

**ELECTRONIC COMMERCE IN MALAYSIA:  
A CASE STUDY ON THE ADOPTION OF  
INTERNET BANKING AMONG  
MALAYSIAN PROFESSIONALS**

**by**

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# TABLE OF CONTENTS

	<i>Page</i>
<b>Acknowledgements</b> .....	<i>ii</i>
<b>Table of contents</b> .....	<i>iii</i>
<b>List of figures</b> .....	<i>ix</i>
<b>List of tables</b> .....	<i>x</i>
<b>Abstrak</b> .....	<i>xv</i>
<b>Abstract</b> .....	<i>xvi</i>
<b>1.0 Introduction</b> .....	<b>1</b>
1.1 Background .....	1
1.1.1 The rise of electronic commerce .....	1
1.1.2 The banking sector and Internet banking in Malaysia .....	3
1.2 Research problem .....	8
1.3 Objectives of the study .....	13
1.4 Scope of the study .....	14
1.5 Significance of the study .....	14
1.5.1 Contribution to theory .....	15
1.5.2 Contribution to practice .....	15
1.6 Structure and organisation of dissertation .....	16
1.7 Summary .....	17
<b>2.0 Theoretical Framework</b> .....	<b>18</b>
2.1 Diffusion of innovations .....	20
2.2 Adoption of information technology models .....	27
2.2.1 Theory of Planned Behaviour .....	27
2.2.2 Technology Acceptance Model .....	28
2.2.3 Decomposed Theory of Planned Behaviour .....	31
2.3 Adoption of electronic commerce .....	32
2.4 Adoption of Internet banking .....	36
2.5 Summary of literature .....	44
2.6 Proposed research model .....	46
2.7 Summary .....	47

<b>3.0</b>	<b>Methodology</b> .....	<b>48</b>
3.1	Population.....	48
3.2	Sampling procedure.....	48
3.2.1	Sampling unit.....	49
3.2.2	Sampling frame.....	49
3.2.3	Sampling method.....	49
3.3	Survey research.....	50
3.4	Hypotheses and research questions.....	51
3.5	Conceptualisation.....	53
3.5.1	Adopters of Internet banking.....	53
3.5.2	Features of Internet banking.....	53
3.5.3	Sex.....	53
3.5.4	Education.....	53
3.5.5	Income.....	54
3.5.6	Age group.....	54
3.5.7	Characteristics of the innovation.....	54
3.5.7.1	Perceived usefulness.....	54
3.5.7.2	Ease of use.....	54
3.5.7.3	Trialability.....	54
3.5.7.4	Compatibility.....	55
3.5.7.5	Observability.....	55
3.5.8	Perceived risk.....	55
3.5.9	Incentives.....	55
3.5.10	Facilitating conditions.....	55
3.5.11	Principles knowledge.....	56
3.5.12	How-to knowledge.....	56
3.5.13	Sources of knowledge.....	56
3.6	Operationalisation.....	57
3.6.1	Adopters of Internet banking.....	57
3.6.2	Features of Internet banking.....	57
3.6.3	Sex.....	57
3.6.4	Education.....	57

3.6.5	Income.....	58
3.6.6	Age group.....	58
3.6.7	Characteristics of the innovation.....	58
3.6.7.1	Perceived usefulness.....	59
3.6.7.2	Ease of use.....	59
3.6.7.3	Trialability.....	60
3.6.7.4	Compatibility.....	60
3.6.7.5	Observability.....	60
3.6.8	Perceived risk.....	61
3.6.9	Incentives.....	61
3.6.10	Facilitating conditions.....	61
3.6.11	Principles knowledge.....	61
3.6.12	How-to knowledge.....	62
3.6.13	Sources of knowledge.....	62
3.7	Research instrument.....	63
3.8	Pre-testing of questionnaire.....	65
3.9	Data analysis method.....	66
3.10	Summary.....	67
<b>4.0</b>	<b>Data Analysis.....</b>	<b>68</b>
4.1	Frequencies.....	68
4.1.1	Demographics and social status.....	68
4.1.1.1	Sex.....	68
4.1.1.2	Age.....	69
4.1.1.3	Ethnicity.....	69
4.1.1.4	Education level.....	70
4.1.1.5	Profession.....	70
4.1.1.6	Job position/level.....	71
4.1.1.7	Average monthly salary.....	71

4.1.2	Internet banking adoption .....	72
4.1.2.1	General Internet banking adoption .....	72
4.1.2.2	Location used to access the Internet.....	73
4.1.2.3	Average amount of time spent on the Internet per week.....	73
4.1.2.4	Number of Internet banking transactions conducted per month .....	74
4.1.2.5	Adoption of Internet banking by sex .....	75
4.1.2.6	Adoption of Internet banking by age .....	75
4.1.2.7	Adoption of Internet banking by ethnicity .....	76
4.1.2.8	Adoption of Internet banking by education level .....	76
4.1.2.9	Adoption of Internet banking by profession.....	77
4.1.2.10	Adoption of Internet banking by job position/level..	77
4.1.2.11	Adoption of Internet banking by income.....	78
4.2	Characteristics of the innovation .....	78
4.2.1	Perceived usefulness .....	79
4.2.2	Ease of use.....	85
4.2.3	Trialability .....	91
4.2.4	Compatibility.....	94
4.2.5	Observability .....	98
4.3	Other factors affecting adoption .....	101
4.3.1	Perceived risk .....	101
4.3.2	Incentives .....	104
4.3.3	Facilitating conditions .....	106
4.4	Knowledge of the innovation .....	107
4.4.1	Principles knowledge .....	107
4.4.2	How-to knowledge .....	110
4.4.3	Sources of information .....	114
4.5	Features of Internet banking .....	115

