



**A COMPARATIVE STUDY OF USERS' vs. DESIGNERS'  
EVALUATION OF THE DETERMINANTS  
E-COMMERCE INTERFACE QUALITY**

An empirical research project presented to the

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by

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## Preface

This Report is not confidential.

We wish to thank the following people for contributing to our research:

Helena Wasserman, Editor of MoneyMax for her suggestions and for including a link to our questionnaire in the MoneyMax daily newsletter.

Tom Salter, who in providing, shorter, easier to remember address for our questionnaire (<http://www.e-survey.ptv.cc>) made it easier for potential respondents to get to our site.

Finally all those who took the time and effort to respond to our questionnaire and especially those who passed it on to other people who they thought might be interested in contributing to our research.

We certify that except as noted above, the report is our own work and all references are accurately reported.

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## Executive Summary

E-commerce is in its infancy and as a result little research has been conducted on which aspects of an e-commerce site's interface are responsible for determining its quality and ensuring its success. (Turban and Gherke, 2000).

As a result there are few measurement tools available against which to benchmark the quality of an e-commerce site's interface, nor are there established guidelines which designers can use in developing e-commerce site interfaces.

This report sets out the results of an investigation into the factors that 60 users and 18 designers identified as being most important in determining e-commerce interface quality as well as the results of an investigation into the existence of significant differences between the importance ratings assigned to these factors.

Conclusions drawn from the report include that not only do differences between users' and designers' perceptions of the determinants of e-commerce interface quality exist, but that these perceptions also vary amongst different demographic groups of users.

Recommendations made are that in order to develop a quality e-commerce site interface, designers must understand the business for which the site is being designed. In addition to this designers must, where possible take into account the user for whom the site is being designed, as this impacts on their perceptions of a quality interface.

Finally areas for further research are proposed, including the development of a comprehensive list of the determinants of e-commerce quality, such that a framework or set of guidelines can be developed, which designers can use in the development of quality e-commerce site interfaces.

**Keywords:** e-commerce, quality, interface, users, designers, perceptions

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## 1. Introduction

Since its inception, the Internet has been seen as a tool that can help reduce and remove barriers of time and distance across borders and boundaries around the world.

E-commerce is the business application of this tool. Whether sales and purchases occur between businesses or directly to an individual customer, e-commerce portrays a shift in the conventional consumer paradigm.

The advantages of e-commerce are numerous. Commonly cited advantages include expanded market coverage, reduced cycles time and reduced costs. These benefits, however, are not the result of the medium itself, but rather the quality of the e-commerce system (Frook, 1997). Thus it must be said that a business on the Internet is still a business and customer service and satisfaction remains a top priority.

E-commerce is defining a new way of connecting, contacting and servicing a customer. In creating this new business channel e-commerce makes a range of self-services possible without human contact.

This lack of human contact means that a business's traditional sales force is being replaced by an e-commerce site's user interface. In other words the point where interaction occurs between two systems, the interface, has changed. (Oxford English Dictionary, 2000)

Subsequently, customers are no longer interacting with a sales force that intimately knows a business and its customers. Site designers and developers, who do not necessarily hail from a consumer background and who might not have an informed knowledge of users' requirements, must design an e-commerce site interface, to meet users' needs and desires.

Thus the importance of the user interface must not be understated. The interface plays a vital role in initially attracting a customer to a site and makes up a large portion of the purchasing experience – it is what s/he interacts with in order to obtain the product or service s/he desires. An effective interface is also important in ensuring repeat purchases and ongoing customer relations as well as playing an important role in determining whether an e-business will be successful or not.

The basis for this empirical research is to investigate the determinants of e-commerce interface quality and to assess whether or not there is a significant difference between users' and designers' evaluations of these determinants. Should it be found that they exist, the reasons for these differences will be explained.

The purpose of this research is to highlight areas of the e-commerce interface that have been identified as important by users, but which designers often neglect. In doing so it is hoped that this will give designers a better insight into those factors that contribute to a quality e-commerce interface, from a users perspective.

## **2. Plan of Development**

The paper will begin by giving a condensed and focused summary of the literature, which forms the basis for this research.

Next a problem statement and hypotheses will be given as well objectives and expected outcomes of the research.

Following this the research methodology will be examined. This includes methods chosen for sampling and data collection, as well an explanation of the survey instrument – a questionnaire that was distributed to designers and users of e-commerce.

The results of the data collected will be compiled and analysed. The implications of this analysis for users and designers will then be discussed and conclusion drawn.

Finally, based on the findings of the research, recommendations will be given regarding the initial hypotheses and to ensure quality e-commerce site interface design as well as recommendations for possible avenues for future research.

### **3. Literature Survey**

The literature survey reviews the body of knowledge surrounding *e-commerce* quality, focusing specifically on users' and designers' perceptions regarding *e-commerce* interfaces.

#### **3.1 Electronic Commerce**

The term *e-commerce* encompasses a very wide range of activities. It can be broadly defined as the use of IT to improve a business's performance (Wang, 1999). More narrowly, it can be defined as the use of Internet based networks to conduct business electronically, entailing all the activities associated with the buying and selling of goods and services. (Hayashi (1996) as cited in Band (1998); Definition of *e-commerce*, 2001; Han & Noh, 1999)

E-commerce is generally divided into two categories: business-to-business and business-to-consumer. In an attempt to keep this literature review to a useful size, business-to-consumer *e-commerce* will be concentrated on with a specific focus on the *e-commerce* interface.

Given the fact that *e-commerce* definitions are wide-ranging and at times contrasting, it becomes necessary to be able to categorise the different types of *e-commerce* in order to make clear which of these is being measured.

#### **3.2 Different Types of E-commerce Sites**

It is necessary to note that there is a distinction between categories of websites. According to Easton (1999), there are three main categories of websites.

*Content or Informational Websites* – These are designed to give users information, such as weather forecasts, news or sports results.

*Paid Subscription Sites* – Here, customers pay for temporary (or permanent) access to content (e.g. an online journal).

*Transactional Websites* – This is the main category that is examined in this literature review, as they are the typical example of business-to-consumer websites. These are used as a point of sale for customer purchases of goods and/or services.

The rapid growth of *e-commerce* from its Electronic Fund Transfer roots of the 1970s to current Internet based platforms is driven by the potential benefits of *e-commerce*. The section that follows describes some of the advantages and disadvantages of *e-commerce*.

### **3.3 Benefits/Advantages of E-commerce**

Some of the main benefits and their implications for different stakeholders include reduced costs, expanded market coverage, reduced cycle times, improved service and customer relationships as well as customised products.

This list is meant only to indicate why *e-commerce* is attractive to its stakeholders and the benefits that can be derived from a quality *e-commerce* venture. It is by no means exhaustive, but rather a grouping of a few of the obvious benefits, that were common in the literature.

