeLone & McLean (1992). Numerous studies have since sought to extend and/or validate this framework. A summary of some key studies and variables examined are shown in Table 1 below. The table shows 11 dimensions of IS success that have been identified. The dimensions of system quality, information quality and user satisfaction have been included in all of the studies. This indicates that they are central to measuring IS success and should be included in any success model.

Seddon & Kiew (1996) attempted to partially validate the DeLone & McLean (1992) model and in so doing suggested the inclusion of perceived usefulness as a replacement to use, given that use is primarily a behaviour, and not reflective of success in contexts where usage is mandatory.

Individual impact and organizational impact were included in the original DeLone & McLean (1992) model, but not in most subsequent studies. DeLone & McLean (2003) in a 10-year update of their 1992 IS success model suggested that individual, organizational and other impacts be collapsed into a single net benefits construct for the sake of parsimony.

Rai et al. (2002) empirically tested and validated both the DeLone & McLean (1992) and Seddon (1997) model, but excluded the individual impact and organizational impact dimensions. Iivari (2005) also attempted to validate the DeLone & McLean (1992) model. In so doing he demonstrated that individual impact could be assessed with a perceived usefulness measure. He did not include organizational impact as a dimension.

Molla & Licker (2001) conceptualized a model of e-commerce success by drawing from the work of DeLone & McLean (1992). In addition to information (or content) quality, system quality, use and user (e-commerce customer) satisfaction, they also highlighted support and service (service quality) and trust as additional factors to consider in a B2C e-commerce environment. They noted too that in a B2C e-commerce environment usage of a system is typically voluntary, unlike in work situations where usage of a system may be mandatory.

DeLone & McLean (2003) in their updated model included the core dimensions of information quality, system quality and user satisfaction, as well as use/intentions to use, net benefits and service quality. They suggested that intention to use may be employed as an alternative to use as a success dimension. DeLone & McLean (2004) illustrated how the updated model could without modification be used to evaluate e-commerce success.

Table 1: Dimensions of IS Success

Dimension	D&M (1992)	S&K (1996)	Seddon (1997)	M&L (2001)	Rai et al. (2002)	D&M (2003/4)	Iivari (2005)
System Quality	X	X	X	X	X	X	X
Information Quality	X	X	X	X	X	X	X
User Satisfaction	X	X	X	X	X	X	X
Use	X		X	X	X	X	X
Individual Impact	X		X				X
Organisational Impact	X		X				
Perceived Usefulness		X	X		X		[X]
Net Benefits of Use			X			X	
Service Quality				X		X	
Trust				X			
Intention to Use						X	

Key: D&M – DeLone & McLean; S&K: Seddon & Kiew; M&L: Molla & Licker

Intention to use is primarily a pre-adoption construct (Davis, 1989). It gives an indication of users' intentions concerning future use of an information system. It is thus not entirely suitable for post-adoption studies, where attempts are made to evaluate the success of an information system (Bhattacherjee, 2001). Bhattacherjee (2001) makes the case for assessing user intentions to continue using a system (continuance intention). Such a measure is more suited to post-adoption studies such as the investigation of IS success. This construct is furthermore appropriate as a success measure in the e-commerce context, where repeat customers are highly valued. Bhattacherjee (2001) found that perceived usefulness, user satisfaction and loyalty incentives were influences on continuance intention. In the next section, a research model is developed by drawing out the salient dimensions of e-commerce success and the relationships between them.

3. Research model

Based on the discussion in the conceptual background section above, the factors that are important in the context of B2C e-commerce systems include the core IS success measures of system quality, information quality (also referred to as content quality in e-commerce environments) and user satisfaction (also referred to as customer satisfaction in e-commerce environments) (Molla & Licker, 2001). Additional factors relevant to e-commerce specifically are trust, service quality (or support and service), loyalty incentives and continuance intention (Bhattacherjee, 2001; Molla & Licker, 2001). As suggested by DeLone & McLean (2003) [continuance] intention was chosen as an alternative to use, given the difficulties of measuring general e-commerce use. Use therefore was not included in our research model. For the same reason net benefits was not included in our research model, but rather perceived usefulness, which is a valid, easily assessable perceptual measure of net benefits (Iivari, 2005; Rai et al., 2002; Seddon, 1997). The relationships between these 8 chosen factors will now be discussed by examining each in turn.

3.1 Continuance intention

Research into IS success has been concerned with the quest for the dependent variable (DeLone & McLean, 1992). DeLone & McLean (1992) initially proposed the organizational impact of an IS as the ultimate dependent variable, preceded by individual impact. In the 10-year update, DeLone & McLean (2003) combined these into a net benefits construct and argued for this as the dependent variable. Given the difficulties associated with assessing usage and net benefits of use as success measures, continuance intention provides an appealing yet credible alternative as the ultimate dependent variable. The focus in this study is on how the various independent variables ultimately impact directly and indirectly on it. As a consequence only unidirectional relationships are considered. Consistent with many mainstream studies in IS, null hypotheses are not expressed (Bhattacherjee, 2001; Gefen et al., 2003; Iivari, 2005).

3.2 User satisfaction

User Satisfaction is the most general perceptual measure of information systems success (Seddon, 1997). In the e-commerce environment it is an important means of measuring customers' opinions of the e-commerce system (DeLone & McLean, 2003). Customers in this study refer to only those who directly use e-commerce services. Wang et al. (2001) developed a measure of customer information satisfaction with e-commerce websites. The measure had dimensions of customer support, security, ease of use, transactions and payment, information content, digital products and services and innovation. Several of these dimensions

overlap with those in IS success models (DeLone & McLean, 2003; Molla & Licker, 2001). For example customer support (service quality), ease of use (system quality) and information content (information quality) appear as dimensions in both success and satisfaction measures. This indicates a lack of conceptual clarity between satisfaction and success in the IS literature (Garrity et al., 2005). As a consequence many studies that incorporate user satisfaction into IS success models employ single item measures for this construct (Rai et al., 2002). Bhattacherjee (2001) identified user satisfaction as a key determinant of whether a user intends to continue using an e-commerce system. The hypothesis suggested is:

H1: User Satisfaction has a positive effect on Continuance Intention for an e-commerce system.