4.6	Hypotheses testing.....	116
4.6.1	H1: There is a difference between male and female professionals with regard to their adoption of Internet banking.....	116
4.6.2	H2: There is a difference between the higher-educated and lower-educated professionals with regard to their adoption of Internet banking.....	117
4.6.3	H3: There is a difference between the high-income and low-income professionals with regard to their adoption of Internet banking.....	118
4.6.4	H4: There is a difference between the younger group and older group professionals with regard to their adoption of Internet banking.....	119
4.6.5	H5: Internet banking adoption is positively related to the perceived usefulness of Internet banking.....	120
4.6.6	H6: Internet banking adoption is positively related to the ease of use of Internet banking.....	121
4.6.7	H7: Internet banking adoption is positively related to the trialability of Internet banking.....	122
4.6.8	H8: Internet banking adoption is positively related to the compatibility of Internet banking with professionals.....	123
4.6.9	H9: Internet banking adoption is positively related to the observability of Internet banking.....	124
4.6.10	H10: Internet banking adoption is negatively related to the perceived risk of Internet banking.....	125
4.6.11	H11: Internet banking adoption is positively related to incentives in Internet banking.....	126
4.6.12	H12: Internet banking adoption is positively related to the professional's facilitating conditions.....	127
4.6.13	H13: Internet banking adoption is positively related to higher levels of principles knowledge.....	128
4.6.14	H14: Internet banking adoption is positively related To higher levels of how-to knowledge.....	129
4.7	Summary.....	130



<b>5.0 Conclusion</b> .....	<b>131</b>
5.1 Discussion.....	131
5.2 Suggestions for further research .....	142
 <b>References</b> .....	 <b>143</b>

**List of Appendices**

Appendix A	Diffusion of Innovations.....	153
Appendix B	Theory of Reasoned Action.....	154
Appendix C	Theory of Planned Behaviour.....	155
Appendix D	Technology Acceptance Model .....	156
Appendix E	Decomposed Theory of Planned Behaviour .....	157
Appendix F	Cover letter to respondents.....	158
Appendix G	Survey questionnaire .....	159

## LIST OF FIGURES

	<i>Page</i>
Figure 2.1	Major categories of literature relevant to the study ..... 19
Figure 2.2	Initial research model: Internet banking adoption by professionals ..... 46
Figure 5.1	Final research model of the factors affecting Internet banking adoption among professionals in Malaysia..... 141

## LIST OF TABLES

	<i>Page</i>
Table 1.1	Internet Users in Malaysia (1997 – 2004) ..... 8
Table 2.1	Features of Internet banking offered by selected Malaysian banks..... 39
Table 2.2	Summary of factors identified as influencing the adoption of Internet banking..... 44
Table 4.1	Sex of the respondents ..... 68
Table 4.2	Age grouping of the respondents ..... 69
Table 4.3	Ethnicity of the respondents ..... 69
Table 4.4	Education level of the respondents ..... 70
Table 4.5	Profession of the respondents ..... 70
Table 4.6	Job position/level of the respondents ..... 71
Table 4.7	Average monthly salary of the respondents ..... 71
Table 4.8	Adoption of Internet banking by professionals ..... 72
Table 4.9	Location used to access the Internet by non-adopters and adopters ..... 73
Table 4.10	Average amount of time spent on the Internet by non-adopters and adopters (per week) ..... 73
Table 4.11	Number of Internet banking transactions by non-adopters and adopters (per month) ..... 74
Table 4.12	Sex of non-adopters and adopters ..... 75
Table 4.13	Age of non-adopters and adopters ..... 75
Table 4.14	Ethnicity of non-adopters and adopters ..... 76
Table 4.15	Education level of non-adopters and adopters ..... 76
Table 4.16	Profession of non-adopters and adopters ..... 77
Table 4.17	Job position/level of non-adopters and adopters ..... 77
Table 4.18	Income of non-adopters and adopters ..... 78
Table 4.19	Responses by non-adopters and adopters on the ability of Internet banking to improve their performance..... 79

Table 4.20	Responses by non-adopters and adopters on the ability of Internet banking to improve their productivity .....	80
Table 4.21	Responses by non-adopters and adopters on the ability of Internet banking to enhance their effectiveness .....	81
Table 4.22	Responses by non-adopters and adopters on the ability of Internet banking to enable them to accomplish tasks more quickly .....	82
Table 4.23	Responses by non-adopters and adopters on the ability of Internet banking to make it easier to perform their jobs .....	83
Table 4.24	Responses by non-adopters and adopters on the usefulness of Internet banking .....	84
Table 4.25	Responses by non-adopters and adopters on the easiness of learning how to use Internet banking .....	85
Table 4.26	Responses by non-adopters and adopters on the easiness of learning how to use Internet banking .....	86
Table 4.27	Responses by non-adopters and adopters on the clarity of their interaction with Internet banking .....	87
Table 4.28	Responses by non-adopters and adopters on the interaction flexibility of Internet banking .....	88
Table 4.29	Responses by non-adopters and adopters on becoming skilful at using Internet banking .....	89
Table 4.30	Responses by non-adopters and adopters on Internet banking ease of use .....	90
Table 4.31	Responses by non-adopters and adopters on the ability to use Internet banking on a trial basis before making an adoption decision.....	91
Table 4.32	Responses by non-adopters and adopters on the ability to try using Internet banking properly before making an adoption decision .....	92

Table 4.33	Responses by non-adopters and adopters on the ability to use Internet banking on a trial basis without spending a lot of money before making an adoption decision.....	93
Table 4.34	Responses by non-adopters and adopters on the compatibility of Internet banking with most aspects of their work .....	94
Table 4.35	Responses by non-adopters and adopters on the compatibility of Internet banking with the way they like to work .....	95
Table 4.36	Responses by non-adopters and adopters on the compatibility of Internet banking with their work style .....	96
Table 4.37	Responses by non-adopters and adopters on the compatibility of Internet banking with most aspects of their work .....	97
Table 4.38	Responses by non-adopters and adopters on their ability to tell others about the results of Internet banking .....	98
Table 4.39	Responses by non-adopters and adopters on their ability to communicate to others about the pros and cons of Internet banking.....	99
Table 4.40	Responses by non-adopters and adopters on the results of Internet banking being apparent to them .....	100
Table 4.41	Responses by non-adopters and adopters on the risk level of Internet banking .....	101
Table 4.42	Responses by non-adopters and adopters on the potential financial losses of Internet banking .....	102
Table 4.43	Responses by non-adopters and adopters on the risk of experiencing huge financial losses when using Internet banking.....	103
Table 4.44	Responses by non-adopters and adopters on the importance of incentives for using Internet banking .....	104
Table 4.45	Responses by non-adopters and adopters on the role of incentives to encourage the use of Internet banking.....	105