### **3.4 Disadvantages of E-commerce**

Although *e-commerce* is usually discussed in terms of the benefits it provides, there are also disadvantages. These disadvantages can be split into those that

are inherent to the media itself and those that are the result of a poor implementation.

Inherent disadvantages include limitations of the technology, lack of person-to-person interaction, lack of e-commerce awareness, non-specific search engines and the anonymity of the media which can lead to fraudulent purchases or sales (Han & Noh, 1999).

Some disadvantages that can result from a poor implementation are a lack of transaction security, slow response times, poor response to customer complaints, poor informational content and a difficult to use website (Scribbins, 1999).

Again these lists are not exhaustive, but rather give balance to the argument that e-commerce is a business panacea. It is important to note that whilst many of these disadvantages are not directly related to the interface of the e-commerce site, a quality interface can assist in alleviating these problems.

### **3.5 Future Trends**

*E-commerce* is dynamic in nature. Trends can become de facto standards in future e-commerce ventures, or they can amount to nothing. However what is a trend today, might be a determinant of the success of an *e-commerce* venture tomorrow.

Identifying trends can be an important factor in ensuring that consumer needs are constantly met. Some trends that might affect business-to-consumer e-commerce are:

- Personalization
- Rapid Fulfilment of Orders
- Custom Pricing

- Intelligent Agents
- Round the clock availability and the ability to shop wherever you are  
(The future of 2000)

None of these predictions, however, are new concepts. They are simply the expression of current ideas as a mature technology. However, no matter what the future holds, in order to achieve a sustained level of success, a quality e-business is required. Thus in the section that follows the concept of e-commerce quality is discussed.

### **3.6 Electronic Commerce Quality**

As e-commerce is in its infancy there is thus very little to compare it to, in terms of other quality e-commerce ventures (Turban & Gherke, 2000).

Quality is subject to perceptions and the expectations of what a user of e-commerce might identify as being important to quality might not be seen as important by a designer of e-commerce – or indeed another user (Kettinger & Lee, 1997). In other words the question is often posed whether there are certain factors (determinants), which when included in an e-commerce site, will ensure a certain level of quality that is acceptable across the board. This is extremely difficult to conceptualise, and as a result, information system literature can be used to highlight the lack of consensus regarding the concept of quality.

Information systems quality is generally defined as conformance to requirements (Crosby as cited in McLeod and Smith, 1996). Due to the subjective nature of quality, what one stakeholder might view as an essential determinant of the quality of an IS, might differ from another. An example of such a discrepancy is that a designer might view elaborate graphics as essential to the quality of an information system, while a user might prefer simpler easy to understand graphics.

Finally, it must be determined, whether a high level of e-commerce quality (provided it can be measured accurately), is a guarantee, or at least contributes to success. However, in order to determine the e-commerce quality and its impact on business, it is necessary that the various aspects of e-commerce be identified.

### **3.7 Different Aspects of E-commerce Quality**

*E-commerce* can be divided into discrete parts. In researching this review, a common and useful division was the identification of front- and back-end aspects of e-commerce (Scribbins, 1999 & Biederman, 1999).

The front-end, or interface, will be used to describe those processes that occur up to and including the placing of the actual order (Whyte, 2001). This includes the informational content of the website, such as terms and conditions, shipping information, privacy policies and product information. It also encompasses the other aspects, such as overall ease of use and the order-placing process itself. It is what attracts a consumer to an e-commerce site and motivates them to place an order and encourage repeat purchases.

Back end includes everything after the placing of the order. Processes involved with order confirmation, order tracking, delivery, payment and customer service (e.g. returns, redress and complaints) are all considered to be back-end (Source: Business Wire, 2000). A quality back-end promotes customer loyalty and repeat purchases from an e-commerce site.

Because e-commerce transactions have both front- and back-end aspects, evaluating the quality of such a transaction would require a very broad investigation. As a result, in order to ensure that meaningful conclusions can be drawn from this research, it is necessary that the scope of the research be limited to the front-end.

### 3.8 Lack of Clarity on the Subject of *E-commerce Quality*

The literature does not make a clear distinction between e-commerce effectiveness and e-commerce quality. However according to some researchers (Anthes, 1999; Alter, 1999), that while a quality website will always be effective, effectiveness is not necessarily an absolute measure of quality.

However, there does seem to be general consensus on the fact that to maintain long-term effectiveness, a quality e-commerce site is needed. In other words, the factors that sustain effectiveness and competitive advantage are better measures of quality (Frook, 1997; Alter; 1999; Anthes, 1999).

Finally, the great majority of literature that has been encountered on the subject of obtaining e-commerce quality and effectiveness exhibits agreement on the fact that there are identifiable determinants of the quality of an e-commerce site (Examples include Han & Noh, 1999; Abels, White & Hahn, 1999; Tracy, 1998 and Schubert & Selz, 2001)

In order to design a quality e-commerce interface it is necessary to first identify the determinants of a quality e-commerce interface. In previous research, various approaches have been taken to identify the e-commerce determinants:

Turban & Gherke (2000) first identified the determinants of *e-commerce* effectiveness in terms of what experts and designers felt were important to the users. Secondly, the research identified the factors that users felt were the most important determinants of *e-commerce* effectiveness.

Whereas in the research of Choi (1999), the determinants of *e-commerce* effectiveness as defined by businesses, related to how an effective *e-commerce* site affected the way they do business; and the determinants of *e-commerce* effectiveness as defined by customers, related to how an effective *e-commerce* site affected their shopping experience.

The lack of consensus on what these determinants are highlights the need for further research.

However before this can be undertaken it is necessary to examine previous research on, as well as methods used, in the measurement of e-commerce quality. Thus the following section describes previous attempts to identify the determinants of, as well as methods used to assess e-commerce quality.

### **3.9 Previous Research on E-commerce Quality**

There has been limited research into previous frameworks and models on e-commerce quality. However, there are two types of research that have been identified. The first relates to identifying the determinants of e-commerce quality, while the second relates to the measuring of e-commerce quality based on determinants already identified.

### **3.10 Identifying Determinants of E-Commerce Quality**

This approach uses statistical methods to analyse the results obtained from the survey instruments to identify what determinants users felt were most important to e-commerce sites.

In the research of Turban & Gherke (2000), the importance of the different variables were determined by users rating them on a Likert scale of 1-5. By using statistical methods to analyse the results obtained from the survey instruments Turban & Gherke were able to identify what factors users felt were most important to a website.

This is a common approach to survey instruments and has been employed in a similar fashion by Selz (1998) as cited in Srivihok (1999); Dholakia & Rego (1998); and Scribbins (1999).