3.3 Perceived usefulness

Rai et al. (2002) in validating the Seddon (1997) model demonstrate that perceived usefulness positively influences user satisfaction with an information system. The hypothesis suggested is:

H2: Perceived Usefulness has a positive effect on User Satisfaction for an e-commerce system.

Bhattacherjee (2001) demonstrated perceived usefulness as a key determinant influencing customer intentions to continue using an e-commerce system, justifying the following hypothesis:

H3: Perceived Usefulness has a positive effect on Continuance Intention for an e-commerce system.

3.4 Loyalty incentives

Bhattacherjee (2001) drew on expectation-confirmation theory (ECT) in the consumer behavior literature, technology acceptance model (TAM) in the IS use literature and agency theory in the organizational economics literature to propose satisfaction, perceived usefulness and loyalty incentives as the three key factors influencing customers' decisions to continue using an e-commerce system. Loyalty incentives has not previously been included in IS success models, but based on Bhattacherjee (2001) it is hypothesized that:

H4: Loyalty Incentives have a positive effect on Continuance Intention for an e-commerce system.

3.5 Trust

Gefen et al. (2003) note that there should be a clear distinction between trusting beliefs and trusting behaviours (e.g., usage of an e-commerce system). In this paper trust is viewed as a set of trusting beliefs about e-commerce (Gefen et al., 2003). Molla & Licker (2001) included trust in their model of e-commerce success. Trust in an e-commerce system has several benefits including heightened perceptions of usefulness and greater intentions to use the system (Gefen et al., 2003). The latter argument may also be extended to encompass the impact of trust on intentions to continue using an e-commerce system. Intention to continue using a system is as much a behavioural intention as intention to use. Thus, the hypotheses suggested are:

H5: Trust has a positive effect on Perceived Usefulness of an e-commerce system.

H6: Trust has a positive effect on Continuance Intention for an e-commerce system.

Molla & Licker (2001) provide support for the influence of trust on user satisfaction. Where an e-commerce vendor is perceived as trustworthy, this leads to heightened levels of user satisfaction. The hypothesis suggested is therefore that:

H7: Trust has a positive effect on User Satisfaction with an e-commerce system.

3.6 System quality

System quality in an e-commerce context, as with traditional IS, is reflected by usability, availability, reliability, adaptability and fast response time of the system (DeLone & McLean, 2003). According to Seddon (1997) system quality is concerned mainly with the consistency of the interface and the ease of use. As such ease of use features prominently in the operationalisation of system quality (Ifinedo, 2006; Rai et al., 2002; Seddon, 1997). In attempting to understand the relationship between system quality and other dimensions of IS success the TAM can be referred to (Davis, 1989). In the TAM, perceived ease of use has been found to influence both perceived usefulness and behavioural intentions to use a new system (Davis, 1989). Given the prominence of ease of use in the assessment of system quality, it therefore follows that:

H8: System Quality has a positive effect on Perceived Usefulness of an e-commerce system.

H9: System Quality has a positive effect on Continuance Intention for an e-commerce system.

The positive impact of system quality on user satisfaction has been recognized and demonstrated in several prior IS success studies (DeLone & McLean, 2003; Rai et al., 2002; Seddon & Kiew, 1996). Molla & Licker

(2001) argue that this effect applies equally to e-commerce systems. There is thus ample evidence to support the hypothesis that:

H10: System Quality has a positive effect on User Satisfaction with an e-commerce system.

A link between system quality (ease of use specifically) and trust has been demonstrated by Gefen et al. (2003). They posit that through investing time and effort in improving the ease of use and usability of websites, e-commerce vendors demonstrate to consumers their integrity and trustworthiness. Thus, the hypothesis supported is:

H11: System Quality has a positive effect on user Trust of an e-commerce system.

3.7 Information quality

Information quality is highlighted by DeLone & McLean (1992) as an important indicator of IS success. Information quality has received increased attention since the advent of the Internet and World Wide Web (WWW) (Lederer et al., 2000). Molla & Licker (2001) suggest that in the e-commerce context, it should be referred to as content quality, whilst DeLone & McLean (2004) suggest retaining the label information quality. Information and content quality are used interchangeably in this study. Lederer et al. (2000) found information quality to be a major influence on the perceived usefulness of websites, as suggested by Seddon (1997) and as validated by Rai et al. (2002) concerning traditional IS. Rai et al. (2002) also validated the relationship between information quality and user satisfaction as suggested by DeLone & McLean (1992) and Molla & Licker (2001). DeLone & McLean (2003) argue that information quality influences intentions to use a system, which may equally apply to intentions to continue using a system. The hypotheses suggested are therefore as follows:

H12: Information Quality has a positive effect on Perceived Usefulness of an e-commerce system.

H13: Information Quality has a positive effect on User Satisfaction with an e-commerce system.

H14: Information Quality has a positive effect on Continuance Intention with an e-commerce system.

3.8 Service quality

Pather et al. (2004) note the importance of service quality in the e-commerce context. Service quality (or support and service in Molla & Licker, 2001) is defined as the overall support delivered by the e-commerce service provider (DeLone & McLean, 2003). Molla & Licker (2001) postulate e-commerce satisfaction is affected by the level of support and service (or service quality) provided by the e-vendor. DeLone & McLean (2003) also show this relationship in their updated model of IS success. They further indicate that service quality influences intentions to use a system, which may equally apply to intentions to continue using a system. The hypotheses suggested are:

H15: Service Quality has a positive effect on User Satisfaction with an e-commerce system.

H16: Service Quality has a positive effect on Continuance Intention for an e-commerce system.