Table 4.46	Responses by non-adopters and adopters on the ease of gaining access to a computer to use Internet banking .....	106
Table 4.47	Responses by non-adopters and adopters on the need for Internet access to perform Internet banking transactions .....	107
Table 4.48	Responses by non-adopters and adopters on the need for Internet banking password to gain access to their bank account .....	108
Table 4.49	Responses by non-adopters and adopters on the need for a monitor/screen to view the results of their Internet banking transactions.....	109
Table 4.50	Responses by non-adopters and adopters regarding their knowledge of how to log-in into an Internet banking facility .....	110
Table 4.51	Responses by non-adopters and adopters regarding their knowledge of checking their account balances using Internet banking .....	111
Table 4.52	Responses by non-adopters and adopters regarding their knowledge of paying their utility bills using Internet banking .....	112
Table 4.53	Responses by non-adopters and adopters regarding their knowledge of transferring funds using Internet banking .....	113
Table 4.54	Responses by non-adopters and adopters regarding their sources of information regarding Internet banking .....	114
Table 4.55	The importance of the various Internet banking features .....	115
Table 4.56	Results of the independent samples t-test for Internet banking adoption and sex.....	116
Table 4.57	Results of the independent samples t-test for Internet banking adoption and education level.....	117
Table 4.58	Results of the independent samples t-test for Internet banking adoption and income .....	118

Table 4.59	Results of the independent samples t-test for Internet banking adoption and age.....	119
Table 4.60	Correlation between Internet banking adoption and the perceived usefulness of Internet banking.....	120
Table 4.61	Correlation between Internet banking adoption and the ease of use of Internet banking .....	121
Table 4.62	Correlation between Internet banking adoption and the trialability of Internet banking .....	122
Table 4.63	Correlation between Internet banking adoption and the compatibility of Internet banking with professionals .....	123
Table 4.64	Correlation between Internet banking adoption and the observability of Internet banking .....	124
Table 4.65	Correlation between Internet banking adoption and the perceived risk of Internet banking .....	125
Table 4.66	Correlation between Internet banking adoption and incentives in Internet banking.....	126
Table 4.67	Correlation between Internet banking adoption and the professional's facilitating conditions .....	127
Table 4.68	Correlation between Internet banking adoption and principles knowledge of Internet banking.....	128
Table 4.69	Correlation between Internet banking adoption and how-to knowledge of Internet banking.....	129

# E-PERDAGANGAN DI MALAYSIA: SATU KAJIAN KES MENGENAI PENERIMAAN PERBANKAN INTERNET DI KALANGAN GOLONGAN PROFESSIONAL MALAYSIA

## ABSTRAK

Masa kini, memang tidak dapat dinafikan bahawa ianya adalah penting bagi organisasi-organisasi tempatan untuk menggunakan e-perdagangan untuk memperolehi kebolehan untuk berdaya saing. Salah satu jenis e-perdagangan yang mendapat perhatian orang ramai di Malaysia ialah perbankan Internet. Perbankan Internet mempunyai potensi untuk menambahbaik mutu dan kebolehan bank-bank tempatan. Perbankan Internet mempunyai banyak kelebihan jika dibandingkan dengan sistem perbankan konvensional kerana ianya membolehkan para pengguna mengakses akaun bank mereka 24/7. Objektif utama kajian ini adalah untuk mengenalpasti factor-faktor yang mempengaruhi penerimaan perbankan Internet di Malaysia. Respons oleh 167 ahli badan profesional tempatan digunakan untuk kajian ini. Kajian ini menggunakan pendekatan teori difusi inovasi Rogers (1995) and lain-lain model penerimaan teknologi maklumat yang berkenaan. Analisis data yang dikumpul melalui kaedah tinjauan dengan menggunakan mel elektronik menunjukkan bahawa terdapat perbezaan diantara golongan penerima dan golongan bukan penerima dari segi jantina, umur, pendidikan dan pendapatan. Secara amnya, individu yang berumur tidak lebih dari 40 tahun, lelaki, mempunyai sekurang-kurangnya ijazah sarjana muda atau memperolehi pendapatan kasar bulanan melebihi RM2000 mempunyai kadar penerimaan yang lebih tinggi. Selain itu, ciri-ciri sesebuah inovasi memang memainkan peranan yang penting dalam penerimaan perbankan Internet. Kebergunaan, kebolehcubaan, keteramatan, kesenangan dan kesepadanan perbankan Internet mempunyai korelasi positif dengan penerimaan perbankan Internet. Selain itu, pengetahuan mengenai sesuatu inovasi juga mempengaruhi penerimaan dan sumber maklumat inter-personal merupakan sumber maklumat paling utama. Insentif dan juga akses kepada Internet terbukti membantu penerimaan manakala risiko penggunaan perbankan Internet menghalang penerimaan perbankan Internet. Kajian ini juga mendapati bahawa kemudahan pembayaran bil, pemindahan dana dan ringkasan akaun bank merupakan fasiliti yang dianggap penting oleh golongan profesional.



## ABSTRACT

It is becoming widely accepted that it is important for businesses to embrace electronic commerce to gain competitive advantage. One form of electronic commerce that has attracted significant attention in Malaysia is Internet banking. Internet banking has the potential of enhancing the capability and improving the profit margins of the local banks in addition to providing a convenient delivery channel to consumers. Internet banking has many advantages over the conventional bank branches, as it provides for convenience to bank customers who can conduct their banking transactions 24/7. The key aim of this research is to identify the factors that affect the adoption of Internet banking in Malaysia. The responses of 167 members of professional bodies in Malaysia were used for this research. This research uses the diffusion of innovation theory proposed by Rogers (1995) and other information technology adoption literature that are relevant to Internet banking. Analysis of the data collected from the email surveys reveals that there are significant differences between adopters and non-adopters with regard to age, sex, education and income. Generally, individuals who are not older than 40 years, male, possess at least a bachelor's degree or earn a monthly gross income of more than RM2000 per month have higher adoption rates. It is also proven that the characteristics of the innovation play an important role in influencing Internet banking adoption. The ease of use, compatibility, perceived usefulness, observability and trialability of Internet banking are found to be positively correlated to adoption. Apart from that, it is also discovered that knowledge of Internet banking influences adoption and that interpersonal sources of information are the key source of knowledge on Internet banking. Incentives and facilitating conditions are facilitators of adoption whilst perceived risk of Internet banking is an inhibitor of adoption. This research also discovered that the features of Internet banking considered important by professionals are account summary, bill payment and funds transfer.

