

Consumer Perception of Electronic-Commerce

A Martins^a

N Martins^b

MS Olivier^a

^aDepartment of Computer Science, Rand Afrikaans University, am@adam.rau.ac.za, molivier@rkw.rau.ac.za

^bIndustrial Psychology Department, UNISA, Pretoria, South Africa, nicellen@iafrica.com

Abstract

Consumers' concerns about conducting electronic business transactions and the risks involved have a vital impact on the transition of electronic business. This paper deals mainly with consumers' willingness to conduct Electronic-commerce and their knowledge of the security measures used in online transactions. In an inferential survey Human Resource (HR) and Information Technology (IT) consumers' perceptions of buying products and services and giving credit card information over the Internet were compared. The results allow one to conclude that consumers generally do not trust the security of Electronic-commerce. It was also found that IT respondents have a better knowledge of security measures used during online transactions than HR respondents, but are still not significantly more willing to conduct Electronic-commerce. The conclusion drawn that it is not so much the lack of knowledge of security measures that has an impact on consumers' perceptions, but rather the issue of trust that needs to be addressed.

Keywords: Electronic-commerce, consumer/customer perception, trust, credit card

Computing Review Categories: D.4.6, K.4.1, K.4.4, K.6.5

1 Introduction

The Internet provides consumers with new means of obtaining useful information and comprises all marketing and sales of products and services. Electronic-commerce is currently attracting a great deal of interest. Not only is it growing rapidly, but also has a significant impact on the computer market and people's working style.

Increasingly more consumers are migrating to Electronic-commerce to make electronic bill payments, to pay for information online, to purchase products, services and prepaid cellphone airtime and even matric report cards. According to Ramsey and eMarketer it has been estimated that the worldwide Electronic-commerce market reached up to \$42 billions consumer transactions in the year 2000 and it is expected that it will reach up to \$65.9 in the year 2001 [17,28]. According to Gray from Ernst and Young the growth of Electronic-commerce in South Africa is expected to grow by 20% every month [18].

The question however, is whether Electronic-commerce is growing to its full potential. Customers' perception of Electronic-commerce and the risks involved have a significant impact on the transition to electronic business.

According to Holt, managing director of WALES [21], a virtual only shop selling Welsh goods, consumers' perceptions of credit card security, vendor trustworthiness and sharing of personal information remain the main obstacles in doing business on the Internet [1]. Section 2 will show that this perception is widely shared by consumers.

The article discusses the preliminary findings on Internet and computer users' attitudes to Electronic-commerce security and their willingness to conduct electronic busi-

ness transactions. This problem argument is followed by the purpose of the research study. Background information is provided, followed by a description of the research process. The major factors and interpretations are then discussed, providing a clear picture of the findings, after which the conclusion of the study is drawn.

Problem Argument

According to Bery [18], e.com joint MD, security is a major concern for South Africans when conducting online transactions. Although statistics indicated a growth of 57% [28] in electronic business transactions from the year 2000, a survey conducted by Commercenet [24] indicated that most consumers still do not trust Electronic-commerce and that security is still a major concern [7,14,15].

Why should consumers trust the security of the World Wide Web with reports of hackers who attacked a company's database and may have compromised credit card information belonging to 15 000 customers according to Computing Fraud and Security [9]?

Purpose of research study

The purpose of this research study is to determine the Electronic-commerce security perceptions of Internet users. This implies a study of consumers' awareness of information security measures and their willingness to conduct online business transactions.

Two groups in the South African population were selected to participate in an inferential survey. The sample consisted of HR consumers and IT consumers. In selecting these two groups, a comparison could be made be-

tween the perceptions and knowledge of information security in Electronic-commerce by involving a group directly involved in the latest technology in IT and a group of people who spend most of their time focusing on human-related and business matters.

The primary research hypotheses to be investigated are as follows:

(1) Most consumers are not willing to give their credit card information during an online electronic transaction because of safety concerns.

(2) IT consumers are significantly more willing to divulge their credit card information during an online electronic transaction than HR consumers.

Secondary research hypothesis:

(3) IT consumers are significantly more aware of and educated about information security measures during an online transaction than HR consumers.

