M-commerce in Saudi Arabia
(Adoption and Acceptance)

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1 Declaration

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3 Abstract

Mobile commerce (m-commerce) uses wireless technology in mobile devices to allow consumers to sell and purchase information, commodities and services online. The Information and Communication Technology (ICT) market in Saudi Arabia leads the Middle East, and the whole Arab region, in terms of spending on infrastructure and projects. The total number of mobile device subscriptions equals almost 98% of the population in Saudi Arabia. The m-commerce features, economic benefits, opportunities and challenges are presented in this research, as well as the penetration of wireless computing. In order to obtain background knowledge of m-commerce, literature and statistics regarding m-commerce in Saudi Arabia and developed countries are introduced. The purpose of the research is to identify the factors that influence m-commerce acceptance and adoption for individuals in Saudi Arabia. Furthermore, quantitative methods are used to get the results. The Technology Acceptance Model (TAM) is used as a research model for this study. Many factors are taken into account, such as bandwidth quality, social influences, in considering its impact in terms of usefulness and perceived ease of use. The most significant factor influences m-commerce adoption is perceived usefulness. A high percentage of participants are willing to use m-commerce. Also, most of participants are not satisfied with the quality of Internet connection. Therefore, the Saudi government should put in place a strategic plan to achieve a new and high quality infrastructure.

4 Introduction

In the last decade, Information Technology (IT) has been evolving rapidly. IT has caused major changes in marketing, the provision of service to customers and competitive behaviour. Such transformation in IT related services allows businesses to increase the revenue of their companies. One magnificent transformation is the Internet. It introduces many services, such as electronic commerce (e-commerce), which make this mode of shopping easier than the traditional process.

The increased impact of e-commerce on the worldwide business environment has led to certain technology and application trends, which in turn have focused concentration on the wireless web and mobile computing. In addition, mobile and wireless devices are allowing organizations to conduct business more effectively (Nah et al, 2005). Mobile commerce (m-commerce) has the potential to become the next e-commerce revolution. It is quite different
from traditional e-commerce, based as it is on wireless technology rather than the Internet. It has features available only in the mobile environment. Moreover, more people now access the Internet through mobile phones or personal digital assistants (PDAs). M-commerce has huge potential in developed countries such as the UK and Japan. It also helps small and medium size companies gain potential customers (Andreou et al, 2002).

A study conducted in 2007 shows that the penetration of e-commerce by Saudi users reached 14.3%. The study indicates that e-commerce users are the most likely to adopt m-commerce services (Deans, 2004). M-commerce provides many opportunities in the business environment, such as allowing consumers to sell and make purchases anytime and anywhere. On the other hand, there are challenges facing this technology, such as health and security issues.

The research aim for this project is to determine m-commerce acceptance and adoption for individuals in Saudi Arabia.

4.1 Statement of the problem

E-commerce continues to deeply influence the global business environment. Technologies and applications are beginning to concentrate on mobile computing and the wireless web (Tarasewich et al., 2002). In addition, companies need to be able to reach as many customers as possible so they can to sell their services and goods via the Internet in order to increase their profit (Cook and Goette, 2004). Although Saudi Arabia is beginning with the development of the Internet and e-commerce, Saudi Arabia is only in its early stages of m-commerce development and adoption compared to other countries such as Japan and the United Kingdom.

This dissertation aims to find out the capability of Saudi people to adopt m-commerce technology by asking them many questions to explore their attitude towards using this technology. The questions contain various factors such as cost, privacy and security, social influence and the quality of Internet connection.

4.2 Aims and Objectives

This research is broken down into many sections to gain full comprehension. An overview of IT and its benefits in the business environment is provided, followed by statistics on IT in Saudi Arabia, with proof that the ICT market in Saudi Arabia is an excellent area for the
implementation of a new technologies.

The research will identify m-commerce and reveal its features, looking to understand the wireless technology environment. In addition, issues such as security and privacy will be introduced, and many views explored in order to find a good solution. Health concerns are considered a challenge for m-commerce, but many studies indicate that mobile phone technology does not affect the health of the public.

This research mentions a lot of m-commerce features, such as ubiquity and flexibility, in order to introduce the importance of adopting this service in Saudi Arabia. Furthermore, it establishes many factors, such as security and cost, which may prevent the successful implementation of m-commerce in Saudi Arabia.

It also looks to study and discover the effectiveness of m-commerce within the Saudi Arabian market in order to ensure that the implementation will be successful. Finally, many advices will be provided for adopting m-commerce in Saudi Arabia.
5 Literature review

This section has been divided into many topics in order to cover the subject. First, some background on IT will be provided, both globally and in Saudi Arabia. Second, there will be a discussion on the penetration of wireless technology, taking into consideration generational acceptance. Third, Internet commercial services, such as e-commerce and m-commerce, will be introduced and defined, drawing on different sources to show the distinctions between them. Fourth, the impact of m-commerce in Saudi Arabia, and in developed countries, will be studied, as well as the economic benefits. Finally, the literature will be discussed in order to obtain recommendations for the business environment in regards to the adoption of m-commerce in Saudi Arabia.