### 3.11 Measuring E-Commerce Quality

The frameworks and models proposed by von Dran et al. (1998); Kim (1999) as cited in Molla (2001); Zhang et al. As cited in Molla (2001); and Schubert and Selz (2001), aim to measure e-commerce quality based on the determinants.

The Kano Model of Quality examines the quality of a website from a consumer's point of view. This identifies categories that are important to users, these include navigation, technical functionality, use and result, appearance, credibility, accessibility and characteristics of information content.

Each of these categories is rated according to a level of customer expectation:

*Expected Quality:* is the minimum level of quality acceptable to customers

*Normal Quality:* encompasses consciously stated needs

*Exciting Quality:* includes features that impress customers and create loyalty

According to von Dran et al. (1998) the result of designing websites to include as many of the exciting qualities as possible is the creation of a competitive advantage.

### 3.12 Summary of Literature

This literature review set out to examine the information available on e-commerce quality, with a specific focus on users' and designers' perceptions.

**Comment:** The word "focus" was missing

E-commerce is a very broad term. As a result we have decided to focus on the front-end aspect of business-to-consumer e-commerce in order to limit the scope of this research. Furthermore, we have identified that it is important that any proposed avenue of research takes both e-commerce advantages and disadvantages into account.

With regard to this research into quality, information systems quality has been defined as conformance to requirements. This means that it is important to know what the requirements are and whether or not they are being met.

Ultimately, due to the lack of consensus on which factors determine e-commerce quality, the discrepancies between the various stakeholders' perceptions of important factors will have to be quantified and subsequently examined. This will therefore determine whether the fact that the differences that exist have a marked effect on the quality and subsequent success of an e-commerce venture.

There has been little research into this area. Of this research, most of it has been on what users think are important to e-commerce quality as opposed to comparing users' and designers' perceptions of the determinants of e-commerce quality.

## **4. Research Question**

This study will attempt to determine whether there is a difference between users' and designers' perspectives of the determinants of e-commerce interface quality.

For the purposes of this research, the term interface quality will not refer only to the graphical design of the interface, but to the effective use of the interface to provide the user with a quality e-commerce experience.

If it is found that there are differences between what users and designers perceive to be determinants of e-commerce interface quality, the reasons for these differences will be explained. Differences between different demographic groups of users will also be examined.

The investigation will focus only on individuals who have had experience using or designing e-commerce website interfaces.

## **5. Research Hypotheses**

The research question mentioned above leads to the following proposed hypotheses:

- [1] There is a difference between users' and designers' perceptions of the determinants of a quality e-commerce interface
  
- [2] Different groups of users view the determinants of a quality e-commerce interface differently (e.g. novice vs. experienced, male vs. female)

## 6. Methodology

### 6.1 Research Sample

#### 6.1.1 Sample Population

The total sample for this paper is made up of two discrete sets of respondents: designers' and users' of e-commerce websites.

#### 6.1.2 Response Rate

In total 150 printed user questionnaires were distributed. Of these, 25 responses were collected. This represents a response rate of 17%. 50 printed designer questionnaires were distributed and of these 7 were collected. This represents a response rate of 14%.

The web questionnaire was circulated by emailing its address to Internet portals, so that a link would be displayed where the questionnaire might be noticed by potential respondents. A link to the questionnaire was displayed on the Moneymax newsletter. The address was also sent to UCT staff members. In total 35 user responses and 11 designer responses were received from the web questionnaire.

It is important to note that the figures for responses received indicate only usable responses. In total 85 responses were received of which and 78 unusable responses were received.

## 6.2 Research Strategy

The survey instrument used to collect data took the form of a research questionnaire.

A questionnaire was used for the following reasons:

- Questionnaires are a cost-effective way of collecting data (Kirakowski, 2001)
- Easy to mass produce and distribute to many people
- People are free to fill it in, in their own time
- People are familiar with questionnaires  
(<http://www.statpac.com/surveys/advantages.htm>)
- Responses are gathered in a standardised way, therefore the responses are more objective than in interviews
- Questionnaires are easy to analyse
- A web questionnaire was used in addition to a printed questionnaire, because it made distribution and data collection easier allowing a wider audience to be reached.

In an attempt to improve the response rate questionnaires were distributed to companies, whose employees were likely to have been exposed to e-commerce – either as designers or users.

## 6.3 Survey Instrument

### 6.3.1 Background for the Instrument

The questionnaire is based on and uses portions of other people's validated survey instruments. The instruments upon which the questionnaire is based were used for research in areas related or similar to the topic of this paper.

The questions in the instrument were developed using those of von Dran et al. (1998) – *An Application of the Kano Model to Website Design*, Turban and Gherke(2000) – *Determinants of e-commerce Website*, Schubert and Selz(2001) – *Measuring the Effectiveness of e-commerce Websites* and Molla (200) – *Determinants of E-commerce Quality: The Customers Perspective*

### 6.3.2 Questionnaire Design

The questionnaire is divided into three basic sections. The first section consists of ten demographic questions.

The second section is made up of sixty questions asking users to rate different aspects of an ecommerce site's interface. Respondents are required to rate each item on a 5-point Likert scale (5 being the most important) in terms of their perception of the item's importance in determining e-commerce interface quality. They are also required to rate each item along three quality dimensions: expected, normal and exciting. These quality dimensions are taken from Kano's model of customer satisfaction, which in turn is derived from Herzberg's identification of hygiene and motivating factors (von Dram et al, 1998).

The final section consists of three questions. Respondents are asked to use a 5-point Likert Scale to rate the degree of satisfaction that they have gained from their e-commerce experiences based on the items they rated as important, moderately important and unimportant in the previous section.

This resulted in a total of sixty-three questions for the questionnaire (excluding demographics). These questions were based on the relevant questions and factors that were examined in previous research on e-commerce quality and effectiveness (see the section entitled '*Background for the Instrument*').

To ensure consistency of answers, the items used to rate the quality of the e-commerce interface were all described using noun clauses. Each item was described as clearly as possible to prevent respondents from deciding on intermediate values only and examples were given where necessary in order to increase understanding and decrease ambiguity.

An important factor to note is the absence of divisions within section 2 of the questionnaire. This in conjunction with the fact that the questions are randomly ordered was done to avoid incorrectly grouping items, which are not related to one another. Once the data has been collected, factor analysis will be performed in order to determine which factors should be grouped together.

A copy of the questionnaire can be found in appendix 1.

### 6.3.3 Data collection

The questionnaire was distributed in two formats; it was handed out as a printed questionnaire and also made available on the Internet as web

form at <http://www.e-survey.pty.cc>. (A printable version of the questionnaire was available for download from the website.)