The first hypothesis is substantiated by the general belief that credit card transactions are unsafe on the Internet. Underlying this hypothesis, education in technical knowledge is inherently necessary for the transition to electronic transactions.

2 Background

Hannon [10] defined Electronic-commerce as sharing business information, maintaining business relationships and conducting business transactions by means of telecommunications networks. The total value of goods and services traded between companies over the Internet will grow to \$321 billion by the year 2002 up from \$48 billion in 1997, according to the Forrester Research Group [10], a technology-consulting firm.

It is of imperative that a high degree of trust should be present to achieve these estimates and to help Electronic-commerce reach its full potential. The well-known qualities of security, namely identification and authentication, authorisation, confidentiality, integrity and nonrepudiation are desirable in the case of electronic transactions.

According to Hannon [10], there are two major concerns on which the industry is working. The first is the status of security protocols. Major role players (Visa, MasterCard, American Express, Netscape Communications, and Microsoft) have been testing the Secure Electronic Transactions (SET) extensively which with more testing might promise a safe haven for all Internet financial transactions.

Public perception is the second concern. The general public believes that the Internet is an unsafe place for credit card usage. This perception dealt with in this research study to establish the true perceptions of the two groups included in this study.

Ernst and Young [18] conducted an Internet Shopping survey and found that South Africans' security concerns are as high as those of US consumers a year ago.

Another survey conducted by AT&T Research Labs

[6] found that 81% of Net users are concerned about threats to privacy while online. It is difficult to point out exactly what the needs and the areas of concern are among consumers, but that safety concerns and vendor trustworthiness are a wide area of concern is clear [2,4,5,7,16,19,20,22,23,25]. With research it is hoped to gain an understanding of different groups of people's perceptions about safety during online transactions.

3 Research Method

To assess the utility of the hypothesis, a survey approach was followed in which the participants were required to complete a questionnaire in order to gain insight into the willingness of different groups of consumers to provide credit card information in an electronic transaction.

Design Sample selection

It is of vital importance that the sample selection should be representative of the population. Thus the results obtained from the sample can be generalised to the larger population through inferential statistics.

The ideal selection of a sample for this research should be conducted in such a way that every person in the population has an equal chance of being selected. The use of a stratified random sample selection described by Dillon, Madden and Firtle [8] is proposed in which participants of the entire population of elements are divided into subpopulations or strata and the elements are then selected separately from each stratum. The approach is quite simple and heightens the accuracy of the survey. The respondents who were selected could complete the questionnaire either by post or telephonically.

Two groups were chosen for comparison in the study. As mentioned in the purpose of the study, the significance of choosing the HR group and the IT group is that both groups are educated but differ in their IT knowledge in that the former have a better knowledge of human and business-related aspects while the latter have better technical and computer skills. A total of 86 respondents participated in the survey. They consisted of 35 people in the HR Industry representing a total of 40.7% of the respondents and 51 people in the IT industry representing 59.3% of the respondents.

It was felt that the selection of small samples in the two segments of the South African population would have an impact on the results and conclusions because they are not entirely representative of the total population, but are significant to support the underlying assumptions. This provides scope for further research.

Questionnaire design

During April 2000, a series of survey questions were designed to provide insight into the HR and IT users' safety and security perceptions and knowledge of online transactions.

The question types that were used varied from Likert-type, to multiple-choice (single-response) to open ended-write-in questions. The questions were divided into the following different dimensions:

- **Computer usage questions.** The computer usage dimension determined the time and usage of the computer in respondents' daily living. This implied using the computer for many different tasks such as administration work, browsing the Web, Electronic-commerce, software development, et cetera.
- **Using Electronic-commerce and online transaction questions.** Respondents' willingness to conduct Electronic-commerce and provide credit card information over the Internet while purchasing a product or services was tested in this dimension.
- **Information security knowledge and awareness questions.** Information security knowledge and awareness questions were used to determine respondents' knowledge and awareness of more technical matters during online transactions. This implied knowledge or awareness of terms like "shttp," "https," "Secure Socket Layer (SSL)," "Secure Electronic Transactions (SET)," "private and public keys," "encryption of messages," et cetera.

A number of HR master students at Unisa completed the pilot survey in order to test the face validity of the questionnaire. This resulted in reformulating the structure of some of the questions to make them more understandable. Most open-ended-write-in questions were changed into multiple-response questions. The scales of the questions were also reformulated.