5.1 History of business connectivity

This section looks at IT both generally and in Saudi Arabia. In addition, an overview will be provided about the penetration of wireless computing, including a look at first, second and third generations. The fourth generation has just been developed, and has not yet been implemented in Saudi Arabia.

5.1.1 Information technology overview

It is difficult to define IT in a way that is acceptable to everyone involved. Domigan (1996) suggests that IT is a strategic resource that facilitates major changes in competitive behaviour, marketing and customer service. Rajaraman (2003) defines IT as something used to acquire, store, organize, and process data to a form which can be used in specified application and disseminate the processed data. The processing of data is central, which includes decision-making, the initiation of suitable action and knowledge improvement, in order to enhance work.

IT has been evolving rapidly over the last decades. Business managers are spending a huge amount of money on IT in order to increase investment in organizations (Tang, 2010). According to Notron (1995), they spend roughly 70 per cent of investments on IT. Furthermore, IT allows businesses to grow through the use of technology such as the Internet, which has been considered a revolutionary advancement in IT. The Internet introduces many services, such as e-mail, which have changed how people interact. In addition, every part of the cycles
of production, service and business are influenced by IT (Pintelon et al, 1999). The major key to successful marketing in many companies, large or small, is the implementation of IT.

Using IT increases the effectiveness of the organization and allows easy implementation of marketing functions, such as stock handling and product planning (Domegan, 1996). This is especially so in electronic commerce, as the Internet enables opportunities for buyers and sellers to interact. The competitive environment of the Internet creates opportunities for companies to reach new customers through their websites, providing new features to attract or satisfy them. Furthermore, fewer transactions and reduced costs are benefits for firms doing business online. For example, electronic airline tickets allow customers to save on the cost of printing documentation and decrease the number of staff needed by the company to receive customer reservations by phone (Chan, 2000).

5.1.2 Information technology in Saudi Arabia

Referring to recent research, conducted in 2009 by the Communication and Information Technology Commission, the adoption of IT in Saudi Arabia came between the late 1990s and early 2000s, as this period witnessed unprecedented growth. Over the past decade, Saudi Arabia has undergone strong economic diffusion. Between 2001 and 2009, the Saudi government, as well as businesses and households, have spent extensively on IT products and services. In 2009, $6 billion was spent on the IT sector. In the Middle East, Saudi Arabia is the largest market for IT, and the highest spender. Even during the economic crisis of 2008 and 2009 the growth of IT spending was continuous. According to the latest World Bank rankings, Saudi Arabia has the most competitive market in the Middle East. ICT Market spending grew 17% in 2010. The local IT market expects that spending on IT will reach roughly $9.8 billion, which is equivalent to 6.17 billion, in 2013, with most of this spending expected to be on hardware and IT services (Gitex report, 2011).

5.1.3 Penetration of wireless computing

A few years ago wireless technology was considered a new technology, but it is now located everywhere. Mobile technology has complex functionality and impacts the lifestyle of consumers (Sheikh, 2006). Chen and Zhang (2004) confirm that wireless communication has become increasingly important in communication, technology and computer science.

Du and Swamy (2009) indicate that James Clerk Maxwell formulated the mathematical
theory of electronic waves in 1873, and Guglielmo Marconi was the first to use wireless communication in 1895, transmitting the three-dot Morse code for the letter S. In addition, he could transfer the code over a distance of three kilometres using electronic waves (Gans et al., 2000). In 1896, he used radio-wave single communication to contact ships sailing off the coast of the United Kingdom. Now, mobile wireless communication has been developed, with the first generation (1G) appearing in 1980, using analogue technologies, and the current third generation (3G) using digital technology (Elliott and Phillips, 2004).

5.1.3.1 First Generation

1G wireless communication devices developed slowly. They were used in special places or certain environments, such as in military and government agencies. As a result, the first commercial mobile phone was introduced to the USA, by AT&T Bell in 1946 (Dasgupta, 2009; Elliott and Phillips, 2004), in particular for military applications. However, there were few users in the business system because of the poor quality. Later, in 1970, AT&T Bell developed the Improved Mobile Telephone Services (IMTS) to be the essential element in the commercial sectors mobile communication (Dasgupta, 2009; Elliott and Phillips, 2004). In 1970 the microprocessor was invented, and the link between the cell site (Base Transceiver Station) and the mobile phone was controlled (Dasgupta, 2009). In 1980, wireless mobile phones, and various telecommunication companies, were born. These companies, such as Nokia in Finland, Motorola in the USA and Ericsson in Sweden, are now the most influential in the m-commerce world (Elliott and Phillips, 2004).