# Chapter 1 Introduction

## 1.1 Background

### 1.1.1 The rise of electronic commerce

Nowadays, news and issues regarding information communication technologies (ICT), electronic commerce and Internet banking are often given prominence in both the media and academia. Some quarters believe that these new communication technologies have the potential of changing the way of life and economic growth of a nation in pursuit of national development and progress.

Electronic commerce can be viewed from a communications, business or technical perspective. According to Kalakota and Whinston (1997), electronic commerce can be broadly defined as the electronic transmission of information, products, services or payments. To many people, electronic commerce is synonymous with shopping on the Internet. This is a gross misconception as the term actually encompasses all business activities that are conducted electronically (Schneider & Perry 2001, p. 3). Watson, Berthon, Pitt and Zinkan (1998) believe that electronic commerce involves the utilisation of information technology to improve and refine the forms of communication that exists between consumers, suppliers, financial intermediaries, government and businesses.

The introduction of the World Wide Web (WWW) in the 1990's signalled an important event for electronic commerce as it enabled the widespread utilisation of easy and user-

friendly Internet applications for end users. This in fact acted as a catalyst to the diffusion and exchange of information on the Internet. The World Wide Web also enabled many organisations to conduct business online at a very low cost with ease (Kalakota & Whinston 1997).

In addition to that, Forrester Research (2000) estimated the total value of electronic commerce transactions worldwide at approximately USD\$ 6.8 trillion by the year 2004, whilst the Asia Pacific region amassing a total of USD\$ 992 billion electronic commerce transactions. Electronic commerce is indeed an important and fertile research area in view of its ability to link organisations to their customers through new communication technologies. The intense growth of electronic commerce can be attributed to the expansion of the World Wide Web and widespread use of hyperlinks on most web pages. The World Wide Web has also removed the barriers to communication and interaction between both the users and organisations (Kalakota & Whinston, pp. 5 – 6). Lapham (1996) stressed that electronic commerce enables organisations to communicate closely with its customers at a more intimate and personal level.

As electronic commerce involves new and different forms of interaction, it is therefore different from the other communications media that most organisations and communication experts are familiar with. One of the more distinguishable feature of electronic commerce is that it empowers the user to determine the direction and the rate of the communication process (Kayanay 1998).

In general, electronic commerce can be categorised into three main elements – business-to-consumer electronic commerce (B2C), business-to-business electronic commerce (B2B) and internal business processes that facilitate the sale and purchase of products and services through the World Wide Web (Schneider & Perry 2001). Electronic commerce transactions on the other hand is defined as the set of interaction process between the buyer, seller and intermediaries. The electronic commerce transaction is said to be complete when both the buyer and seller agree upon a set of conditions or terms, and the exchange of goods or service occur (Rocha & Oliveira 2000). The growth of electronic commerce has not only affected business transactions, it has in fact affected the ways in which financial institutions, especially banks operate these days.

### **1.1.2 The banking sector and Internet banking in Malaysia**

In Malaysia, the banking sector is composed of licensed institutions namely commercial banks, finance companies, merchant banks, discount houses and money brokers that are licensed under the *Banking and Financial Institutions Act 1989* (BAFIA) and supervised by the Central Bank, *Bank Negara Malaysia* (*Bank Negara Malaysia* 2001).

The economic role of the banking and financial services sector is to mobilise funds between savers and investors. To this end, many banks and financial institutions have attempted to utilise information technology initially for internal use and communication, and later as a vehicle for external communication and transactions with their customers.

On the whole, the market environment in the banking sector is becoming increasingly competitive and dynamic especially with the completion of the merger programme among domestic banking institutions which will see 31 commercial banks (of which 14 are fully foreign-owned), 19 finance companies, 12 merchant banks and 7 discount houses merged and reduced to 10 domestic banking groups consisting of 10 commercial banks, 10 finance companies and 9 merchant banks (*Bank Negara Malaysia* 2001; Chou & Chou 2000). The landscape of the Malaysian banking sector is expected to change and evolve significantly where institutions with strong value propositions survive and expand while others will eventually exit this competitive market (*Bank Negara Malaysia* 2001).

The banking and finance sector was one of the first industry sectors to benefit from the use of information technology since early computers which were initially developed for scientific and military purposes made their way into commercial applications in the 1960's with the Electronic Recording Machine – Accounting (ERMA) (NOIE 1999, p. 91). At that time, financial institutions such as banks were literally swamped with the growing volume of cheques that needed to be processed. By automating the function with ERMA, the first bank to use the computer, the Bank of America, reported that only nine employees were needed to accomplish the tasks of fifty employees (NOIE 1999, p. 91).

Information communication technologies (ICT) still play a pivotal role in the banking sector these days. The *Bank Negara Malaysia's Masterplan* (2001) reiterates that ICT will continue to be a key driver in banking in the future as successful banking

institutions will be those that are able to leverage most from ICT. It also highlighted that one of the key areas of new technology investments for local banks would be the development of alternative delivery channels, notably the Internet which has the potential of enabling financial service providers develop strong value propositions both in the context of wired and wireless Internet banking (*Bank Negara Malaysia 2001*).

Beginning in the early 1970's and following the introduction of credit cards, a technological milestone in the annals of the banking sector was made with the introduction of the automated teller machine (ATM) that could perform many of the functions of human tellers. In the evolution of electronic banking, the next major development was the formation of what is known as ATM networks, allowing customers to transact from virtually anywhere via networked ATMs (Giannakoudi 1999). According to Pang (1995), ATMs were introduced in Malaysia in 1981 and presented local banks with a more cost-effective solution to address the need for branch networks to service bank customers.