Due to time constraints and the length of the questionnaire, it was decided to hand-deliver and collect all the printed questionnaires. By doing this, as well as making our collection policy clear it was hoped that potential respondents would be more inclined to answer quickly and that a greater response rate could be achieved.

Responses from the printed questionnaire were collected from the companies and people to which it was distributed and the data entered manually. Responses from the web form were received via e-mail.

#### **6.4 Research Objectives**

The main objectives of the research are to:

- i.) Establish what users and designers define as the determinants of a quality e-commerce site's interface
- ii.) Determine whether there is a difference between users' and designers' perspectives of the determinants of a quality e-commerce interface

#### **6.5 Desired Outcomes for the Research/Importance and relevance of the research**

The desired outcomes for this study can be examined from two perspectives, namely a research and a practical perspective.

From a research perspective, the findings are intended to add to the bodies of knowledge surrounding e-commerce quality and website interface design.

From a practical perspective, the findings will help identify what users define as the determinants of ecommerce interface quality. In documenting these determinants, website designers will be in an improved position to design websites that better meet the needs of users.

This in turn will provide users with a more fulfilling e-commerce experience and provide designers with a set of practical guidelines for building quality into an e-commerce website's interface.

Practical tools that could arise from the results of the above research include:

- The development of a weighted framework for the evaluating the quality and effectiveness of an e-commerce website's interface
- Establishing a set of guidelines to assist designers in developing a quality e-commerce interface

## 7. Statistical Analysis of Results

### 7.1 Statistical Methods

The data collected by means of the questionnaire distributed to users and designers of e-commerce web-sites was entered into Statistica and analysed using the following tests:

**Factor Analysis:** Factor Analysis was used to identify distinct, meaningful groupings amongst the 60 determinants of e-commerce interface quality surveyed in the questionnaire

**Analysis of Variance:** Analysis of Variance was used to test for significant differences in the mean importance ratings assigned to the 60 determinants by different user groupings

**Ranked Means:** Ranked Means were used test for differences in the order of importance placed on the 60 determinants by users and designers

**Skewness and Kurtosis:** Measures of Skewness and Kurtosis were calculated for each of the 60 determinants to test the normality of their distribution

**Frequency Counts:** Frequency counts were used to determine the level of satisfaction placed on each of the 60 determinants along three expected quality dimensions: expected, normal, and exciting

## 7.2 Factor Analysis

In order to determine the most meaningful groupings of variables several iterations of factor analysis were performed using “maximum factor” numbers of 6, 12 and 30 with an eigenvalue of 1.000.

The factor loading tables of the three iterations were examined and factors with less than three variables were discarded, as their validity could not be supported by calculating Cronbach’s Alpha Co-efficient.

In the first iteration six factors were identified, each with too many unrelated variables to provide distinct, meaningful categories against which the differences in perceptions amongst users and designers could be compared.

The second iteration identified ten factors. Here, again each factor contained too many unrelated variables as to be considered useful.

In performing the third iteration 15 factors were initially identified, eight of which were discarded because they contained less than three variables. The factor loading table for this iteration can be found in appendix 2.

What follows is a list of the remaining seven categories of determinants against which the differences in perceptions amongst users and designers could be compared:

### 7.2.1 Information Content

- Clearly stated security policies
- Clearly stated shipping policies
- User friendliness of the search function
- Your customer profile is adjustable
- Clearly stated refunds policies

- Clearly stated product return / service cancellation policies
- Trustworthiness of the e-commerce site owner
- Clear instructions for using the e-commerce site
- Clearly stated privacy policies

#### 7.2.2 Entertainment Features

- The use of information presented for users' interests (i.e. not related to the business conducted on the e-commerce site)
- The use of humour on the e-commerce site
- The use of animations on the e-commerce site
- The use of background music on the e-commerce site

#### 7.2.3 Security and Privacy

- Assurance that transactions will be conducted securely
- Assurance that all financial information will be kept private (e.g. credit card no)
- Accessibility of website
- Assurance that personal information will be kept private/not misused

#### 7.2.4 Reuse of Customer Information

- Customisability of the site display
- There are noticeable benefits from a stored customer profile (targeted marketing)
- Information content is based on your (repeat users) previous visits
- Information updates about products/services are sent to the user automatically

#### 7.2.5 Appearance and Layout

- The content of the website is legible (fonts, layout of text etc.)
- Easily understandable screen layout
- Ease of entering information on the website (personal, order and other)

#### 7.2.6 Navigation

- The use of links that are up to date
- The use of meaningful names for links
- The use of terms and graphics is consistent throughout the e-commerce site

#### 7.2.7 User Assistance

- Comprehensiveness of instructions
- Online help is available for the use of the website
- Information updates about products/services are sent to the user when requested

### **7.3 Comparison of Ranked Mean Importance Ratings with Findings of Previous Research**

After the data collection was completed, a list was compiled showing the average importance ratings users assigned to the various determinants of e-commerce interface quality. The skewness and kurtosis of means were checked and the list ranked in order, from the highest to the lowest importance rating.

As the questionnaire used in this study was based on previous research, comparing this collected data to that of the previous studies is useful in testing the validity of the instrument.

The section that follows is a discussion of the results obtained and a comparison of these results to those obtained in previous, similar research (see appendix 3).

In the research of Turban and Gherke (2000), users rated *Security and Privacy* as the most important determinants of e-commerce effectiveness. This finding is in agreement with our research, which indicated that users rate issues relating to security and privacy as their top four most important determinants of e-commerce interface quality.

The fifth and sixth most important determinants of e-commerce interface quality as rated by users in our survey were that all costs of the transaction be clearly stated and that content of the information on the site be accurate.

The importance of clearly stated transaction costs was confirmed by the research of Scribbins (1999), which identified this as an important determinant of a quality e-commerce interface.

The importance of accurate information content was supported by the research of von Dran et al. (1998), which showed that a lack of accurate information content meant that the e-commerce site did not even meet the user's most basic needs

The issues that were rated as least important by our research were the use of animations and background music on the website. This is confirmed by the research of Turbin and Gherke (2000) who recommended that in order for an e-commerce site to be effective, animations and multimedia effects be limited. The importance ratings assigned by designers to the 63 determinants could not be confirmed as no previous research on this topic was found.

## 8. Hypothesis 1

The following section will test the first hypothesis by interpreting the statistics generated from the collected data:

**Hypothesis 1: There is a difference between users' and designers' perceptions of the determinants of a quality e-commerce interface**

In order to test this hypothesis two statistical approaches were taken:

- Analysis of Variance was used to test for significant differences between the importance ratings, assigned by users and designers, to the determinants of e-commerce interface quality set out in the questionnaire
- The importance ratings assigned by users and designers to the determinants of e-commerce interface quality set out in the questionnaire were averaged, ranked and compared for differences

### 8.1 Results

The analysis of variance conducted on the data at a significance level of  $p < 0.0500$  identified ten marked differences between the mean importance ratings assigned by users and designers to the categories identified in the factor analysis.