The data of the pilot survey were not included in the survey data because of significant changes to the questionnaire. None of these respondents participated in the survey. This ensured that respondents did not develop a learning curve, which could affect the way they answered the questionnaire a second time, thus affecting the data.

Conducting the survey

A one-week period in May 2000 was used in which the respondents, using the paper and pencil method, completed questionnaires. The questionnaires were mainly completed in a group format. According to Huysamen [13] a group format enforces a greater measure of uniformity ensuring standardisation as well as greater objectivity and speed and diminishes the possible influence of the questionnaire conductor.

Data capturing

In order to capture and interpret the data correctly and quickly, Survey Tracker [27], a statistical software program, was used. The questionnaire was designed in Survey Tracker according to the scientific rules of scales and question types built into the software. It was also used in

the statistical collection and analysis of the data. The reporting feature was used to generate the reports for the two groups of data.

All questionnaire data were hand captured into the SurveyTracker database.

Statistical procedure

Survey Tracker [27] was used to obtain useful information on the survey and to compile statistical reports. The statistical calculations in the investigation were done with the help of Hintze's [26, 11] Number Cruncher Statistical System (NCSS), with the aid of a personal computer.

Hintze's [3,11] t-test calculation for the independent samples was used. This procedure tests the statistically significant difference between the averages of the two populations [12]. He emphasises the following assumptions underlying this technique:

- The variance of the samples is similar. NCSS provides an F-ratio score that tests the assumption that the two populations have the same variance. Unequal variance t-test results are also provided for each calculation, in case the assumption is rejected.
- The element of error is distributed normally.

4 Results

Profile of respondents

The purpose of the biographical questions was to compose a profile of the respondents. The following table contains the results of the two groups:

Computer usage

This dimension determined the time and usage of the computer in respondents' daily living. Only 33.7% use the computer for more than six hours a day and 58.1% between two and six hours per day. In comparison with the use of the Internet, most respondents (61.6%) indicated that they use the Internet less than one hour per day or between two and four hours (33.7%)

What is rather interesting is that respondents use the computer mostly for sending e-mail (91.9%), browsing the Web (80.2%), and for administration work (77.9%). Only 27.9% made use of the computer for Internet banking and only 10.5% for Electronic-commerce. It is clear that the sample consists of regular Internet users.

Using Electronic-commerce and online transactions

The purpose of these questions was to provide information about the respondents' willingness to conduct Electronic-commerce and provide their credit card information over the Internet while purchasing a product or service.

Profile questions	HR respondents	IT respondents
Work for a private company	57.1%	51.0%
Work for a government institution	31.4%	13.7%
Self-employed	11.4%	9.8%
Student	0.00%	23.5%
Managerial position	34.3%	21.6%
IT specialist	0.00%	27.5%
Postgraduate	100.0%	7.8%
Graduate or diploma	0.00%	58.8%
Male	28.6%	64.7%
Female	71.4%	35.3%

Table 1: Profile of Respondents

Only 27.9% of the respondents are willing to buy products or services on the Internet. The most common reasons indicated by the 72.1% respondents who do not buy on the Internet were that they are not interested (43.9%), they believe it is not safe (26.7%) and they feel it is easier to shop at a shopping centre (26.7%). Other reasons were that they do not have access to the Internet (10.5%), do not know how to buy products on the Internet (9.3%) and they feel it takes too long to deliver the purchased goods (9.3%).

A total of 66.3% of the respondents are not willing to give their credit card information in a secure transaction on the Internet while purchasing products or services. Even if the bank guarantees the safety of the transaction, 57.8% are still not prepared to give their credit card information over the Internet. Most respondents (62.7%) feel it is also not safe to give your credit card to a waiter in a restaurant, but still do!

The most common reason they were all concerned about was the safety of their credit card information when conducting online business (41.9%) or that a hacker could intercept their credit card number (32.6%). Other reasons were that some respondents are not interested (18.6%) or that they prefer to shop at a shopping centre (16.3%). One respondent said in the open-ended-write-in question; *“Nothing beats the experience of shops. I prefer to see and touch the goods that I purchase. There is a social experience in shopping. I prefer shopping to ensure the quality of the goods purchased.”*

In comparing the HR results to the IT results (see Table 2) it is clear that IT respondents are more willing to buy products or services over the Internet than the HR respondents. Table 3, however, indicated that this was *not* a significant difference!