Once the convenience and reliability of these systems were established, consumers' desire to utilise these kinds of financial services for additional uses expanded. This led to the introduction of telephone banking and cable banking in the 1980's which allowed for greater convenience and access from remote locations via an automated system of the bank utilising automated voice response (AVR) technology (Giannakoudi 1999; Suganthi, Balachandher & Balachandran 2001).

Telephone banking was only introduced in Malaysia in the early 1990's which provided another delivery channel for banks to utilise (Suganthi, Balachandher & Balachandran 2001). Drawbacks of this medium such as lack of visual verification and bidirectional communication, allowed for the introduction of personal computer banking which utilises proprietary software and access to a private network (Sorkin 2002). Nevertheless and despite the investment of huge amounts of money on personal computer banking, its success was limited due to interoperability problems (Giannakoudi 1999).

The disadvantages of the earlier banking systems were overcome with the emergence of the Internet and the World Wide Web. Unlike personal computer banking, Internet banking allows anyone equipped with common Internet access facilities to access their bank account details and conduct a myriad of financial transactions online. Hence, Internet banking appears as both a response to both the technical limitations of the previous banking systems and to the growing demands of customers who now require sophisticated packages of products tailored specifically to their financial needs (Chou & Chou 2000).

As imperfections in the operation of the sector have been reduced with the development of new transactions technology and new ways of harnessing information with the aid of information technology, it is evident that further change is evident with the new capacities introduced by the use of electronic commerce (NOIE 1999). This process of keeping pace with the developments of the industry is indeed a difficult one but is

necessary for them to effectively deliver financial products and services within the context of an Internet-enabled world (Chou & Chou 2000).

As with any new technology and innovation, many terms exist to describe Internet banking. Cuevas (2001) observes that a variety of terms are used to describe Internet banking. According to her, some of the most common terms used to describe Internet banking are net banking, web banking, virtual banking, online banking, home banking, remote banking and browser-based banking (Cuevas 2001). To avoid confusion, the term Internet banking shall be adopted to refer to the service provided by a bank to enable their customers to access their bank accounts and perform secure financial transactions via the Internet (Cuevas 2001; Sciglimpaglia & Ely 2002).

In Malaysia, many local and foreign financial institutions have begun to provide Internet banking services after the approval of *Bank Negara Malaysia* was received on 1 June 2000. Among the pioneers of this new communication technology in Malaysia are Maybank, Southern Bank and Hong Leong Bank who have been providing Internet banking services to their customers since 2000 (Suganthi, Balachandher & Balachandran 2001).

At present, it is estimated that there are approximately 800,000 Internet banking users in Malaysia with many new users signing up with the respective banks (Phang & Fernandez 2002, p. 4). Out of all the banks operating in Malaysia, Maybank currently has 600,000 and the largest number of Internet banking customers (Phang & Fernandez 2002, p. 4). It is anticipated that the Internet banking market will reach 1.1 million



users in the year 2004 with the total number of Internet banking accounts reaching 1.6 million (IDC Malaysia 2000).

## 1.2 Research Problem

According to Datuk Tan Chai Ho, the Deputy Minister of Energy, Communication and Multimedia, Malaysian entrepreneurs should seize the opportunity to use the Internet and electronic commerce to promote and sell their products and services to obtain competitive advantage (*The Star*, 14 June 2000). In addition to that, Datuk Tan also stressed on the significant contribution of electronic commerce to global trade which constitutes 25 percent of total global trade and is estimated to be worth USD\$ 3.8 billion in 2001 (*The Star*, 14 June 2000).

**Table 1.1 Internet Users in Malaysia (1997 – 2004)**

<b>Year</b>	<b>Internet users (millions)</b>
1997	0.44
1998	0.58
1999	1.27
2000	1.89
2001	2.72
2002	3.23
2003	3.63
2004	3.91

(Source: Multimedia Development Corporation 2000, Malaysia: E-Commerce Readiness Self Assessments, Paper presented to the APEC E-Commerce Convention, Tokyo, Japan, p. 28)

The prospects of electronic commerce, especially Internet banking is bright as the total number of Internet users in Malaysia is expected to grow from 1.27 million users in 1999 to approximately 3.91 million users in 2004 as represented in Table 1.1 (Multimedia Development Corporation 2000, p. 28). Although the prospects are encouraging, current statistics indicate that only three percent of Malaysian Internet users transacted online in 2001 (Taylor Nelson Sofres Interactive 2002). However, IDC Malaysia is optimistic of the potential of Internet banking in Malaysia and anticipates that there will be 1.1 million people using Internet banking applications from their homes with a total of 1.6 million Internet banking accounts nationwide (Ng 2002, p. 23).

Looking at the advantages and the competitive edge to be gained with the use of electronic commerce, it is therefore appropriate for the banking sector in Malaysia to utilise this new communication technology application to facilitate their continued growth. The *Bank Negara Malaysia* (2001) endorses the importance of the Internet in facilitating the use of alternative delivery channels by local banks and has the view that Internet banking will be an integral part of a modern banking system.

According to Sorkin (2002), it is important for banks to get customers online as it affects the banks' bottom line. This is mainly because Internet banking has diminished the importance of proximity, overcoming the tyranny of distance that forced many banks to open and operate branches everywhere to service their customers which will become a thing of the past if the adoption of Internet banking is widespread (Sorkin 2002). Apart from that, Internet banking will offer banking institutions significant

advantage in customer acquisition, customer retention and allow for the development and promotion of brands through these new delivery channels (*Bank Negara Malaysia* 2001).

Internet banking has the capability of increasing the banks' customer base exponentially as it is no longer dependent of the location of branches anymore and would definitely reduce its costs as the cost of serving a customer is significantly lower than with human tellers in the long run (Sorkin 2002). Silverman (1999, p.144) convincingly asserts that:

There's no question the Net [Internet] will enable banks to process transactions far more cheaply than they do today at branches. It will help them gather deposits and better track customers' tastes. The Internet could even position banks to take an expanded role as cyberspace centres for all bill payments.