The full ANOVA table can be found in appendix 4. Summarised results of this ANOVA test can be seen in the table that follows:

Factor	p	Mean by Respondent Type	
		Users	Designers
Information Content	0.016488	4.1796	3.7963
Entertainment Features	0.781462	2.0833	2.1528
Security and Privacy	0.635471	4.7750	4.8472
Re-use of Customer Information	0.263413	2.9250	3.1667
Navigation	0.009639	3.9778	4.5370
User Assistance	0.993103	3.6500	3.6481
Appearance and Layout	0.273959	4.2444	4.0370

Table 1: Summarised results of ANOVA test for differences between the mean importance ratings assigned by users and designers to the categories identified in the factor analysis

From the preceding table it can be seen that users assigned higher mean importance ratings than designers to the information content of the e-commerce site while designers assigned higher mean importance ratings to issues regarding the navigability of the site.

In order to support the findings of this ANOVA test, a frequency count of the quality dimensions assigned by users and designers to each factor was calculated:

Factor	Users						Designers					
	Expected		Normal		Exciting		Expected		Normal		Exciting	
Information Content	294	54%	197	36%	49	9%	107	66%	52	32%	3	2%
Entertainment Features	39	16%	138	58%	63	26%	2	3%	53	74%	17	24%
Security and Privacy	174	73%	47	20%	19	8%	64	89%	8	11%	0	0%
Re-use of Customer Information	51	21%	135	56%	54	23%	13	18%	40	56%	19	26%
Navigation	103	57%	58	32%	19	11%	45	83%	9	17%	0	0%
User Assistance	74	41%	88	49%	18	10%	27	50%	20	37%	7	13%
Appearance and Layout	106	59%	43	24%	31	17%	43	80%	8	15%	3	6%

Table 2: Frequency count of quality dimensions assigned by users and designers to factors

In the above table the factors to which users and designers assigned significantly different importance ratings are highlighted. The following discussion explains the results seen in table 1 and table 2.

## 8.2 Discussion of Results

The factor on which users placed more importance than designers was *information content* whereas designers placed more importance on the factor concerning *navigation*.

The difference between the perception of importance of information content might be attributed to two factors:

### 8.2.1 E-commerce is in its infancy

E-commerce is still in its early stages (Turban and Gherke, 2000) and as a result of this presents many uncertainties to users of e-commerce, who might often have limited experience in purchasing goods/services online. (50% of the users of e-commerce who responded to the questionnaire had performed less than 21 e-commerce transactions and 88% had been using e-commerce for less than 3 years.)

From the results it is clear that users place a high level of importance on being able to obtain information about all aspects of the e-commerce transaction, using the interface.

Examples include the desire for clarity on shipping, security, returns, refunds, returns and privacy policies, which do not necessarily relate to the quality of the product or service itself, but rather to the processes involved with and the consequences of buying online.

These are aspects of transactions that users are more likely to be familiar with when employing traditional methods of purchasing goods and services. However as users tend to have limited experience with e-commerce, these are aspects of a transaction that they might be unfamiliar with.

In contrast designers, who are more familiar with the ecommerce medium and are not the ones putting their money at risk might not as readily identify with these issues and subsequently may neglect them.

It is therefore important that, in designing an e-commerce interface, designers take into account all aspects of a transaction.

#### 8.2.2 Designers are often not part of the company whose e-commerce site they designed

In order to obtain responses by designers of e-commerce sites, questionnaires were distributed to web design companies. Thus the data collected about designers was biased towards individuals who would be contracted to design an e-commerce site. In addition to this e-commerce designers typically come from a design or technical (as opposed to a consumer/business) background.

This may result in an e-commerce site being designed by individuals who do not have a good understanding of the business and transaction processes of the client for whom they are designing the site as well as a limited knowledge of users' requirements.

Another issue is that designers of e-commerce sites might place undue importance on the site's appearance, at the expense of its ability to properly deal with all aspects of the transaction. Comparing the mean importance rating that users and designers assigned to the *information content* and *appearance and layout* factors supports this finding. While users assign approximately equal mean importance ratings to these factors (4.18 vs. 4.24),

designers feel that *information content* is less important than *appearance and layout* (3.79 vs. 4.04).

This is further supported by statistically different importance ratings identified by ANOVA tests at a variable level (see appendix 12). These tests showed that while designers felt that the consistent use of colours was more important than clearly stated business policies, users felt the opposite.

The other factor on which designers' and users' mean importance rating differed significantly was *navigation*. Designers placed more importance than users on the role that the navigability of an e-commerce site plays in determining the quality of its interface.

While there is a difference in mean importance ratings between users and designers, it should be noted that both groups gave an above average mean importance rating to this factor. This implies that while users feel that issues of navigation are important, they do not feel it is as high priority as do designers.

In order to gain further insight into this issue, the frequency counts of the quality dimensions of these factors were examined. In comparison to 83% of designers, only 57% of users expected a site to have links that were up-to-date and had meaningful names as well as a consistent use of terms and graphics throughout.

The following explanation is offered: In designing a site designers place an emphasis on the operational aspects of their site; users on the other hand are concerned with both operational and business aspects. Again it can be seen that issues relating to navigation of the site are not as high a priority for users as is the case with designers.

The discussion above related to significant differences in mean importance ratings at the factor level. When performing a similar ANOVA test on the data

at a variable level, additional differences were found in the mean importance ratings assigned by users and designers to the determinants of e-commerce interface quality. A discussion of selected differences at the variable level follows:

The first difference at the variable level relates to the form versus the function of the site interface, there was again a discrepancy between users and designers perceptions of which variables were most important. The data revealed that while designers were more concerned with the appearance of the website in terms of a consistent use of colours throughout, users placed a greater importance on issues of usability, such as a consistent use of terms and graphics.

Another interesting difference that arose was that while both groups of respondents considered the impact that the interface has on the quality of the product or service offered by the e-commerce site to be an important determinant of e-commerce interface quality (both assigned an average importance rating of greater than 4); designers felt that it was more important than users did.

While at first glance this appears as somewhat of an anomaly, it might be explained by looking at the most frequent e-commerce transaction conducted by the respondents (users).