5.1.3.2 Second Generation

Between 1980 and 1990 wireless telecommunications grew in popularity. There were many problems with the 1G devices, such as low network capacity and the weakness of security, and this led to the development of the 2G. The 2G wireless systems were based on digital technology. The 2G had a higher network capacity, known as the Global System for Mobile Communication (GSM). In modern mobile commerce, the GSM is a very important network because it has a completed network architecture (Elliott and Phillips, 2004). Further research (Dasgupta, 2009) led to major developments in the new system, leading to improved quality in 2G devices. At the same time, costs were lower for consumers because of the high capacity. Elliott and Phillips (2004), in their recent book, found that 2G mobile phones were useful
and improved the business market. It could receive and send a text message, through a short message service (SMS), to other mobile phones, and it could browse the Internet through the Wireless Application Protocol (WAP).

5.1.3.3 Third Generation

The main purpose for developing 3G technology was to provide services with voice communication, for example the transfer of multimedia data, video streaming and swift access to the Internet. The motivation for 3G was the transfer of economic cost models from the e-commerce domain to the m-commerce domain by providing technology-enhanced PCS portals that were economically viable. The first country to use 3G technology was Japan, in 2001, and it spread to Europe and the USA in 2002 (Elliott and Phillips, 2004). Business lifestyle changed, as 3G offered services that made business easier, such as voice, fax and faster Internet. The services could be used anywhere and anytime with seamless global roaming, and provided opportunities for innovation (Dasgupta, 2009). Consequently, in 2007, worldwide mobile phone subscriptions increased to 3.3 billion, and roughly 800 million people accessed the Internet using mobile phones for many services, such as e-mail and online games (DU and Swamy, 2009).

According to the IT report (2009), Saudi Arabia’s infrastructure supports 3G for both individuals and the business environment.

5.2 Internet commercial services

The Internet has influenced marketing in different ways. A lot of companies have found that the Internet helps create a successful business environment because it provides an effective way to introduce services and products (Herbig and Hale, 1997). In addition, many commercial services exist on the Internet, such as online banking and media, as well as e-commerce and m-commerce technologies. E-commerce is continuously impacting the global business environment, and it is now beginning to focus on mobile computing and the use of wireless technology to access the Internet (Tarasewich et al, 2002). Therefore, in order to understand m-commerce, it is important to first understand e-commerce.
5.2.1 Definitions of e-commerce

E-commerce users are the most likely to adopt m-commerce services (Deans, 2004). Kalakota and Whinston (1997) showed there are many definitions of e-commerce, relying on different perspectives, such as business process and communications perspectives. However, all of the definitions are acceptable.

E-commerce from a communication perspective relates to the use of telephones or computer networks to implement payment processes and deliver information, services and products. From a service perspective, it is a tool that reduces the cost of services and takes into account consumer satisfaction, the quality of goods and fast delivery. From a business perspective, it is the automatic application of business transactions and workflow. From an online perspective, it allows people to sell and purchase goods and information through online services (Kalakota and Whinston, 1997). Qin (2009), however, found that the largest organisations, such as IBM, HP and ISO, have their own definitions of e-commerce. For instance, the International Organization for Standardization (ISO) defined e-commerce as something that exchanges information between the enterprise and customers, or inside the enterprise. Furthermore, Timmers (1999) extended the ISO definition and included the provision of services, such as sales support.

A good definition of e-commerce comes from Cook and Goette (2006), who suggest it is the carrying out of business activities that lead to an exchange of value, where the parties interact electronically, using network or telecommunication technologies.

5.2.2 Defining m-commerce

In recent years, mobile devices have become powerful and popular, and can be used for various applications, for example in mobile navigation systems. Deans (2004) confirms that mobile commerce and wireless networks will most likely be used for browsing the World Wide Web to access data and information.

Mobile commerce is occasionally referred to as mobile e-commerce or m-commerce. The definition of m-commerce is clear. Tarasewich (2002) defined it as the activities relating to a (potential) commercial transaction conducted through communications networks that interface with wireless (or mobile) devices, such as mobile devices or PDAs (Tarasewich, 2002). In addition, according to Sadeh (2002) and Wei and Ozok (2005), m-commerce can be defined as any transaction with a monetary value that is conducted via a mobile telecommunications network that allows for freedom of movement for the end user.
5.2.3 M-commerce features

Keng et al (2001) and Turban et al (2005) find that the major features of m-commerce are only possible in the mobile environment, which indicates an opportunity for new application development.

**Ubiquity:** users are able to employ mobile devices for business purposes anywhere and at any time. Furthermore, services and applications are available just as freely (Keng et al, 2001; Turban et al, 2005). Examples of m-commerce applications are Stock prices and Weather (which let consumers to check weather situation from anywhere and anytime). (Andreou et al, 2002).