Harris & Goode (2004) found that service quality plays an important role, not only in enhancing user satisfaction, but as an influence on trust and perceived usefulness. There is therefore support for the following hypotheses:

H17: Service Quality has a positive effect on Trust in an e-commerce system.

H18: Service Quality has a positive effect on Perceived Usefulness of an e-commerce system.

The above set of hypotheses can be summarized into a research model, as shown in Figure 1 below.

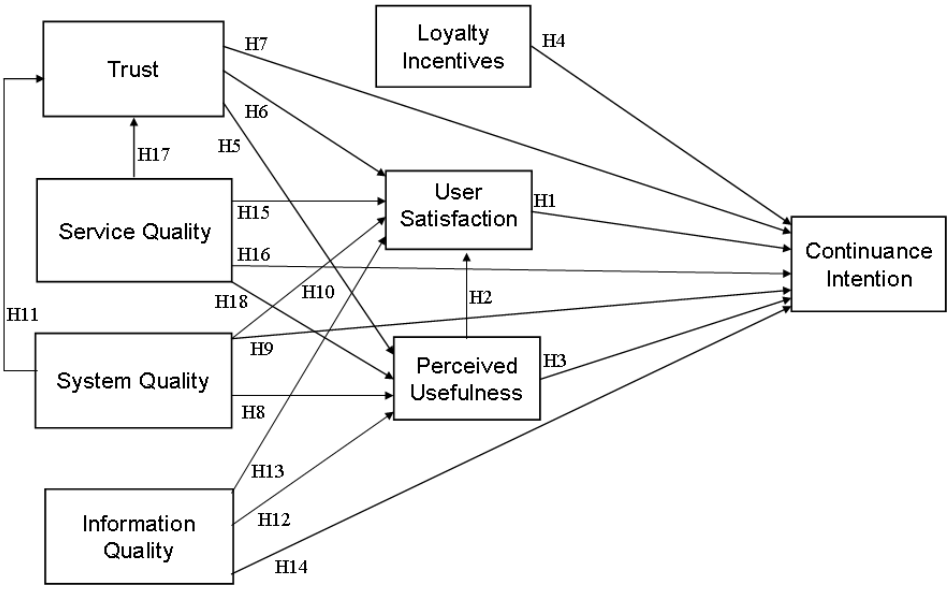

Figure 1: B2C E-commerce success model

4. Research methodology

The methodology employed in this study was positivistic, quantitative and hypothetic-deductive. Hypotheses were derived from the extant literature on IS and e-commerce success, leading to the development of the framework in Figure 1. A survey instrument was then developed in order to assess and measure the different dimensions of success from an e-commerce user perspective. For the purposes of focusing the study, online retail as a specific type of B2C e-commerce activity was investigated. The data was analysed statistically to validate the instrument and test hypotheses. The instrument design, sample design, data collection procedure and data analysis procedure will be discussed in this section.

4.1 Instrument design

DeLone & McLean (2004) provides the following advice to researchers aiming to evaluate e-commerce success: "Researchers and practitioners should not let themselves be carried away by the hype of the new economy and led to believe that this new and rapidly changing environment requires entirely new measures of IS success. One should look first at the cumulative tradition, and determine which existing and validated success measures can be used in the e-commerce environment. As much as possible, tried and true measures should be enhanced and expanded with modifications or, where necessary, new measures should be considered. Selection of e-commerce success dimensions and measures should be contingent on the objectives and the context of the empirical investigation, but tested and proven measures should be used whenever possible. Completely new and untested metrics should be adopted only as a last resort" (p. 43).

In keeping with this advice, measures that were tried and tested in previous IS success or e-commerce success studies were sought. The measures needed to be sufficiently generalisable to various types of B2C e-commerce systems. For example, online retail varies from online grocery shopping to airline ticket purchasing, the frequency of purchase (and therefore e-commerce usage) varying depending on product and context. A detailed search of relevant instruments used by previous researchers was conducted. Based on this search, the instruments shown in Table 2 below were used to create the questionnaire. Slight modification to suit the context of e-commerce was necessary for some instruments.

Table 2: Instruments Used to Measure B2C E-commerce Success Dimensions

Measure	Number of Items	Source
System Quality	7	Seddon (1997)
Information (Content) Quality	7	Rai et al. (2002)
Service Quality (Support & Service)	4	Wang et al. (2001)
Trust	6	Suh & Han (2002)
Loyalty Incentives	3	Bhattacherjee (2001)
Perceived Usefulness	6	Suh & Han (2002)
User (Customer e-commerce) Satisfaction	1	Rai et al. (2002)
Continuance Intention	3	Bhattacherjee (2001)

The questionnaire was divided into two sections. In the first section, the 8 measures in Table 2 were laid out (See Appendix 1). The measures made use of a 5-point Likert scale, anchored by Strongly Disagree (1) at one end to Strongly Agree (5) at the other. All the original measures in Table 2 were designed in this way. The second section gathered general demographic information about the respondents such as age, income, gender, Internet experience and habits, and e-commerce experience. Internet experience and habits were assessed using measures derived from Tan & Teo (2000).

4.2 Sample design

This study was aimed at a population of e-commerce users, specifically online retail customers in South Africa. There were no specific demographic requirements, apart from the fact that respondents were required to have conducted online retail activity via the medium of the Internet. Of the estimated 3.4 million Internet users in South Africa at the end of 2004 (World Wide Worx, 2005), about 41% were estimated to have engaged in e-commerce activities such as shopping online (Webchek, 2004). The demographic profile of the typical e-commerce user in South Africa is thought to be young to middle-aged, university-educated, and affluent (De Villiers & Van Der Merwe, 2001; Brown & Buys, 2005). The gender split is estimated to be only slightly biased towards males.