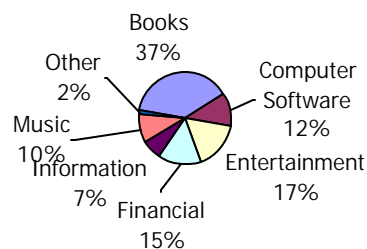


Figure 1: Users' most frequent e-commerce transaction

In the figure above it can be seen books were by far the most common purchase of the users who answered the questionnaire. In the case of books, it is not so much that users are unconcerned about the quality of the product they are buying, but rather that there are limitations in the variations of quality that exist in this product. In addition to this, book retailers do not always have control over the quality of the product they are selling.

In other words, because a user expects a book to be of a standard quality, s/he does not consider the quality as high a priority as other issues, for example clearly stated security policies, which if incorrect have a greater potential cause difficulties for the buyer.

The final variable to be discussed in which users and designers had statistically different opinions of were how satisfied they were with the way that e-commerce sites handled the issues that they had rated as unimportant. This can be explained by using the example of animations on the e-commerce site interface. Both users and designers rated this item as having the lowest importance in terms of determining e-commerce interface quality. However when a designer chooses an animation to use on an e-commerce site, it is governed by their opinion, in other words they will choose what they like – however this might the designer's taste might not be the same as the users.

From the above analysis, it can be seen that differences do exist between users' and designers' perceptions of the determinants of a quality e-commerce interface and thus the proposed hypothesis can be accepted.

## 9. Hypothesis 2

The following section will test the second hypothesis by interpreting the statistics generated from the collected data:

**Hypothesis 2: Different groups of users view the determinants of a quality e-commerce interface differently (e.g. novice vs. experienced, male vs. female)**

In order to test this hypothesis Analysis of Variance (ANOVA) was used to test for significant differences between the mean importance ratings assigned by various *user groupings* to the factors previously identified.

In addition to this *factor* level analysis, ANOVA was used to test for the same differences at the *variable* level i.e. amongst the 63 determinants of e-commerce interface quality as set out in the questionnaire.

### 9.1 Results

The user groupings were examined at a significance level of  $p < 0.05000$  and full set of ANOVA results for this hypothesis can be found in appendices 5 to 11.

## 9.2 Discussion of Results

### Respondent's Internet Skill Level

Users were placed in the following groups according their Internet skill level:

<i>Beginner</i>	(0% of respondents)
<i>Intermediate</i>	(36.67%)
<i>Advanced</i>	(63.33%)

The analysis of variance detailed in appendix 5 identified a statistically significant difference in the importance ratings assigned by these different skill groupings to the following two factors: *Security and Privacy* and *Appearance and Layout*.

Whilst the mean importance rating assigned to these factors by users in both groupings was high, users in the advanced grouping found the factors significantly more important than users in the intermediate grouping.

The difference in mean importance rating is illustrated in the following table of summarised ANOVA results:

Factor	p	Mean by Respondent Skill Level	
		Intermediate	Advanced
Information Content	0.883763	4.166666667	4.927631579
Entertainment Features	0.406838	2.215909091	4.927631579
<i>Security and Privacy</i>	<i>0.012705</i>	<i>4.511363636</i>	<i>4.927631579</i>
Re-use of Customer Information	0.400197	2.806818182	4.927631579
Navigation	0.064991	3.712121212	4.927631579
User Assistance	0.812279	3.681818182	4.927631579
<i>Appearance and Layout</i>	<i>0.004944</i>	<i>3.924242424</i>	<i>4.927631579</i>

Table 3: Summary of ANOVA test for significant differences in ranked mean importance ratings assigned by user skill level

The increased importance placed on these factors by users in the advanced skill level grouping could be attributed to their increased use of the Internet and hence their increased likelihood of having had bad e-commerce experience(s).

At the variable level, the analysis of variance detailed in appendix 6 identified eight statistically significant differences in the importance ratings assigned by these different skill groupings to the following determinants:

*Clear Statement of Delivery Costs*

*Assurance that all financial information will be kept private*

*Assurance that personal information will be kept private/not misused*

Whilst the mean importance rating assigned to these determinants was high across all three of the skill levels, the ratings assigned by users who fell into the Advanced skill level category were consistently higher with ratings of 4.87, 4.97 and 4.95 respectively.

Here, as in the case of the *Security and Privacy* factor discussed above, the increased importance placed on these three determinants by users who fell into the Advanced skill level group could be attributed to their increased use of the internet and hence their increased likelihood of having had a bad e-commerce experience.

*An Easily Understandable Screen Layout*

*Regularly Updated Website Content*

*Legibility of the Website Content*

*The Use of Links that are Up-to-Date*

*Page Loading Speeds*

Here again, whilst the mean importance rating assigned to these determinants was high across all three of the skill levels, the ratings

assigned by users who fell into the *Advanced* skill level category were consistently higher.

The increased importance placed on these determinants of e-commerce interface quality by users who fell into the *Advanced* users group could be attributed to their increased likelihood of exposure to e-commerce sites that have effectively addressed these issues.

It should be noted, however, that these findings may have been skewed by the fact that users were asked to classify themselves into the three categories: *Beginner*, *Intermediate*, and *Advanced* without any guidelines as to what defines a member of each group. The research of Turbin and Gherke (1998) did, however, support the finding that *advanced* users felt more strongly about many e-commerce issues than users in the *intermediate* group did.

### **E-Commerce Access Location**

Users were placed in the following groups according to the location from which they most often access the Internet:

<i>Home</i>	(36.67% of respondents)
<i>Office</i>	(58.33%)
<i>Internet Café</i>	(1.67%)
<i>School</i>	(3.33%)

The analysis of variance detailed in appendix 7 identified a statistically significant difference in the importance ratings assigned by these different skill groupings to the following factor: *Entertainment Features*.

Users who accessed the Internet from home placed significantly less importance on this factor than users who access the Internet from work, school, or an Internet café.

The difference in mean importance rating is illustrated in the following table of summarised ANOVA results:

Factor	p	Mean by Respondent Access Location			
		Home	Office	Café	School
Information Content	0.967466	4.171717	4.177778	4.444444	4.166667
Entertainment Features	0.04103	1.875	2.092857	3.5	3.5
Security and Privacy	0.935643	4.784091	4.75	5	5
Re-use of Customer Information	0.637988	2.863636	2.914286	3.75	3.375
Navigation	0.382588	3.742424	4.095238	4.666667	4.166667
User Assistance	0.513246	3.787879	3.533333	4.333333	3.833333
Appearance and Layout	0.806395	4.227273	4.257143	3.666667	4.5

Table 4: Summary of ANOVA test for significant differences in ranked mean importance ratings assigned by user access location

The difference in mean importance rating could be explained by home users' general lack of bandwidth and reluctance to spend unnecessary amounts of time and hence money online waiting for multimedia to download.