**Customisation:** users can customise information and send it to other consumers as an SMS (Turban et al, 2005).

**Personalisation:** there is a huge amount of information, as well as services and applications, on the Internet, and m-commerce allows owners of mobile devices to set up special services or applications in suitable ways (Keng et al, 2001). Andreou et al (2002) suggest that advertising and auctions are a good example of such m-commerce applications.

**Mobility:** users can conduct business anytime and anywhere (Nah et al, 2005).

**Flexibility:** mobile devices are portable. Mobile users can make transactions or receive data when travelling, through Internet-enabled mobile devices (Keng et al, 2001; Nah et al, 2005). Flexible features allowing banking or the purchase of goods are examples of m-commerce applications (Andreou et al, 2002).

**Dissemination:** most geographical regions have wireless technology. Therefore, mobile users are more likely to transfer data via the Internet (Keng et al, 2001; Nah et al, 2005).

5.2.4 Differences between e-commerce and m-commerce

There are not many differences between e-commerce and m-commerce in terms of concept. Andreou (2002) found that m-commerce users are probably less patient, and need to develop the services more than e-commerce users. Also, Elliott and Phillips (2004) indicate that all of them make use of commercial opportunities via electronic technology. E-commerce uses Internet access to transfer data and information via computer technology, and while m-commerce is also interested in access to the Internet, the transfer of data and information is through wireless technology and portable devices, such as PDAs. E-commerce consumers are stationary, while m-commerce consumers are mobile. Indeed, many people think that m-commerce
refers to mobile e-commerce. However, there are major differences between m-commerce and e-commerce. For instance, m-commerce provides location-based services. Furthermore, there are many factors constraining a mobile Internet, such as screen size and the limitation of memory. The following table will illustrate the comparative differences between e-commerce and m-commerce.

<table>
<thead>
<tr>
<th>Factor</th>
<th>E-commerce</th>
<th>M-commerce</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product or service focus</td>
<td>Product focus</td>
<td>Service focus</td>
</tr>
<tr>
<td>Product or service provision</td>
<td>Wired global access</td>
<td>Wireless global access</td>
</tr>
<tr>
<td>Product or service assets</td>
<td>Static information and data</td>
<td>Dynamic location-based data</td>
</tr>
<tr>
<td>Product or service attraction</td>
<td>Fixed non-time-constrained access</td>
<td>Mobility and portability of access</td>
</tr>
</tbody>
</table>

Table 3: Differences between e-commerce and m-commerce (Elliott and Phillips, 2004) pp.20

5.2.5 E-commerce and m-commerce in Saudi Arabia

The number of Internet users in Saudi Arabia grew from 1 million SR in 2001 to 9.8 million SR in 2009, a number equivalent to 38.5% of the population. The number of broadband subscriptions increased to 2.75 million. Most of the growth in 2009 was contributed by wireless broadband, especially mobile broadband. The percentage of individuals with mobile phone devices reached 98% of the population in 2009. The number of subscriptions in 2001 was at approximately 2.5 million when the Communication and Information Technology Commission (CITC) was established. In 2009 subscriptions grew to around 44.8 million.

One of the great things introduced by the Internet is e-commerce. The Saudi e-commerce market is the central market in the Islamic World, as Saudi Arabia has the largest economy in the Middle East and virtually no direct taxes. It has a high annual population growth rate of 3.4%, and Saudi society provides a wide consumer base for commerce and technology driven initiatives. E-commerce has provided a major advantage and a significant area of competition (Al-Tawil et al, 2004).

A study conducted in 2007 shows that Saudi users penetration of e-commerce reached 14.3%. A growing number of Saudi Arabian businesses are interested in e-commerce and mobile business-to-business (B2B) and business-to-consumer (B2C) applications. Many local banks, such as the Saudi Fransi Bank, offer Internet banking services and online brokerage services for the U.S. stock market (Djeflat, 2009). According to the Arab Advisors Group (2011),
Saudi Arabia’s Internet users, around 39% of adults, buy products and pay for services online. These e-commerce users have spent an estimated $3 billion on products and services through e-commerce transactions in 2010. Around 48.36% of Internet users in Saudi Arabia bought services or goods via the global network or mobile phones.

In terms of m-commerce, Saudi Arabia is beginning a growth phase. There is a huge opportunity for brands to reach and connect to consumers on a personal level. In terms of the infrastructure, it has been improved in order to be suitable for 3G connections, which allows competition between telecommunications companies. Currently, m-commerce in Saudi Arabia emphasizes SMS and MMS messaging, which are plentiful in the marketplace. Companies are using SMS and MMS marketing as a way to make the organization more visible, and to offer discounts and alerts. However, the Saudi market has not seen mobiles used as part of an integrated solution to build brands. Generally, the companies send SMS messages randomly via Internet servers, and consumers thus receive many mobile advertisements every day, which can be upsetting. As a result of the volume of messages, changing public perception is the primary challenge for marketers. On the negative side, many mobile marketers still use bulk SMS or MMS messaging to contact their consumers without identifying a target group, such as students or a specific gender. Also, messages were sent to recipients without accurate data. Marketers must implement new technology in order to use modern mobile marketing tools and applications.