Other interesting results are that most respondents (86.9%) said that they would not provide personal information over the Internet when requested by a website and that most of them (94.0%) have never sent encrypted e-mail messages.

In all of the above-mentioned results, the IT respondents were more positive than the HR respondents, but the analysis in Table 3, as stated earlier, shows no significant differences between the two groups.

Information security knowledge and awareness

This dimension contained more technical questions in order to obtain information about the respondents' basic knowledge and awareness of security measures and methods on the Internet as well as the use of information security policies by their companies. It was expected that IT respondents' security knowledge would be better than that of the HR respondents'. Table 4 indicates that there were some significant differences (bold printed information) between the two groups.

The overall mean of the questions indicated that 73.6% of the HR respondents did not have knowledge of the Information Security measures and methods used for the Internet compared with the 29.2% of the IT respondents.

The main lack of knowledge was in the use of digital certificates and in what Secure Socket Layer (SSL) implies. One of the significant differences indicated in Table 4 between the HR respondents and the IT respondents was that none of the HR respondents knew how to use digital certificates compared with 36.7% of the IT respondents who did know.

In the use of private and public key encryption, 85.7% of the HR respondents did not know how to use the method compared with 32.7% of the IT respondents, resulting in a significant difference (see Table 4). Another significant difference was knowledge of the term “*shttp://*.” Of the HR respondents, 80.0% did not know what the term meant compared with 32.7% of the IT respondents.

There was also a significant difference where 57.1% of the IT respondents had never sent encrypted e-mail messages compared with 80.0% of the HR respondents. Eighty-three percent of the HR respondents did not know how to verify the identity of a website, ensuring it is not a hoax, in comparison with 33.3% of the IT respondents. This resulted in a significant difference as seen in Table 4.

Fifty-six percent of the respondents said that the company they work for has an information security policy, but 25.3% were unsure. Only 43% of the respondents' companies enforce the awareness of the policy, 31.6% of the respondents did not know and 25.3% said the companies they work for do not enforce awareness of the information

Questions	Respondents	Mean	No	Yes
I will give my credit card number on the Internet when purchasing a product or service.	HR	1.29	71.4%	28.6%
	IT	1.37	62.7%	37.3%
I buy products or services on the Internet.	HR	1.17	82.9%	17.1%
	IT	1.35	64.7%	35.3%
Grand mean	HR	1.23	77.1%	22.9%
	IT	1.36	63.7%	36.3%

Table 2: Conducting Electronic-Commerce

Variable	HR mean	IT mean	T-value	P-value
Using Electronic-commerce and online transactions				
I buy products or services on the Internet.	1.17	1.35	1.8543	0.08
I do Internet banking on the Internet.	1.26	1.39	1.2591	0.3
I will give my credit card number on the Internet while purchasing a product or service.	1.29	1.37	0.7624	0.43
I provide personal information on the Internet.	1.74	2.02	1.8184	0.36
I will give my credit card number on the Internet if the bank guarantees the security of the transaction.	2.00	2.49	1.8894	0.59
I think it is safe to give my credit card number on the Internet in a secure transaction.	1.94	2.22	1.1957	0.52
I think it is safe to give my credit card number to a waiter in a restaurant.	2.14	2.38	1.1204	0.37

* Significant on the 5% level ($p < 0.05$)