As such, banks now view Internet banking as a positive step to decreasing operating costs and increasing revenue by reducing staff and branch networks (IDC Malaysia 2002). This is the chief reason why many banks are willing to invest heavily in Internet banking initiatives even without seeing the returns on investment yet.

Hence, it is exigent that the adoption and implementation of Internet banking by financial institutions be sensitive to the needs of the users to allay whatever fear and concerns the users may have with regard to Internet banking. This is crucial because the success of Internet banking applications in Malaysia will be largely determined by its adoption and continued use by the users.

Although Internet banking is extremely popular and common in the more developed countries such as the United States of America, Japan, Australia and the European Community, it has only been recently introduced in Malaysia with a very small customer base (Mantel 2000; Suganthi, Balachandher & Balachandran 2001). Furthermore, the total value of transactions conducted over the Internet in Malaysia is relatively very small if not insignificant compared to that recorded in the more developed countries (Multimedia Development Corporation 2000). The CEO of IBM Malaysia attributes the slow adoption of Internet transactions to the fear and negative perception that many consumers have regarding the security of these transactions (*The Star*, 3 August 1998, p. 14).

The Multimedia Development Corporation of Malaysia (2000) acknowledged that the primary barriers to the adoption of electronic commerce in Malaysia include the lack of public trust on the Internet, lack of technical knowledge and the small number of Internet users resulting in a lack of critical mass needed to justify the costs involved in electronic commerce initiatives by businesses. According to HSBC's general manager for personal banking Mr Rohit Bhargava, HSBC Malaysia has spent about RM100 million to develop its online@hsbc Internet banking system (Mokhtar Hanafiah 2002, p. 5). Furthermore, due to the mistrust that many users have of the Internet, the adoption of Internet banking is still not widespread in Malaysia as '.... many people prefer the normal banking system when making payments and withdrawals' (*The Sun*, 25 July 2002, p. 13).

It cannot be denied that the methods and ways of conducting businesses and financial transactions have changed with the introduction of electronic commerce and in particular, Internet banking in recent years. Consumers are beginning to learn and accustom themselves with the new modes and ways of interaction in a highly dynamic electronic environment termed as 'marketspace' (Schneider & Perry 2001, p. 301). To some consumers, Internet banking is already part of their daily routine, but the majority are still reluctant to enjoy the convenience afforded by this innovation due to reasons such as mistrust and Internet access that have not been thoroughly investigated.

Currently, the factors that encourage or inhibit the use of Internet banking applications in Malaysia are still not known. In order to encourage the growth and widespread adoption of Internet banking in Malaysia, the identification and analysis of the factors that affect the adoption of Internet banking applications by consumers must be conducted. When furnished with this invaluable information, the relevant authorities such as the banks, *Bank Negara Malaysia* and the relevant government agencies would be able to formulate plans and strategies to encourage the adoption of Internet banking in Malaysia.

Clearly, there is a need for research to address this lack of knowledge in this field. The research problem identified for this study is:

**What are the factors that affect the adoption of Internet banking applications by Malaysian professionals?**

### 1.3 Objectives of the Study

The main objective of this study is to identify and analyse the factors that influence consumers (particularly professionals) to adopt Internet banking applications in Malaysia and to discuss methods that could be implemented by the authorities to expedite the adoption of Internet banking in Malaysia.

The specific objectives of this study are:

- To analyse the influence and applicability of some of the factors (such as perceived usefulness, ease of use, trialability, compatibility, observability, perceived risk, incentives) known to influence the adoption of technology, electronic commerce and Internet banking in other countries (based on previous studies) within the Malaysian B2C Internet banking context;
- To analyse the effect of demographic factors such as sex, age, income and education level on the adoption of Internet banking among professionals in Malaysia;
- To gauge the impact of channel knowledge and facilitating conditions on the adoption of Internet banking among professionals in Malaysia; and
- To identify the sources of knowledge for Internet banking adopters in Malaysia and the Internet banking features that are important to users.

## **1.4 Scope of the Study**

This study shall focus on the views and concerns of local Internet users with regard to Internet banking from a communication perspective utilising Everett Rogers' (1995) diffusion of innovations theory, channel theory and relevant past studies (Technology acceptance model, decomposed theory of planned behaviour) on the adoption of new technology. In addition to that, this study shall be conducted on members of two professional bodies representing engineers and accountants in Malaysia. This is because members of these professional bodies can represent the main target of this study i.e. professionals who are believed to be the early adopters of innovations (Rogers 1995).

## **1.5 Significance of the Study**

Insights into the factors affecting the adoption of Internet banking applications can provide invaluable information to the banking sector to ensure the success of their Internet banking initiatives and future development plans. The outcome of this study could facilitate more informed decision-making by organisations that are involved in the provision of Internet banking applications and services to their customers. Furthermore, the areas of electronic commerce and Internet banking adoption have not been well researched in Malaysia.

As such, the next logical move at this stage would be to perform research in Malaysia, based on previous studies performed in other countries to further enhance the understanding of Internet banking adoption in Malaysia. The increasing number of articles or papers in both academic and practitioner journals indicate that it is timely to

evaluate the factors impacting the diffusion of Internet banking today. The following sections address both the theoretical and practical contributions expected from this study.

### **1.5.1 Contribution to theory**

The outcome of this research is expected to add to the existing knowledge in the adoption literature and bridge the knowledge gap that exists with regard to the adoption of Internet banking applications in Malaysia. Although many models of innovation adoption have been developed in the past, including Rogers' diffusion of innovations model, none of these models relate specifically to the adoption of Internet banking in Malaysia. Hence, contribution in terms of Internet banking adoption within the Malaysian context is expected. Furthermore, the output of this research will enhance and add to the depth of understanding of Internet banking and may provide a platform for future research in this area.

### **1.5.2 Contribution to practice**

In general, there is little research providing guidelines to practitioners and developers regarding the Internet banking adoption process. It is hoped that a theoretical contribution to existing frameworks within the Malaysian context can be developed to promote a better understanding of this field amongst users, practitioners, bank managers and government officials. In addendum, it is envisaged that the results emanating from this study would enable the generation of a set of guidelines that could assist the local banks in the promotion and implementation of Internet banking applications.