When these challenges regarding service and development are met, m-commerce will provide significant marketing opportunities in Saudi Arabia. The Saudi nation is willing to embrace modern technology and methods of communication, such as the iPhone and BlackBerry (Henoud, 2010).

However, m-commerce has yet to be integrated into most enterprises. Several companies in Saudi Arabia have websites, which they have been using to provide information about the company and how to contact them. However, few organisations have implemented e-commerce or m-commerce to serve and satisfy their customers. Despite significant investment in ICT, only two organizations in the country have started to use m-commerce applications. The Saudi Telecommunications Company (STC) launched an application for a service directory to provide customer satisfaction, but it still does not provide anything in the commercial field, such as for paying bills (STC, 2011). Also, the Ministry of higher education (MOHE) has its own application, which lets students follow-up with them and make requests or enquiries (MOHE,
5.3 Expansion of m-commerce

Recent research (BBC, 2010) shows that the number of people using mobile phone connections has increased to roughly five billion, with a prediction that it will reach approximately six billion by 2012. One of the analysts confirms that it is "the most prolific consumer device on the planet". M-commerce has many services, such as mobile banking and mobile retail, and according to several studies, m-commerce is experiencing rapid growth (Choi et al., 2002). In 2010, m-commerce transactions continued to increase, and the global revenue from mobile ticketing and mobile retail reached $72 billion. Also, mobile payment revenues are predicted to reach $30 billion by 2014 (Ghezzi et al., 2010). In addition, m-commerce is going to bring about a change in the way users purchase products and services (Clarke, 2008).

5.4 M-commerce in developed countries

In a short period of time, m-commerce has experienced rapid growth in developed countries. For example, consumer purchases in the United States (US), using mobile shopping, grew from around $396.3 million in 2008 to $1.4 billion in 2009. Travel was the most popular purchase in the US, representing 31%, and then computer and electronic equipment, which represented 20% (ABI Research, 2011). In 2009 the most popular m-commerce application in France (for 30% of the population) was Train or Plane Tickets. Mobile shopping has been adopted in Japan for many years, and it is responsible for around 17% of all e-commerce sales (Howe, 2010). In addition, m-commerce does not necessarily have to be used only in trade, as it can be used for other important aspects of life. Referring to Harris et al. (2005), the UK registered one of the largest single uses of m-commerce when mobile phone subscribers donated over 1 million, via SMS, to support relief projects after the 2004 Asian tsunami.

5.5 M-commerce challenges and opportunities

M-commerce is becoming more attractive to individuals and business organisations. It creates several opportunities for players in the field, such as Mobile Network Operators or Content and Service providers (Tsagalatidou et al., 2000). One of the capabilities of m-commerce is the ability to allow consumers to make purchases different locations. Consumers can conduct transactions
and obtain information from different places, which is part of m-commerces high value. For example, the provision of value-added services to customers that were previously difficult to reach means that m-commerce offers huge opportunities for expanding a client-base. Also, the loyalty of consumers might be increased by making services more appropriate (Clarke, 2008).

On the other hand, m-commerce faces challenges, such as the lack of ubiquitous, wireless network areas, technical differences among wireless devices, privacy and security. The capacity of bandwidth is still not ideal for m-commerce and other services, such as e-commerce and cloud computing (Gould et al., 2006). Some of the key challenges are discussed below.

5.5.1 Privacy and security issues

Today, privacy and security are a major concern for electronic technologies. M-commerce shares security concerns with other technologies in the field. Privacy concerns have been found, revealing a lack of trust in a variety of contexts, including commerce, electronic health records, e-recruitment technology and social networking, and this has directly influenced users (Zhou, 2011).

Qin (2009) states that billions of mobile devices are accessing the Internet without security mechanisms. M-commerce depends on wireless technology, which presents a higher risk from hackers (Gould et al., 2006). Schwiderski and Knospe (2002) suggest there are many different views regarding m-commerce security challenges.

**Mobile device:** It contains private and sensitive information. It can be easily stolen or misplaced, allowing unauthorised persons access to this data (Nah et al., 2005). In addition, security is a concern with m-commerce, especially with financial transactions (Sheikh, 2006).

**Radio interface:** According to Schwiderski and Knospe (2002), protected data transformation, in terms of confidentiality, integrity and authenticity, is required when accessing a telecommunications network. In particular, protecting important data is vital, such as personal information and bank accounts.

**M-commerce application:** To provide consumer satisfaction, a business should secure m-commerce applications, especially those involving payment. For instance, before carrying out the payment process, both businesses and customers prefer to authenticate each other (Schwiderski and Knospe, 2002).