Table 3: Using Electronic-commerce and online transactions

Information security knowledge and awareness	HR mean	IT mean	T-value	P-value
I send e-mail messages over the Internet.	3.26	3.33	0.3205	0.51
I have sent encrypted e-mail messages in the past.	1.20	1.55	-2.7689	0.00*
I know what the s in shttp:// means.	1.29	2.18	-5.3299	0.01*
I know what Secure Electronic Transactions (SET) imply.	1.60	2.44	-4.9080	1.01
I know what Secure Socket Layer (SSL) implies.	1.17	2.06	-6.1925	0.00*
I will give my credit card number on the Internet if the site uses Secure Socket Layer (SSL).	1.60	2.08	-3.1538	0.20
I know what a digital certificate is.	1.56	2.29	-4.0318	0.83
I know how to use a digital certificate.	1.11	2.00	-6.5660	0.00*
I know how to use private and public key encryption.	1.20	2.02	-5.5178	0.003*
I know how to verify the identity of a website, making sure it is not a hoax.	1.17	2.02	-6.1950	0.00*
I know how to send encrypted e-mail messages.	1.34	2.25	-5.0637	0.10
I know how to decrypt e-mail messages.	1.37	2.27	-5.0413	0.07
My company has an information security policy.	2.26	2.50	-1.3743	0.48
My company enforces the awareness of the information security policy.	2.00	2.23	-1.2667	0.60

* Significant on the 5% level ($p < 0.05$)

Table 4: The comparisons between HR respondents and IT respondents

5 Conclusion

This research grew out of an interest in the perceptions and fears of consumers to use the Internet to conduct Electronic-commerce and their knowledge of the security methods and controls used during online transactions. With the growth in Electronic-commerce and the future forecasting of the increase of online business transactions it is important that Electronic-commerce develop to its full potential.

It was expected that consumers are unwilling to divulge their credit card information during an online electronic transaction, generally safety concerns were the main reason. For research purposes, two groups of people from the industry, HR consumers and IT consumers, were compared. It was also expected that the IT consumers would be more willing to give their credit card information during an online transaction than the HR consumers. Another expectation was that the IT consumers are more aware of and educated about information security measures during an online transaction than HR consumers.

The results obtained from the inferential survey confirmed the expectations for both of these arguments. In general, the respondents were not willing to give their credit card information over the Internet because of safety concerns. The first hypothesis can therefore be regarded as true and strengthens the argument that consumers are unwilling to give their credit card information during an online transaction because of safety and hacker concerns.

The expectation that IT consumers are more willing to divulge their credit card information during an online transaction than HR consumers was found to be false. Both groups enjoy the thrill of physical shopping in a face-to-face environment and were mostly not interested in changing their behaviour to conduct Electronic-commerce for some products. Although they prefer shopping centres there seems to be a general lack of trust among consumers whether in an electronic transaction or in a face-to-face transaction.

It was found that IT consumers are more aware of and educated in Information Security measures during an online transaction than the HR consumers therefore the secondary hypothesis is accepted

Since the IT respondents had a fairly good knowledge of the security measures, but are still not significantly more willing to use Electronic-commerce than the HR respondents, the conclusion can be drawn that awareness and knowledge of the use of security measures during Electronic-commerce do not necessarily contribute to the fact that consumers will be more willing to use Electronic-commerce. Familiarity with and confidence in their environment and lifestyle, built up over a long period of time, contribute to the fact that consumers accept the way of purchasing provided by vendors and attach credence to it. Although face-to-face transactions are part of consumers'

everyday living, they do not feel totally confident about it, but because of familiarity with the system, they make use of it. This cyclical process of familiarity which builds up acceptance and credibility, and ultimately trust could be used as a stepping stone to build trust in Electronic-commerce. The problem of trust and consumers' perceptions of safety measures should be addressed to convince consumers to use Electronic-commerce. Consumers have to be convinced to trust vendors, and their fear of hackers and safety issues on the Internet will have to be proven wrong over time and with concrete evidence.

In practice, the results of this study indicate that the challenge still stands. The results of the study as well as other prior research could help to determine and address consumers' specific needs and concerns about online transactions. Training and development by companies and the implementation of an information security awareness policy are important issues in changing behaviour and perceived perceptions.

The principle factor as stated earlier is trust. Further research in electronic-commerce perceptions of the rest of the population as well as developing a model of trust in Electronic-commerce is needed for the human-computer interrelationship.