This finding is supported by two statistically significant differences in the importance ratings assigned by these different groupings to the following determinants at the variable level:

*The use of animations on the e-commerce site*

*The use of background music on the e-commerce site.*

Here again, users who accessed the Internet from home assigned significantly less importance to these two determinants.

## Age

Users were placed in the following groups according to their age:

<i>19 to 30 years</i>	(55% of respondents)
<i>31 to 45 years</i>	(21.67%)
<i>Over 45</i>	(23.33%)

The analysis of variance detailed in appendix 8 identified ten statistically significant differences in the importance ratings assigned by these different age groupings at the *variable* level. These included the importance of:

### *Clearly Stated Delivery Costs*

Whilst all age groupings felt that Clearly Stated Delivery Costs were important, users in the 19 to 30 year age grouping felt particularly strongly about this determinant assigning a mean rating of 4.94, just less than the maximum possible importance rating of 5.

This could be attributed to lower income levels associated with users in the 19 to 30 year age group and hence their concern for the total transaction cost.

### *Indicators of Current Location in the Site*

Users over the age of 45 felt more strongly about this determinant than users in the younger age categories, possibly due to their relative inexperience with e-commerce and web sites (a smaller percentage of users over the age of 45 had conducted more than 20 ecommerce transactions, than had users under the age of 45).

### *Re-use of Personal Information and the Provision of a Number of Payment Options*

The importance assigned to the *Re-use of Personal Information* and the *Provision of a Number of Payment Options* decreased as the user's age increased.

The increased importance placed on the *re-use of personal information* by users in the 19 to 30 year age group could be attributed to their familiarity with the capabilities of the medium and their exposure to this functionality elsewhere on the Internet.

The increased importance placed on the *Provision of a Number of Payment Options* by users in the 19 to 30 year age group could be attributed to the dominance of credit cards as the payment medium of choice on the internet. Younger users may not have the steady income levels and credit rating required to obtain such a card and would thus welcome the provision of a payment medium with lower barriers to entry.

### *The Use of Humour on the E-commerce Site*

Whilst users under the age of 45 placed a low importance on the use of humour on the e-commerce site, users over the age of 45 assigned this determinant an average rating of importance.

Could it be proved that users over the age of 45 see e-commerce as a less serious business channel than users under the age of 45 then this rating could be explained. This, however, will require further investigation.

## **Gender**

Users were placed in the following groups according to their gender:

*Male* (85% of respondents)

*Female* (15%)

The analysis of variance detailed in appendix 9 identified three statistically significant differences in the importance ratings assigned by these different gender groupings to the following determinants at the *variable* level:

### *Availability of Online Help for the Website*

The availability of online help for the e-commerce website received an average importance rating of 3.49 from men and 4.22 from women.

### *Availability of Clearly Stated Shipping Policies*

Whilst both groups rated the availability of clearly stated shipping policies as important, women placed significantly more importance on this determinant assigning it a mean rating of 4.78 – just short of the highest ranking 5 – compared to men with an average rating of 4.21.

Given the lack of female respondents (9 in total) it is uncertain whether these differences are attributable to female users of e-commerce in general and will require further research.

### Length of the Respondent's E-Commerce Experience

Users were placed in the following groups according to their length of e-commerce experience:

<i>&lt; 6 Months</i>	(11.67% of respondents)
<i>6 to 12 months</i>	(8.33%)
<i>1 to 2 years</i>	(43.33%)
<i>2 to 3 years</i>	(25%)
<i>&gt;3 years</i>	(11.67%)

The analysis of variance detailed in appendix 10 identified seven statistically significant differences in the importance ratings assigned by these different experience groupings at the *variable* level. These included differences relating to the:

#### *Clearly Stated Shipping Policies*

As the length of a user's e-commerce experience increased the mean importance rating assigned to the clear statement of shipping policies decreased. Users who fell into the group with less than six months experience had a mean rating of 5, while users in the group with two to three years experience had a mean importance rating of 4.3.

This decrease in importance rating could be attributed to the user's increased confidence and knowledge of e-commerce transactions and the associated shipping methods.

### *Automatic Sending of Information Updates to the User*

As the length of a user's e-commerce experience increased, the mean importance rating assigned to the automatic sending of information updates to the user decreased. Users who fell into the group with less than six months experience had a mean rating of 3.14, whilst users in the group with two to three years experience had a mean importance rating of 1.71.

This decrease in importance rating could be attributed to the user's increased familiarity with the e-commerce sites they visit. The longer a user has been using a particular e-commerce site the more familiar they will become with its content and are more likely to notice, or know where on the site to find, new content.

### **Number of E-Commerce Transactions Conducted by the Respondent**

Users were placed in the following groups according to the total number of e-commerce transactions they had completed:

<5	(16.67% of respondents)
5 to 10	(15%)
11 to 20	(18.33%)
>20	(50%)

The analysis of variance detailed in appendix 11 identified one statistically significant difference in the importance ratings assigned by these different groupings to the determinants at the *variable* level. This difference related to:

*Information being Presented in an Easy to Understand Manner*

As the number of ecommerce transactions conducted by the user increased the mean importance rating assigned to this determinant decreased. For users who had conducted less than five ecommerce transactions the mean rating was 4.7, this dropped to 3.7 for users who had conducted 11 to 20 transactions.

This trend can be attributed to the fact that as users conduct more transaction they become more familiar with the transaction process and the workings of the e-commerce site they visit. As a result they are less likely to experience difficulty in understanding the information presented on the site.

From the above analysis it can be seen that different groupings of users do view the determinants of a quality e-commerce interface differently. Thus the hypothesis proposed above can be accepted.

It should be noted, however, that given the limited sample size of 78 responses further research will be necessary to validate the application of these observations to the e-commerce user population in general.

## **10. Limitations of the research**

The limitations of this research are as follows:

### **10.1 The lack of previous research in this area**

As e-commerce is a new field very little research has been conducted to establish the determinants of e-commerce interface quality. The lack of established standards for the measurement of e-commerce quality means that this research is exploratory in nature and has thus been conducted from a practical perspective. As a result it has been difficult to benchmark the findings of this research against the work of others.

### **10.2 Limitations of the Instrument**

A limitation of the instrument was the length of time it took to complete. Potential respondents were reluctant to answer the questionnaire, based on the number of questions, as well as the fact that each item in the second section had to be rated on two different scales (importance and satisfaction).

However, the length was justified by the need to obtain a set of the determinants of e-commerce interface quality that was as comprehensive and unambiguous as possible. The differences between user and designers perceptions of the determinants of e-commerce interface quality can therefore be more specifically ascertained, rather than giving a more general and less useful set of differences.

Although the questionnaire was revised several times, users' opinions were not canvassed in a pilot study due to time constraints.