In Saudi Arabia, and many other countries, fines are implemented for any company that shares consumer information. Keeping data safe is an important part of the process (IT report,
5.5.2 Health issues

Individuals and businesses still have concerns about using wireless technologies. The UK and Japan have done a lot of research on this issue. Gould et al (2006) found that most evidence confirms that mobile phone technology does not affect the health of the public. Nevertheless, many governments are obligating manufacturers of mobile phone devices to publish health proof (Elliott and Phillips, 2004). According to the Federal Communications Commission (FCC), some studies indicate that wireless devices might influence pacemakers (FCC, 2010).

5.5.3 Cost

Accessing the Internet through mobile wireless devices is still more costly than wired Internet access via a personal computer or laptop. The speed of transforming data using 2G wireless technologies is limited. Also, some 3G wireless technologies and devices have not been able to transfer data swiftly (Elliott and Phillips, 2004).

5.5.4 Limited area

Efficient and speedy wireless telecommunication services exist in specific regions, such as the US and Japan. This service does not support geographical areas with limited populations, such as desert areas. Because of a lack of infrastructure, many developing countries prefer to adopt wireless telecommunication, which includes satellite communication phones, instead of wired telecommunication (Elliott and Phillips, 2004).
5.6 Economic benefits of m-commerce

Increasing the value of goods and services influences the economic growth of a nation or entity. There are many related factors that influence this, such as technology and population growth.

Technology and its services play an important role in this era. The growth in the volume of mobile phone devices in many developing countries opens new opportunities for developing the global economy, with services such as e-commerce exploiting the spread of personal computers (PC) in order to increase an organisation’s revenue. M-commerce continues to change the business world by introducing new business models. It offers exclusive benefits, for example data portability, immediacy and connectivity (Howe, 2010).

The forecasts for world mobile transactions indicate unprecedented growth, with transactions predicted to rise from $162 billion in 2010 to around $984 billion in 2014 (Yankee Group, 2010). However, Yankee Groups survey shows that less than 10 percent of consumers would be willing to pay extra for mobile transaction services, such as mobile banking and mobile payments. Research by ABI predicts that by 2015 consumers will be spending $119 billion on goods and services via mobile phones, which will represent roughly 8% of total e-commerce sales (Deatsch, 2011).
5.7 The theoretical framework

5.7.1 The acceptance of information technology

Since the 1980s, roughly 50 per cent of all new capital investment in organisations was in information technology. Modern information system (IS) literature explains user acceptance of new technology (Venkatesh et al., 2003) and user acceptance of technology is an important area of study (Chuttur, 2009). Venkatesh et al., (2003) confirm that there are many studies about why and how individuals adopt new information technologies. Some of them focus on individual acceptance of technology by using intention or usage as a dependent variable. The basic conceptual framework explains individual acceptance information technology as seen in figure 1.

![Figure 1: The user acceptance model (Venkatesh et al., 2003)](image)

Many studies depend on this model to reveal the acceptance and adoption of information technology advances, for example, wireless internet by Liu et al., (2008) mobile commerce by Zhengchuan (2008), and online electronic payments by Askounis and Rigopoulos (2007).

Several models expand the basic concept of user acceptance such as the theory of reasoned action (TRA), the technology acceptance model (TAM), the motivational model (MM) and the unified theory of acceptance and use of technology (UTAUT). They all rely on the TAM model developed by Venkatesh et al., (2003).
5.7.2 Technology acceptance model (TAM)

TAM offers a powerful and robust explanation for user acceptance and usage behaviour. The TAM model posits that behavioural intention determines computer usage to use a system, where individual attitude toward using the system and perceptions of its usefulness determines system usage intention.

Al-Somali et al., (2009) confirmed that attitude toward acceptance of a new information system (IS) plays an important part in its success. Attitude directly affects the intention to use technology (Bertrand and Bouchard, 2008). TAM suggests that two key beliefs determine user acceptance, and they are perceived ease of use and perceived usefulness.

![Technology Acceptance Model](image)

**Figure 2:** Technology Acceptance Model

5.8 Discussion issues: professional, legal and ethical

Obtaining results for this research relies on a web-survey and questionnaire. It will take into consideration many issues, such as professional, legal and ethical issues. First, in terms of professional issues, professional competence in areas such as privacy, integrity and security should be looked at, implementing internationals, which provide guidance on computer-related matters of quality and safety. Second, Legal issues will take into account contract law, data protection law and computer misuse law. Finally, Ethical issues will deal with the protection of privacy and a good identify of stakeholder analysis such as person, group and organisation.
6 Research model and hypotheses

The research model is shown in figure 3. This study proposes its own model that is extended from TAM by Venkatesh et al. (2003). It focuses on attitude toward, and therefore attitude toward is adopted to measure the decision on whether to accept and adopt m-commerce. Yang (2005) mentioned that researchers have extended TAM by the integration of external variables. These variables include prior use and experience (Venkatesh and Morris, 2000), privacy and security (Pikkarainen et al., 2004), cost (Cao et al., 2009; Khalifa and Shen, 2008) and Internet connection quality (Al-Somali, 2009; Zahid et al., 2010) and others.