## **1.6 Structure and Organisation of Dissertation**

This Master of Arts (Communication) dissertation is structured as follows:

### **Chapter 2 Theoretical Framework**

This chapter provides a review of the literature surrounding electronic commerce in general and more specifically, Internet banking. It presents the main theory used to orientate the research and reviews other literature and models relevant to the study of Internet banking adoption. Based on the literature, relevant variables affecting Internet banking adoption are identified and presented in a conceptual framework for this research.

### **Chapter 3 Methodology**

This chapter identifies and describes the methodology used to explore the research problem and details the hypotheses to be evaluated. Data collection procedures and the operationalisation of the constructs identified in the literature review are presented.

### **Chapter 4 Data Analysis**

This chapter presents the results of the survey conducted and tests the hypotheses identified earlier with relevant statistical tests.

### **Chapter 5 Conclusion**

This chapter provides conclusions about the research problem identified for this study and summarises the findings of the survey with regard to the research questions and hypotheses that are formulated. Finally, suggestions for future research are discussed.

## 1.7 Summary

This chapter has provided a background of electronic commerce and the banking sector in Malaysia. The research problem for this study has been identified as 'What are the factors that affect the adoption of Internet banking applications by Malaysian professionals?'. In addition to that, it has also outlined the significance of this study on the adoption of Internet banking among professionals in Malaysia, justified by the potential contribution to both theory and practice. The final section of this chapter then presented an overview of the various chapters in this MA (Communication) dissertation.

The next chapter reviews the relevant literature on the diffusion of innovations, in particular the adoption of information communication technologies and Internet banking.

## Chapter 2      Theoretical Framework

This chapter provides an overview of the published literature relevant to the study of Internet banking adoption among professionals in Malaysia. Internet banking is still at its infancy in Malaysia and there is no model that has been specifically developed to explain its adoption and usage by Malaysian consumers. The ever-increasing importance of information technology in providing strategic and competitive advantage to organisations, especially with the uptake of electronic commerce in the new millennium has made it exigent that the factors or variables affecting its adoption and success be identified.

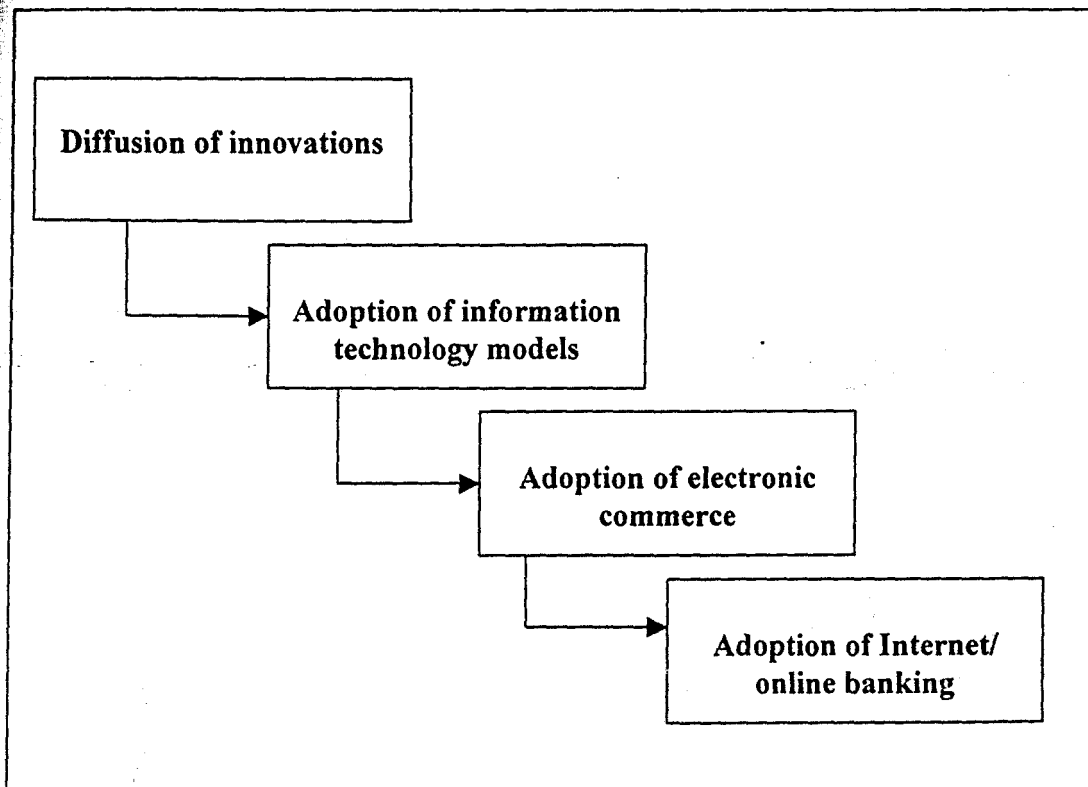
The adoption and success of Internet banking applications in Malaysia does not solely depend only a single success measure or dependent variable (DeLone & McLean 1992; Seddon 1997). Instead, many dependent variables which are inter-related and inter-dependent which can be broadly categorised into information quality, system quality, service quality, use, user satisfaction and net benefits come into play (DeLone & McLean 2002).

There are four areas of literature that are relevant to the adoption of Internet banking which are represented in Figure 2.1. The relevant literature provides invaluable insights to the factors, especially the variables that are believed to determine the success of information technology innovations and applications.

The first group of literature addresses the diffusion of innovations which provides insights into the rate at which a particular innovation is adopted and the characteristics of the innovation that can either facilitate or inhibit its adoption. The second group of literature specifically addresses the adoption of information technology based on the diffusion of innovations framework.

Next, relevant literature with regard to the diffusion of electronic commerce applications within various sectors is then presented, which is then followed by the final section that specifically focuses on the adoption of Internet banking technologies by individuals.