### **10.3 Sample size limited**

Given time constraints and the length of the questionnaire, a limited number of responses were received. As a result the findings of this research may have been skewed in favour of a particular demographic set of respondents.

In addition, a considerably lower number of responses were received from designers (18 designer vs. 60 user respondents) which may also have skewed the data.

## **11. Conclusions**

As a result of the findings in the research, the following conclusions can be drawn:

### **11.1 There is an identifiable set of factors that determine the quality of an e-commerce interface**

The factor analysis conducted on the data collected identified seven distinct factors, each containing a set of related variables, perceived to be important in determining the quality of an e-commerce interface.

This implies that a comprehensive list of these factors must be established and used in order to ensure a quality e-commerce site interface.

### **11.2 Designers and Users differ along some of these factors**

The results of the research indicated that there were areas in which designers and users opinions on e-commerce interface quality differed.

### **11.3 Designers value Appearance, whereas Users value Usability**

It was found that while designers tend to prioritise the graphical design aspects of an e-commerce site's interface, users feel that issues relating to the usability of the site's interface are more important.

#### **11.4 Users want to know about all aspects of a transaction**

In addition, users expressed the opinion that an important function of the interface was to provide clarity on the information content (i.e. policies, terms and conditions) that is related to the transaction. Designers on the other hand felt that this issue was significantly less important than did the users.

The differences above could be attributed to the fact that designers tend to come from a technical or design background, rather than a business/consumer background. They could also be a result of the fact that designers of sites are often not employees of the business for whom the site is being designed.

The implications of this is that in order to design a quality e-commerce site interface, designers must understand the business for which the site is being designed, and must also understand the needs of users.

#### **11.5 Different groups of users place differing degrees of importance on the factors that determine e-commerce quality**

Apart from the differences between designers' and users' perceptions of the determinants of e-commerce interface quality, differences were found between the various demographic sets of users.

These included differences between the various age groups, length of e-commerce experience, the number of e-commerce transactions and access location

The implications of this finding are that designers must, where possible, design site interfaces, which are orientated towards meeting the needs of specific demographics groups of users.

### **11.6 Findings of the research warrant further investigation into why differences between users and designers perceptions of e-commerce interface quality exist**

The research has shown that differences between users' and designers' perceptions of e-commerce interface quality do exist. Possible explanations for the existence of these differences were proposed based on the collected data. However, to accurately determine why the opinions of users and designers differ, further investigation is necessary.

## **12. Recommendations**

Given the conclusions presented above, the following recommendation can be made:

### **12.1 Further research is necessary to determine an agreed upon set of factors for the determinants of e-commerce interface quality**

The literature reviewed in relation to the determinants of e-commerce interface quality was limited, as a result comparing these papers with one another and the findings of this paper showed that while similarities did exist there was by no means a general consensus on the determinants of ecommerce interface quality.

Thus, it is recommended that further research be undertaken in order to develop a standardised list of factors against which designers can benchmark the quality of the e-commerce interface they develop.

In recommending this research it must be noted that due to the changing nature of e-commerce it is unclear whether such a list would remain a reliable benchmark in the long term.

### **12.2 Designers must design e-commerce sites with users' perceptions of the determinants of a quality e-commerce interface in mind**

In order to design an e-commerce site interface that best meet the requirements of users, designers must ensure that they understand both the business for which and the needs of the users for whom the ecommerce site is being developed.

### **12.3 Designers must concentrate on usability**

This means that it is important for designers to pay special attention to developing an e-commerce site interface that is easy to use.

### **12.4 The interface must be used to clarify the information content of the e-commerce site**

In addition to the previous recommendation, designers must focus on ensuring that the site's interface is used in providing clarity about issues relating to the information content of the purchase, including the terms, conditions and policies surrounding the transaction.

It is therefore recommended that the business for whom the site is being developed, make it clear how their existing processes – i.e. those aspects of their business that need to be addressed using the e-commerce site's interface – impact on the functionality required of the site's interface.

### **12.5 When designing an e-commerce site consideration should be given to the different demographic profiles of users**

Users of different demographic profiles place varying degrees of importance on those factors and variables identified as the determinants of e-commerce interface quality.

It is thus recommended that designers attempt to identify and understand the needs of the specific demographic group for whom they are developing the e-commerce site. In doing so they will develop e-commerce sites that better meet user's needs.

## **12.6 Research needs to be conducted into the reasons behind the differences in users and designers perceptions of e-commerce interface quality**

While this research has provided possible reasons for the differences identified in users' and designers' perceptions of the determinants of e-commerce interface quality, further research is necessary to accurately determine the real reasons for these differences.

## **13. Recommendations for further Research**

Given the findings of this paper, the following recommendations can be made for future research:

### **13.1 Include demographics for designers**

The demographic variables analysed in this study were shown to have a significant effect on the mean importance ratings assigned by users to the factors and variables identified as possible determinants of e-commerce interface quality.

It is recommended that future studies test for a similar relationship amongst designers and not only users.

### **13.2 Create a set of guidelines which designers can use to benchmark the e-commerce interface quality of the site they are developing**

Whilst this research identified differences in the perceptions of users and designers, no attempt was made to translate these findings into a practical tool to assist designers in developing e-commerce sites that better address these issues.

It is recommended that future studies aim to create a practical tool that can be used to apply the findings of research to the development of e-commerce sites.

### **13.3 Test the survey instrument for validity and reliability**

It is recommended that the questionnaire used in this research be tested for validity and reliability, and that additional variables be identified.

In addition, it should be distributed to a larger, more diverse and evenly distributed sample.

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## **APPENDIX 1: QUESTIONNAIRE**

**APPENDIX 2: FACTOR LOADING TABLE**

**APPENDIX 3: RANKED MEAN IMPORTANCE RATINGS**

**APPENDIX 4: ANOVA ON RESPONDENT TYPE  
(FACTOR LEVEL)**

**APPENDIX 5: ANOVA ON USER SKILL  
(FACTOR LEVEL)**

**APPENDIX 6: ANOVA ON USER SKILL  
(VARIABLE LEVEL)**

**APPENDIX 7: ANOVA ON USER ACCESS LOCATION  
(FACTOR LEVEL)**

**APPENDIX 8: ANOVA ON USER AGE  
(VARIABLE LEVEL)**

**APPENDIX 9: ANOVA ON USER GENDER  
(VARIABLE LEVEL)**

**APPENDIX 10: ANOVA ON USER EXPERIENCE  
(VARIABLE LEVEL)**

**APPENDIX 11: ANOVA ON USERS' NO. OF  
TRANSACTIONS  
(VARIABLE LEVEL)**

**APPENDIX 12: ANOVA ON RESPONDENT TYPE  
(VARIABLE LEVEL)**

**APPENDIX 13: TABULATED DATA**