6.1 Perceived usefulness

TAM proposes that perceived usefulness is a major factor in the acceptance of an information system. Perceived usefulness is the degree to which a person believes that using a particular system would enhance his/her job performance (Venkatesh and Morris, 2000). A study was conducted by Pikkarainen et al., (2004) to determine consumer acceptance of online banking. They showed that perceived usefulness is one of the factors that has most influenced online banking use. By applying this factor to the m-commerce context, the following hypothesis is proposed:

H1: Perceived usefulness has a significant influence on adopting m-commerce in Saudi Arabia.

6.2 Perceived ease of use

According to TAM, perceived ease of use (PEOU) is a major factor that affects acceptance of information systems (Davis et al., 1989). PEOU is defined as the degree to which a person believes that using a technology will be free from effort (Venkatesh et al., 2003). By applying this factor to the m-commerce context, the following hypothesis is proposed:

H2: Perceived ease of use has a significant impact on adopting m-commerce in Saudi Arabia.
6.3 Attitude toward use

Attitude toward use is an individual's positive or negative feelings about performing the target (Venkatesh et al., 2003). Davis finds that a user's attitude toward using a specific information technology or application is a major factor determining whether an individual uses that system. In this research, users' perceived usefulness (PU) and perceived-ease-of-use (PEOU) and two other factors, privacy and security, and cost determine a user's attitude toward use. By applying this factor to the m-commerce context, the following hypothesis is proposed:

H3: The attitude toward using m-commerce has a positive impact on the behavioral intention to adopt m-commerce technology.

6.4 Cost

Cost is identified in many studies as an important factor for the adoption of e-commerce. In m-commerce, the cost includes the subscription fees, such as wireless application protocol (WAP) fees (Khalifa and Shen, 2008), equipment costs and transaction fees (Cao et al., 2009). Islam et al., (2001) confirm that cost is a major factor on the acceptance of mobile service. According to Bertrand and Bouchard (2008), the cost was a perceived variable, which affected the intention to use a system. In a study by Khalifa and Shen (2008), the cost influences the perceived usefulness of m-commerce (Mallat et al., 2008). This study uses the cost as a factor that influences attitude toward use of m-commerce. The following hypothesis is proposed:

H4: There is a significant relationship between cost and m-commerce adoption in Saudi Arabia.

6.5 Privacy and security

Privacy and security are important issues in technology, particularly with e-commerce, cloud computing, and m-commerce. Privacy concerns always increase when new information technologies, such as WAP-enabled mobile technology enhance capabilities for use, storage, and communication of personal details (Liu et al., 2008). According to Dewan and Chen (2005),
a wireless trust environment consists of security and privacy. In m-commerce, a study showed that trust is critical because financial transactions contain important information. Users of m-commerce want to know that their information is secure and safe. Referring to Islam et al., (2011) found that security influences consumer acceptance of a technology. There are many attributes that affect the adoption of mobile payments in United States, for example, slow m-commerce diffusion, security and privacy concerns (Dewan and Chen, 2005). The following hypothesis is proposed:

H5: There is a significant relationship between privacy and security and m-commerce adoption in Saudi Arabia.

6.6 Social influence

Venkatesh et al., (2003) defined social influence as the degree to which an individual perceives that important others believe he or she should use the new system. Social influence plays a major role in determining the acceptance and usage behaviour of adopters of new technology (Venkatesh and Morris, 2000). Molina et al., (2008) confirm that social influence has an indirect impact on their intention to adopt m-commerce. In their study, they found that social influence affects attitude toward mobile innovations. The following hypothesis is proposed:

H6: There is a significant relationship between quality of Internet connection and m-commerce adoption in Saudi Arabia.

6.7 Quality of the Internet connection

Internet connection quality is a vital component for any Internet-based application. In Saudi Arabia, the Internet was introduced in 1994 and it was used in state academic, medical and research institutions. In 1999, the public got access to the Internet and it was, and remains controlled by the government of Saudi Arabia. The Internet connection is limited because the King Abdulaziz City for Science and Technology (KACST) created firewalls to prevent users from accessing any websites that are against Saudi Internet policies, especially those relating
to religion, behaviour and culture.

In prior research, Internet connection quality has had a major impact on the usage of online banking acceptance, such as consumer acceptance of online banking (Pikkarainen et al., 2004). According to Zahid et al. (2010), Internet connection quality is one of the factors affecting the adoption of online banking. A poor quality Internet connection delayed e-commerce adoption in Pakistan (Aslam, 2001). The following hypothesis is proposed:

H7: There is a significant relationship between the quality of the Internet connection and m-commerce adoption in Saudi Arabia.