In order to reach a sample of this target population, postgraduate business students at a leading South African university were the primary target group. A few respondents (7) from outside of this group also participated. Postgraduate business students have been used in prior e-commerce studies in recognition that they very often have e-commerce experience (Gefen at al., 2003). In South Africa this is the case too. Brown & Buys (2005) found that this group conformed closely to the profile of the typical e-commerce user in terms of age, education and income. A realistic sample for a positivistic study of this nature was deemed to be in the region of 150 to 250 respondents (De Villiers & Van Der Merwe, 2001; Molla, 2002). This figure was deemed more than sufficient to carry out the envisioned statistical analysis (Molla, 2002).

4.3 Pilot study

Before the major study, a pilot study was conducted. The purpose was to establish the basic soundness of the instrument and to check for any problems related to wording and ambiguity in measurement items. The respondents for the pilot study were 10 IS Masters students. Through the pilot it was recognized that respondents needed to be instructed to base their responses on their most recent e-commerce experience, rather than their general perceptions. Asking questions that relate to the most recent service encounter enabled the researchers to elicit attitudes with respect to a specific experience (Shankar et al., 2003). The instrument made use of existing validated measures, so no pre-tests were conducted to refine the measures.

4.4 Data collection and analysis procedure

For the postgraduate students, questionnaires were distributed just before the end of their formal classes. This method was very effective as the questionnaires were returned immediately after completion. It also ensured a high response rate. In total, 183 questionnaires were returned of which 166 were useable. 17 were unusable, either because they were incomplete or because the respondents indicated that they had no experience of purchasing or shopping from online retail sites.

Several statistical tests were employed to analyse the data. Descriptive statistics were used to describe the respondent profile, to ascertain the mean scores for key variables, and to determine correlations between the variables. To test for instrument reliability, the Cronbach alpha was used, whilst factor analysis was employed to determine construct validity. To test the hypotheses multiple linear regression equations were formulated.

5. Data analysis and results

In this section, the demographic profile of the respondents and other descriptive findings will be presented, followed by validation and refinement of the measuring instrument. The hypotheses will then be tested.

5.1 Demographic profile

Appendix 2 shows the self-reported demographic profile of the 166 valid responses in terms of gender, age, education, profession and income. 69% of the respondents were male, with 93% between the ages of 25 – 44. 86% had either an undergraduate and/or postgraduate degree. 69% were managers or professionals,

and 79% were in the upper income brackets, earning more than R 10,000 per month. This profile matches the typical profile of a South African e-commerce user, except for the larger proportion of male respondents. The male bias in the respondent profile was due to the majority of postgraduate business students being male.

5.2 Internet and e-commerce experience

The level of Internet and e-commerce experience amongst the sample is shown in Appendix 3. 72% had Internet access at home. The majority (71%) had over 5 years of Internet experience, but only 14% had over 5 years online shopping experience. Most (89%) used the Internet a few times a day or more, on average for more than an hour at a time. The Internet was mostly used for communications, followed by getting information and product support, downloading free resources, banking, online shopping and entertainment respectively.

Respondents were asked what products and services they purchased online. The most common purchases were by category: (1) books, magazines and stationary, followed by (2) DVDs, movies and videos, then (3) music, and (4) flowers, gifts and cards. These results are consistent with those of De Villiers & Van Der Merwe (2001), who also found that books were the most popular product purchased online by South African consumers. The respondents were asked what online retail web site they were referring to in responding to the questionnaire. The most commonly referred to was Amazon.com. Other retail web sites referred to included Kalahari.net (a South Africa retailer similar to Amazon.com), FlySAA (a South African airline), Picknpay.co.za (the e-commerce site of a major South African supermarket chain) and Inthebag.co.za (the e-commerce site of a major South African supermarket chain). This is also consistent with De Villiers & Van Der Merwe's (2001) findings where they stated: "*It should be of concern for local Internet entrepreneurs that Amazon.com, an American site, is by far the most popular site for local Internet users*" (p. 13).

5.3 Instrument validity, reliability and refinement

The measures in the survey were derived from existing instruments that had been previously validated in prior IS and e-commerce studies. It was still nevertheless necessary to confirm their validity and reliability. Some refinements were also anticipated, since the context of e-commerce is slightly different to the more traditional IS context where some of the measures had been developed.

5.3.1 Construct validity

Confirmatory factor analysis (CFA) is often used to assess construct validity (Molla, 2002). Since the questionnaire was devised from previously validated instruments, CFA was used to validate and refine the measurement model. The following commonly applied decision rules were used (Wang et al., 2001; Tan & Teo, 2000):

- Use a minimum eigenvalue of 1 as a cutoff value for extraction;
- Delete items with factor loadings of less than 0.5 on all factors or greater than 0.5 on two or more factors;
- Use varimax rotation;
- Exclude single item factors from the standpoint of parsimony.

There were 8 major constructs identified in the research model of Figure 1, containing 37 measurement items, as shown in Table 2. One of the constructs, user (customer e-commerce) satisfaction contained only a single item and so was not included in the factor analysis. 7 factors were therefore expected to emerge. The iterative sequence of factor analysis and deletion was executed and repeated until distinct factors were identified (Wang et al., 2001).

As a result of the CFA, 8 of the original 37 items mentioned in Table 2 were deleted to ensure construct validity. The CFA identified 6 distinct factors, namely Perceived Usefulness/Continuance Intention, Information (Content) Quality, System Quality, Trust, Loyalty Incentives and Service Quality (Support and Service) (See Table 3). The only anomaly that remained was the loading of Continuance Intention on the same factor as Perceived Usefulness. This attests to the strong influence of Perceived Usefulness on Continuance Intention. These constructs were still retained and treated as separate constructs, as their Variance Inflation Factors (VIFs) were well below the upper limit of 10 (Tan & Teo, 2000). Furthermore, there are strong conceptual grounds for treating Perceived Usefulness and Behavioural Intentions as distinct

(Davis, 1989; Bhattacherjee, 2001). Table 3 shows the optimal factor loadings achieved after elimination of items, while Table 4 illustrates which items were deleted, and the structure of the final measurement model.