**Figure 2.1 Major categories of literature relevant to the study**



## 2.1 Diffusion of innovations

The diffusion of innovations theory (see Appendix A) describes the rate of adoption of innovations was posited by Everett Rogers in the 1960's. Since then, diffusion research has been applied and utilised in a wide array of research traditions including anthropology, rural sociology, education, communication and management (Rogers 1995). Rogers and other researchers have since completed many studies resulting in the refinement and modification of the original diffusion of innovations framework.

Rogers (1995, p. 10) defines diffusion as '... the process by which an **innovation** is **communicated** through certain **channels** over **time** among members of a **social system**'. Rogers (1995) stressed that the four main elements of diffusion research i.e. the innovation, communication channels, time and the social system are identifiable in every diffusion research study. In short, the term diffusion relates to the level of adoption of a particular innovation as a ratio of adopters to non-adopters in an industry (Coombs, Saviotti & Walsh 1993). The diffusion of an innovation will follow an S-curve shape over time and different innovations will have different rates of adoption resulting in the curve having different slopes depending on whether the curve has a sharp incline or not.

An innovation '... is an idea, practice, or object that is perceived as new to an individual or other unit of adoption' (such as the organisation) (Rogers 1995, p. 10). Bannock, Baxter and Rees (1984) describe an innovation as the introduction of new products or production processes during the discovery or devising of new products and processes.

The second element in the diffusion process is the communication channel which is the means by which messages are relayed and communicated from one individual to another resulting in some form of information exchange (Rogers 1995). The third element of the diffusion process is time that permits the identification of an innovation's rate of adoption by members of a social system (Rogers 1995). Rogers (1976, p. 300) argues that:

Time is an explicit element in all diffusion research. But the measurement of time is one of the most egregious methodological weakness of past diffusion inquiry due to over reliance on recall data.

Finally, the social system is defined by Rogers (1995, p. 23) as '... a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal'. Rogers (1995) also explained that the members of the social system may be composed of individuals, informal groups, organisations or subsystems.

One of crucial features of the diffusion of innovations theory is the identification of characteristics and features of innovations that help increase the rate of adoption. Rogers (1995) suggests that characteristics of innovations as perceived by individuals help persuade potential adopters to either accept or reject a particular innovation. These five characteristics of innovations identified by Rogers (1995, pp. 15-6) are:

- (i) Relative advantage – the degree to which an innovation is perceived as better than the idea it supersedes. Among the important factors are social prestige, convenience and satisfaction.

- (ii) Compatibility – the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and the needs of potential adopters. An idea that is compatible with the values and norms of a social system will be adopted more rapidly than an innovation that is incompatible.
- (iii) Complexity – the degree to which an innovation is perceived as difficult to understand and use. Innovations that are simpler to understand are adopted more rapidly than innovations that require the adopter to develop new skills and understandings.
- (iv) Trialability – the degree to which an innovation may be experimented on a limited basis. An innovation that is more trialable will be adopted more quickly as it represents less uncertainty to the individual considering it for adoption.
- (v) Observability – the degree to which the results of an innovation are visible to others. The easier it is for individuals to observe the results of an innovation, the more likely they are to adopt it.

Hence, Rogers (1995) concludes that innovations that are perceived by individuals as having greater relative advantage, compatibility, trialability, observability and less complexity will have a higher rate of adoption than other innovations. Studies by many researchers have indicated that these five characteristics of innovations and their sub-components are indeed the most important characteristics of innovations in explaining the rate of adoption (Rogers 1995).

Research on the adoption of innovations, in particular information communication technologies reveal that Rogers' five characteristics of innovations have a significant role in encouraging adoption (Cheah 1999; Ismail Hashim 2000; Lim 1999; Shanida Hanim 2000). Lim (1999, p. 72) discovered that an innovation's difficulty affected its adoption rate and yielded a Pearson's coefficient of  $-0.8$  at 0.01 level of significance, indicating a negative relationship between difficulty and adoption. Other attributes such as relative advantage (0.57), compatibility (0.69), trialability (0.25) and observability (0.39) indicate that there are indeed correlation between these variables and the adoption of personal computers by university undergraduates at Universiti Sains Malaysia at 0.01 level of significance (Lim 1999, pp. 70-4).

Apart from that, Tornatzky and Klein (1982) identified ten characteristics which have been most frequently addressed in the 105 articles they reviewed. These characteristics included the five characteristics identified by Rogers (1995), plus cost, communicability, divisibility, profitability and social approval. In their discussion, Tornatzky and Klein (1982) noted that communicability was closely related to observability, and divisibility with trialability.

Rogers and Shoemaker (1971) asserted that users go through a series of processes in knowledge, conviction, decision and confirmation before they are ready to adopt an innovation and this process actually begins once the user becomes aware of the product. Howard and Moore (1982), and Guiltinan and Donnelly (1983) also emphasised on the importance of awareness as an antecedent for the adoption of any innovation. As such, it is crucial for banks to ensure that there is adequate information regarding their



Internet banking initiatives are made available to bank customers to encourage adoption (Suganthi, Balachandher & Balachandran 2001).

According to Rogers (1995, p. 165), the innovation decision process involves the evaluation of an innovation by an individual with regard to the innovation's advantages and disadvantages as '... the individual would like to understand the evaluation and give meaning to it'. In essence, there are three types of knowledge that play a major role in the adoption process. Rogers (1995, p. 165) categorised these knowledge as 'awareness knowledge', 'how-to knowledge', and 'principles knowledge'.

Awareness knowledge is basically information about the existence of the innovation which will consequently motivate individuals to gather more how-to and principles knowledge (Rogers 1995). How-to knowledge is made up of information necessary to use an innovation correctly and is believed to affect the adoption of a particular adoption (Rogers 1995). Rogers (1995, p. 166) stressed that '... when an adequate level of how-to knowledge is obtained prior to the trial and adoption of an innovation, rejection and discontinuance are likely to result'.

Principles knowledge on the other hand consists of information dealing with the functioning principles underlying how the innovation functions and operate (Rogers 1995). Studies on a wide array of innovations ranging from the adoption of personal computers by teachers (Kazlauskas 1995), the adoption of the solar cooker by the *Bashoto* tribe in Lesotho (Grundy and Grundy 1994) to the use of birth control devices in Peru (Valente, Parades and Poppe 1998) prove that an individual's knowledge of the