References

- [1] M Atanasov, *The truth about Internet fraud*, Ziff Davis Smart Business for the New Economy, April 2001.
- [2] R Barrett, *The answer to Credit-Card Security*, May 2000, <http://www.zdnet.com/intweek/stories/news/0,4164,2560079,00.html>
- [3] J Boeyens, In *Manspec analysis - statistical analysis package*, pp 55-57, 1993.
- [4] C Botha, *How secure is our online transaction?*, In INTER@CTIVE Week, 1(4), p 3, May 2000.
- [5] B Charny, *The high(er) cost of business online*, July 2000, http://cma.zdnet.com/taxis/techinfobase/techinfobase/+Rd6e8PUtwzmwww1xFqr+_X9vXKq7mwwwwhmzmwwwwdFqrp1xmwBniFqnhw5B/display.html
- [6] Cranor, F Laurie, *Understanding Net Users' Attitudes About Online Privacy*, AT&T Labs-Research Technical Report TR99.4.3, 24 April 1999, <http://www.Research.att.com/library/trs.TRs/99/99.4>
- [7] D de Myer, *A Cure for Credit Card Fraud - Orbiscom shoots to end e-shoppers' security concerns. (Company Business and Marketing)*, Ziff Davis Smart Business for the New Economy December 2000.
- [8] WR Dillon, TJ Madden, NH Firtle, *Essentials of marketing research*, Homewood, IL IRWIN, p 223, Boston, 1993.

- [9] B Gengler, *RealNames warns customers of hack attack*, In Computer Fraud and Security, p 6, April 2000.
- [10] NJ Hannon, *The Business of the Internet*, International Thomson, pp 184, 193, Cambridge, 1998.
- [11] JL Hintze, *Number Cruncher Statistical System, version 5.03 5/90*, Kaysville, Utah: NCSS.
- [12] DJ Howell, *Fundamental statistics for the behavioral science*, third edition, pp 118-119, Duxbery, Belmont, California, 1993.
- [13] GK Huysamen, *Sielkundige meting - 'n Inleiding*, J.L van Schaik, Hatfield Pretoria, 1996.
- [14] IT Security, *The Privacy Leadership Announces New Survey Reveals Trust Gap Exists Between Consumers and Businesses About Information Exchange*, April 2001,
<http://www.itsecurity.com/tecsnews/apr2001/apr47.htm>
- [15] IT Security, *Security Fears, Increased e-Business Investment Top Survey of IT Pros; Network World Study Also Reveals Significant Growth in Handheld Devices and Major Concerns With Storage*, April, 2001,
<http://www.itsecurity.com/tecsnews/apr2001/apr44.htm>
- [16] P Kamthan, *E-commerce in the www: Prospects and Concerns*, March 2000,
<http://www.irt.org/articles/js155/index htm3intro>
- [17] P Kamthan, *E-commerce on the WWW: a Matter of Trust*, In Internet Related Technologies, 25 April 1999,
<http://irt.org/articles/js158/index htm>
- [18] R Lain, *Internet shopping soars at the end of the century*, In The Mercury, p 3, In IT Technology, Tuesday 18 January 2000.
- [19] M Merklow, *E-commerce Security Technology - Part One*, 2000,
http://ecommerce.internet.com.outlook/article/0,1467,7761_253601,00.htm
- [20] M Merkow, *E-commerce seal of security and trust*, June 1998,
http://ecommerce.internet.com/outlook/article/0.1467,7761_126061,00.html
- [21] Reutes, *UK users don't trust e-commerce*, In CNET-News, 12 March 1998,
<http://news.cnet.com/news/0-1003-200-327352.html>
- [22] A Sherter, *E-Commerce Special Report: Chase In Pursuit Of Internet Spoils: The bank's Ronald Braco plots a course to the e-commerce promised land*, January 2000,
http://cma.zdnet.com/taxis/techinfobase/techinfobase/+wo6e8l-EwzmwwwwhxFqo_+WKK88WqzmwwwwmzmwwwdFqrp1xmwBniFqnhw5B/display.html
- [23] D Sussis, L Rush, *Guarding your turf*, June 1999,
<http://ecommerce.internet.com/outlook/solutions/e-consultant/article/0,1467,142471,00.html>
- [24] <http://www.commerce.net>
- [25] http://www.gvu.gatech.edu/user_surveys/survey_1998-10/grapgs/privacy/q02.htm
- [26] <http://www.ncss.com>
- [27] <http://www.surveytracker.com>
- [28] J Weisman, *Report: E-commerce to grow 57% in 2001. E-Commerce Times*, January 2001,
<http://www.ecommercetimes.com/perl/story/?id=6530>