Table 3: Final factor loadings

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Perceived Usefulness (PU)						
PU1	0.10	*0.76*	0.04	0.06	0.16	0.05
PU2	-0.02	*0.76*	0.13	0.14	0.08	0.12
PU3	0.11	*0.80*	-0.08	0.13	0.17	0.10
PU4	0.17	*0.80*	-0.08	0.00	0.05	0.14
PU5	0.18	*0.68*	0.05	0.11	-0.10	0.24
PU6	0.13	*0.77*	-0.10	0.28	0.15	0.15
Information (Content) Quality (IQ)						
IQ1	0.11	0.29	0.07	*0.74*	0.11	0.13
IQ2	0.16	0.08	0.00	*0.78*	0.00	0.10
IQ3	0.19	0.20	-0.01	*0.62*	0.27	0.17
IQ5	0.03	0.09	-0.01	*0.66*	0.18	0.31
IQ7	0.27	0.15	0.05	*0.75*	0.05	0.02
System Quality (SQ)						
SQ4	0.19	0.06	-0.01	0.21	*0.56*	0.17
SQ5 (Reversed)	0.20	0.23	0.05	0.10	*0.68*	0.18
SQ6 (Reversed)	0.13	0.12	0.02	-0.06	*0.79*	0.11
SQ7 (Reversed)	0.10	0.15	0.09	0.20	*0.71*	0.17
Continuance Intention (CI)						
CI1	0.16	*0.56*	0.02	0.23	0.26	0.26
CI3 (Reversed)	-0.10	*0.55*	-0.06	0.17	0.36	0.17
Trust (TR)						
TR1	0.12	0.27	-0.04	0.17	0.34	*0.70*
TR2	0.18	0.24	0.01	0.05	0.14	*0.77*
TR3	0.31	0.26	-0.02	0.14	0.29	*0.64*
TR4	0.30	0.18	0.17	0.26	0.04	*0.61*
TR6	0.22	0.15	0.07	0.25	0.22	*0.70*
Loyalty Incentives (LI)						
LI1	0.12	0.02	*0.90*	0.02	0.10	0.08
LI2	0.17	-0.04	*0.92*	0.03	0.08	0.06
LI3 (Reversed)	-0.04	-0.03	*0.81*	0.02	-0.06	-0.02
Service (Support & Service) Quality (SS)						
SS1	*0.73*	0.13	0.05	0.14	0.33	0.20
SS2	*0.73*	0.19	0.12	0.15	0.29	0.23
SS3	*0.76*	0.12	0.12	0.27	0.06	0.25
SS4	*0.76*	0.13	0.05	0.24	0.12	0.22
Expl.Var	2.95	4.69	2.46	3.21	2.81	3.04
Prp.Totl	0.10	0.16	0.08	0.11	0.10	0.10

Table 4: Refined Instruments

Construct	Original Instrument (No. of Items)	Refined Instrument (No. of Items)
System Quality (SQ)	7	4
Information (Content) Quality (IQ)	7	5
Service Quality (Support & Service) (SS)	4	4
Trust (TR)	6	5
Loyalty Incentives (LI)	3	3
Perceived Usefulness (PU)	6	6
User (Customer e-commerce) Satisfaction (US)	1	1
Continuance Intention (CI)	3	2

5.3.2 Instrument reliability

In order to assess reliability of the refined instrument, the Cronbach Alpha was calculated for each construct (Tan & Teo, 2000). Reliability is indicated if the Cronbach Alpha is greater than 0.7. The lowest Cronbach Alpha was 0.71, thus demonstrating that all measures exhibited reliability (see Table 5).

Table 5: Reliability test

Construct	Items	Cronbach Alpha
Perceived Usefulness (PU)	6	0.89
Information Quality (IQ)	5	0.83
System Quality (SQ)	4	0.76
Trust (TR)	5	0.86
Loyalty Incentives (LI)	3	0.86
Service Quality (SS)	4	0.88
Continuance Intention (CI)	2	0.71
User Satisfaction (US)	1	N/A

5.4 Descriptive statistics for B2C e-Commerce success dimensions

Table 6 illustrates the mean scores for the 8 dimensions and the correlations between them. The coefficients in bold italic are significant at $p < 0.05$. The mean scores for all dimensions are above 3 on a scale of 1 to 5 indicating that on average the e-commerce systems were perceived as successful. The lowest score of 3 was for loyalty incentives (LI), and the highest was for continuance intentions (CI), with a mean of 4. All the dimensions were significantly correlated with each other ($p < 0.05$), with the exception of loyalty incentives (LI), which only correlated with service quality (SS). It is perhaps an indication that including LI in the e-commerce success model was ill-conceived. As DeLone & Mclean (2004) note, *"…despite the multidimensional and contingent nature of e-commerce success, an attempt should be made to significantly reduce the number of different measures used to measure success, so that research results can be compared and findings validated*" (p. 44). The 7 remaining factors are all interrelated, indicating they are part of a higher order measure of B2C e-commerce success. The correlations between them do not exceed 0.63, which is indicative that they are nevertheless distinct constructs.

Table 6: Descriptive Statistics for B2C e-Commerce Success Dimensions

	Mean	PU	IQ	SQ	CI	TR	LI	SS	US
PU	3.7	1.00	*0.41*	*0.37*	*0.63*	*0.50*	0.01	*0.37*	*0.44*
IQ	3.4		1.00	*0.38*	*0.41*	*0.50*	0.08	*0.51*	*0.40*
SQ	3.8			1.00	*0.46*	*0.55*	0.11	*0.49*	*0.45*
CI	4.0				1.00	*0.50*	0.00	*0.36*	*0.48*
TR	3.7					1.00	0.12	*0.62*	*0.53*
LI	3.0						1.00	*0.20*	0.13
SS	3.4							1.00	*0.55*
US	3.9								1.00

5.5 Hypothesis testing

The hypotheses were tested using multiple linear regression equations to represent the relationships shown in Figure 1. The following equations were built:

CI = h1* US + h3 * PU + h4 * LI + h7 * TR + h9 * SQ + h14 * IQ + h16 * SS……(i)
US = h2 * PU + h6 * TR + h10 * SQ + h13 * IQ + h15 * SS……..(ii)
PU = h5 * TR + h8 * SQ + h12 * IQ + h18 * SS……...(iii)
TR = h11 * SQ + h17 * SS……(iv)

h1 to h18 represent the beta values corresponding to the hypotheses they represent. Recursive simultaneous equation models, such as equations (i) to (iv) can be estimated by using multiple linear regression applied to each equation separately (Pindyck & Rubinfeld, 1998). Table 7 below summarises the results of the regression tests. Hypotheses were supported if the p values were less than 0.05. 9 of the 18 hypotheses were supported and are highlighted in bold italics in Table 7. Table 7 shows that the three major variables influencing continuance intentions are perceived usefulness, user satisfaction and system quality,

with perceived usefulness being the primary contributor. User satisfaction in turn is influenced by perceived usefulness and service quality, with service quality having the higher beta value. Perceived usefulness is primarily influenced by trust and information quality. Trust is strongly influenced by service quality and system quality, in that order.

Table 7: Hypothesis testing

Hypothesis	Independent Variable	Dependent Variable	Beta value	p level (*p<0.05)	Hypothesis Supported?
H1	*User Satisfaction (US)*	*Continuance Intention (CI)*	*0.17*	**0.0223*	*Yes*
H2	*Perceived Usefulness (PU)*	*User Satisfaction (US)*	*0.18*	**0.0131*	*Yes*
H3	*Perceived Usefulness (PU)*	*Continuance Intention (CI)*	*0.43*	**0.000*	*Yes*
H4	Loyalty Incentives (LI)	Continuance Intention (CI)	-0.05	0.431	No
H5	*Trust (TR)*	*Perceived Usefulness (PU)*	*0.34*	**0.0004*	*Yes*
H6	Trust (TR)	User Satisfaction (US)	0.16	0.0676	No
H7	Trust (TR)	Continuance Intention (CI)	0.11	0.1900	No
H8	System Quality (SQ)	Perceived Usefulness (PU)	0.11	0.1848	No
H9	*System Quality (SQ)*	*Continuance Intention (CI)*	*0.17*	**0.0150*	*Yes*
H10	System Quality (SQ)	User Satisfaction (US)	0.14	0.0752	No
H11	*System Quality (SQ)*	*Trust (TR)*	*0.31*	*0.0000*	*Yes*
H12	*Information Quality (IQ)*	*Perceived Usefulness (PU)*	*0.19*	*0.0175*	*Yes*
H13	Information Quality (IQ)	User Satisfaction (US)	0.05	0.5112	No
H14	Information Quality (IQ)	Continuance Intention (CI)	0.09	0.2114	No
H15	*Service Quality (SS)*	*User Satisfaction (US)*	*0.28*	*0.0008*	*Yes*
H16	Service Quality (SS)	Continuance Intention (CI)	-0.08.	0.3115	No
H17	*Service Quality (SS)*	*Trust (TR)*	*0.47*	*0.0000*	*Yes*
H18	Service Quality (SS)	Perceived Usefulness (PU)	0.01	0.9215	No

The supported hypotheses are illustrated in Figure 2 below.

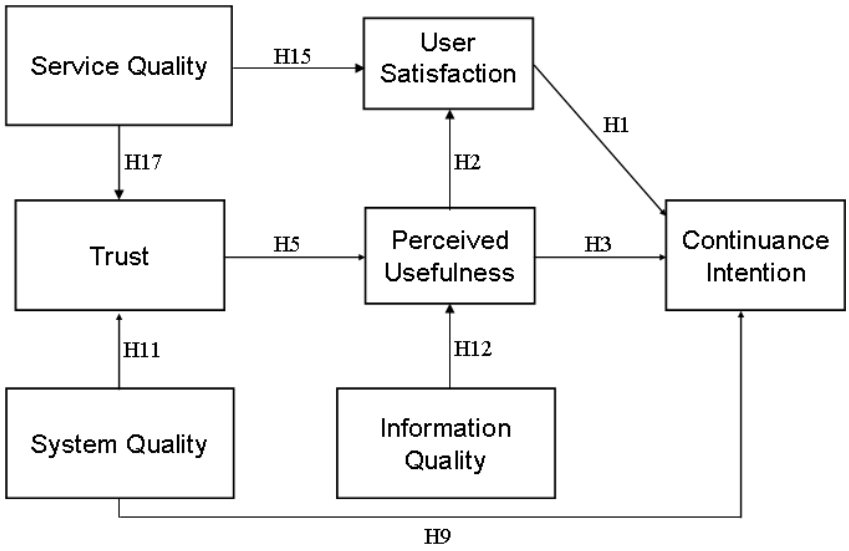

Figure 2: Refined e-Commerce success model

6. Discussion and implications

The model shown in Figure 2 is a very much refined version of Figure 1. As illustrated in Table 6 all the 7 dimensions in Figure 2 are significantly correlated, indicating that they are all dimensions of the same higher order e-commerce success construct. The contribution of multiple linear regression analysis has been to identify the most significant relationships while controlling for interrelationships between factors and indirect effects. The strong influence of perceived usefulness and user satisfaction on continuance intention and the negligible influence of loyalty incentives are as expected from Bhattacherjee (2001). The influence of system quality on continuance intentions mirrors the equivalent perceived ease-of-use to usage-intentions relationship in the pre-adoption TAM model (Davis, 1989). System quality is often operationalised as the ease and/or difficulty of system use (Rai et al., 2002; Seddon, 1997), which allows for this parallel to be drawn. The influence of information quality is shown to be primarily on perceived usefulness and not continuance intentions. This finding is indicative that information quality indirectly influences continuance intentions through perceived usefulness, as reasoned by Lederer et al. (2000). This rationale may apply also to the trust variable which has a strong influence on perceived usefulness, but not on continuance intentions. Perceived usefulness and service quality both have an influence on user satisfaction. Trust indirectly affects user satisfaction through perceived usefulness. Trust, finally, is strongly influenced by service and system quality. The relationship between system quality and perceived usefulness is surprisingly absent in the refined model of Figure 2. This apparent anomaly can be attributed to the inclusion of the trust variable, whereby system quality indirectly affects perceived usefulness through trust.

These findings show that the inclusion of service quality (DeLone & McLean, 2003) and trust (Molla & Licker, 2001) in the traditional IS success model significantly alters the nature of relationships between success dimensions. These relationships are reflective of the new e-commerce context, where service quality and trust are essential attributes for successful B2C e-commerce. The inclusion of continuance intentions rather than use or intentions to use is also a valuable refinement, as customer intentions to continue using an e-commerce system are reflective of repeat customers. Given the importance of these three variables to e-commerce success, more sophisticated conceptualizations and measures can be used to investigate their full impact. For example, Gefen et al. (2003) identify structural assurances, familiarity with the e-vendor, situational normality and calculative-based beliefs as important factors in enhancing trust. Concerning service quality, several studies suggest the use of a comprehensive instrument such as SERVQUAL to assess this dimension (DeLone & McLean, 2004; Molla & Licker, 2001; Pather et al., 2004).

DeLone & Mclean (2004) recommend that fewer and not more dimensions are needed to describe IS success. The inclusion of continuance intention was not as an extension to their model, but as a better means of assessing usage intentions in a post-adoption context such as when evaluating IS success (Bhattacherjee, 2001). The inclusion of trust as an additional variable was justifiable given its importance to e-commerce (Gefen et al., 2003; Molla & Licker, 2001). The addition of loyalty incentives on the other hand was found to be unnecessary. This additional factor did not correlate with most of the other interrelated dimensions. It also did not influence continuance intentions as hypothesized. DeLone & Mclean's (2004)

stance that additional dimensions beyond those in their updated model will not add much value to the e-commerce success concept is therefore partially vindicated.

In developing an instrument to assess the different dimensions of success, existing validated measures were drawn upon and modified appropriately. The use of existing measures proved successful as the instrument, after refinement, was shown to be both valid and reliable. DeLone & McLean's (2004) exhortation to researchers to use existing measures so as to build up a cumulative tradition was therefore justified.

The model of Figure 2 provides practitioners with a holistic, multidimensional perspective on e-commerce success. There is a tendency in practice to focus on different success dimensions in isolation, and not recognize their strong interrelationships. By considering the different dimensions in the model, and looking closely at their interrelationships, a better understanding of how to measure and improve e-commerce offerings can be obtained. The model may also be used to diagnose and address problems with B2C e-commerce offerings. For example, if an online vendor is experiencing problems related to lack of trust amongst potential or existing e-customers, a two-pronged strategy aimed at simultaneously enhancing service quality and system quality will help improve the levels of trust.

7. Limitations and further research

The sample was drawn largely from a group of MBA and other postgraduate students at a leading South African university. Most of the respondents were working professionals or managers and were representative of the typical e-commerce user in South Africa. There was however a predominance of males in the sample, whereas there is no major gender bias evident amongst e-commerce users in South Africa (De Villiers & Van Der Merwe, 2001). This was a limitation of using such a group of students. Future research might draw from a wider sample of e-commerce users to ensure the sample is even more representative of the typical e-commerce user in South Africa.

The instrument validation process revealed that continuance intention and perceived usefulness loaded on the same factor during CFA. This was indicative of the strong relationship between perceived usefulness and behavioural intentions, as identified in the pre-adoption TAM model, and in post-adoption studies such as by Bhattacherjee (2001). To ensure greater discriminant validity, it may be necessary to revisit the continuance intention instrument, given that the perceived usefulness instrument has been validated in a wide variety of contexts.

For the sake of parsimony, it may also be suggested that either perceived usefulness or continuance intentions be included in the e-commerce success model. This would be in line with the call by DeLone & McLean (2004) for a reduction in the number of dimensions of e-commerce success. Future research could therefore assess alternative models of e-commerce success to identify the best-fit model. Rai et al. (2002) conducted such a study for traditional IS success models.

Some dimensions of e-commerce success were difficult to operationalise. For example, user satisfaction with e-commerce has been identified by Wang et al. (2001) as consisting of 7 dimensions. Many of the dimensions overlap with those identified in the e-commerce success model of Figure 1. A single-item measure was therefore used to assess overall user satisfaction as suggested by Rai et al. (2002). Future research ought to bring conceptual clarity to this overlap of dimensions between e-commerce user satisfaction and success.

This study has incorporated continuance intentions as the ultimate dependent variable. Future research might attempt to incorporate appropriate measures for use and net benefits into the model, either as an alternative for continuance intentions or in addition to it.

To add explanatory richness and greater conceptual clarity to the phenomenon of B2C e-commerce success, it is perhaps timely at this juncture to conduct an inductive, qualitative enquiry using methods such as the grounded theory methodology. Even in well-researched areas such as IS success, grounded theory studies may be conducted to garner a better understanding of the social processes at play (Glaser, 1992).

8. Conclusion

IS success is a multi-faceted and multi-dimensional construct. In a B2C e-commerce context, customer service and trust in an online vendor are of utmost importance. It stands to reason therefore that service

quality and trust are two additional dimensions to consider in addition to the traditional dimensions of system quality, information quality, user satisfaction, perceived usefulness, and use/intentions to use.

Given the variety of products and services on offer to e-commerce consumers, using frequency of use as a general measure of e-commerce success is problematic. Frequency of use is also dependent on the nature of products and services being purchased. For example, online grocery shopping might be conducted more frequently than purchase of airline tickets for some. Assessing customer intentions to continue using an e-commerce system is perhaps a better measure of success, as it reflects repeat business regardless of product/service. It also treats behavioural intentions as a post-adoption phenomenon, as is required for evaluating success of a system. The pre-adoption intention to use measure from the TAM model is not as suitable to use for this evaluative purpose.

The validation of the initially formulated model in Figure 1 showed that the 7 major dimensions making up e-commerce success are all interrelated. However, only 9 of the 18 original hypotheses were supported. This was because the hypothesis testing delineated direct and indirect relationships between the core set of e-commerce dimensions. Overall the ultimate dependent variable, continuance intentions, was found to be directly influenced by perceived usefulness, user satisfaction and system quality. User satisfaction was directly impacted by service quality first and foremost and then perceived usefulness secondly. This affirms the strong association between a satisfied customer and good quality service. Perceived usefulness was influenced by trust and information quality. Trust in turn was influenced by service and system quality.

The confirmation of 7 interrelated dimensions for e-commerce success and a set of 9 direct relationships provides for a parsimonious way of understanding and evaluating B2C e-commerce success. Much of the research in this domain has been of a conceptual nature. This study adds to the body of knowledge by empirically validating a refined model of B2C e-commerce success upon which future studies can build.

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Appendix 1: Instrument Measures

(Answered with respect to the most recent e-commerce experience)

Perceived Usefulness (PU)

PU1. Using this online shopping site enhances the productivity of my shopping activities.
PU2. Using this online shopping site has a critical role in supporting my shopping activities.
PU3. Using this online shopping site makes it easier to do my shopping activities.
PU4. Using this online shopping site enables me to accomplish shopping activities more quickly.
PU5. Using this online shopping site improves my performance (e.g. saving time or money) of shopping activities.
PU6. I find this online shopping site useful for my shopping activities.

Information (Content) Quality (IQ)

IQ1. This online retail site provides the precise information I need.
IQ2. This online retail site provides responses to questions and queries that are exactly what I need.
IQ3. This online retail site provides sufficient information to enable me to do my tasks.
* *IQ4. This online retail site has errors that I must work around.*

IQ5. I am satisfied with the accuracy of information provided by this online retail site.
** IQ6. The output options (printer-friendly options, page sizes allowed for, etc.) are sufficient for my use.*
IQ7 .The information provided by this online retail site is helpful regarding my questions or problems.

System quality (SQ)

* SQ1. This online retail site is user friendly.
* SQ2. Compared to other sites, this online retail site is easy to become familiarized with.
* SQ3. I find it easy to get this online retail site to do what I want it to do.
SQ4. I find it easy to become skilful at using this online retail site.
SQ5. I believe that this online retail site is cumbersome to use.
SQ6. To use this online retail site requires a lot of mental effort.
SQ7. I get frustrated when I use this online retail site.

Continuance Intention (CI)

CI1. I want to continue using this online retail site rather than discontinue its use.
** CI2. My intentions are to continue using this online retail site rather than use any other alternative means of shopping.*
CI3. I would like to discontinue the use of this online retail site.

Trust (TR)

TR1. This online retail site is trustworthy.
TR2. I trust in the benefits of the decisions made by this online retail site, i.e.: I trust the specials offered and recommendations made by the site.
TR3. This online retail site keeps its promises and commitments.
TR4. This online retail site keeps customers' best interests in mind.
** TR5. This online retail site would do the job right even if not monitored.*
TR6. I trust this online retail site.

Loyalty incentives (LI)

LI1. This online retail site offers incentives for its continued use, such as frequent flier miles or bonus points.
LI2. I get rewarded for my continued patronage of this online retail site.
LI3. This online retail site generally does not give me any loyalty incentives for my continued use of its service.

Service quality (support and service) (SS)

SS1. I am satisfied with the customer support provided by this online retail site.
SS2. I am satisfied with the after-sales service provided by this online retail site.
SS3. This online retail site understands my problems and requests.
SS4. This online retail site responds to my requests fast enough.

User (customer e-Commerce) satisfaction (US)

US1. I am satisfied with making purchases online from this online retail site.
* Dropped Items

Appendix 2: Demographic profile of respondents

	Count	%
Gender		
Male	114	69%
Female	51	31%
Unknown	1	1%
Age		
Under 18	3	2%
18 – 24	4	2%
25 – 34	113	68%
35 – 44	42	25%
45 -54	4	2%
55 +	0	0%
Highest Education Qualification		
High School	4	2%
College Diploma	9	5%
Technikon Diploma	11	7%
Undergrad. Degree	49	30%
Postgrad. Degree	93	56%
Occupation		
Full-time Student	36	22%
Professional	76	46%
Technician/Artisan	4	2%
Manager	38	23%
Unemployed	1	1%
Self-employed	4	2%
Other	5	3%
Missing	2	1%
Monthly Taxable Income		
R 0 - R 1,999	11	7%
R 2,000 - R 4,999	5	3%
R 5,000 - R 9,999	11	7%
R 10,000 - R 19,999	54	33%
R 20,000 +	76	46%
Missing	9	5%

Appendix 3: Internet and e-Commerce experience

	Count	%
Internet Access at Home?		
Yes	119	72%
No	46	28%
Missing	1	1%
Internet Experience (yrs)		
< 1	2	1%
1 – 3	9	5%
3 – 4	15	9%
4 – 5	22	13%
> 5	118	71%
Online Shopping Experience (yrs)		
< 1	31	19%
1 – 3	64	39%
3 – 4	33	20%
4 – 5	15	9%
> 5	23	14%
Frequency of Internet Use		
Few times/month	8	5%
Once a week	10	6%
Few times/day or more	148	89%
Intensity of Internet Use per Average Day (hrs)		
< ½	12	7%
1/2 – 1	49	30%
1 – 3	68	41%
> 3	37	22%
Extent of Internet Use (Scale of 1 to 5)		
	Mean	**StdDev**
Get Information and Product Support	4.0	1.1
Communications	4.8	0.8
Download Free Resources	3.3	1.3
Entertainment (e.g. Online games)	1.9	1.2
Purchasing/Shopping	2.6	0.8
Banking	3.2	1.1