**Figure 3:** The research model for studying the adoption of m-commerce.
7 Summary of hypotheses

<table>
<thead>
<tr>
<th>Hypothesis Number</th>
<th>Hypothesis Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Perceived usefulness has a significant impact on attitude towards adopting m-commerce in Saudi Arabia.</td>
</tr>
<tr>
<td>H2</td>
<td>Perceived ease of use has a significant impact on adopting m-commerce in Saudi Arabia.</td>
</tr>
<tr>
<td>H3</td>
<td>The attitude towards using m-commerce has a positive impact on the behavioural intention to adopt m-commerce technology in Saudi Arabia.</td>
</tr>
<tr>
<td>H4</td>
<td>Cost has a significant impact on attitude towards adopting m-commerce in Saudi Arabia.</td>
</tr>
<tr>
<td>H5</td>
<td>Privacy and security have a significant impact on attitude towards adopting m-commerce in Saudi Arabia.</td>
</tr>
<tr>
<td>H6</td>
<td>Quality of Internet has a positive impact on the perceived ease of use of adopting m-commerce in Saudi Arabia.</td>
</tr>
<tr>
<td>H7</td>
<td>Social influence has a positive influence on perceived usefulness to adopt m-commerce in Saudi Arabia.</td>
</tr>
</tbody>
</table>

Table 2: Summary of hypotheses
8 Research methodology

This research uses survey methodology to test research hypotheses and the proposed model. A theoretically grounded questionnaire was developed to call for responses from Saudi Arabian consumers about their perception of m-commerce technology. The following sections describe the questionnaire, data collection, validity and reliability, research purpose, research approach and research strategy.

8.1 Research purpose

The aim of academic research can be explanatory, descriptive and exploratory. Referring to Yin (2009), an exploratory research design attempts to define the hypotheses and the research questions precisely. Descriptive research design describes different characteristics of a phenomenon. The explanatory research design can be used to investigate phenomenon with the aim being to develop suggestive ideas. This design attempts to clarify the course of events and relate how things happened (Yin, 2009).

The aim for this study is to reveal the factors influencing adoption and acceptance of m-commerce technology. The study is an exploratory study.

8.2 Research approach

Quantitative and qualitative methods are two of the main research methods when conducting research in the social sciences (Yin, 2009). According to Kumar (1999), three criteria determine whether to classify the study as quantitative or qualitative: the study, how the variables are measured and how the information is analysed.

According to Golafshani (2003), the quantitative approach suits researchers who use experimental methods and quantitative approach measures to test hypothetical generalizations. Researchers also emphasize the measurement and analysis of causal relationships between variables.

The qualitative research approach uses a naturalistic approach that seeks to understand phenomena in context-specific settings, such as a real world setting [where] the researcher does not attempt to manipulate the phenomenon of interest (Golafshani, 2003). There are many ways of implementing it, such as find out the different opinions people have about an issue (Kumar, 1999).
In contrast, the quantitative research approach relies on numbers and statistics that are presented in figures. The results of the qualitative research approach are based on describing an event or observed situation with words. Thus, the qualitative approach is the most suitable for this study.

8.3 Research strategy

When conducting empirical data collection, there are many possible approaches. As seen in figure 4, Yin (2009) found that there are many research questions the researcher can choose between, such as a survey, experiment, history, case study and an analysis of archival records.

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Form of research question</th>
<th>Requires control over behavioral event</th>
<th>Focus on contemporary events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>How, Why</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>History</td>
<td>How, Why</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Case Study</td>
<td>How, Why</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Archival Analysis</td>
<td>Who, What, Where, How many, How much</td>
<td>No</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Survey</td>
<td>Who, What, Where, How many, How much</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 3: Research strategy (Source: (Yin, 2009))

This study explores the factors that influence adoption and acceptance of m-commerce technology, based on respondent views. Kasunic (2005) defined a survey as a data gathering by questionnaire and analysis approach in which respondents answer questions or respond to statements that were developed in advance. This study contains questions formed of “what”, and referring to Yin (2009), the relevant approach is a survey.
8.4 Data collection

This study uses qualitative data collection tools. Data collection consists of a survey. A survey instrument to measure attitudes and beliefs regarding professional roles and responsibilities will be administered to a broad spectrum of participants. Little and Bouffard (2004) defined data collection as a strategy and system used to gather information on participants, programs, and other elements of the evaluation.

A questionnaire was used to collect empirical data for this study to test the hypotheses regarding the factors that influence the adoption and acceptance of m-commerce technology in Saudi Arabia. A pilot study was conducted with the revised questionnaire to ensure that the questionnaire was appropriate and the statements were clear.

8.4.1 Primary data

The primary data were collected through a web survey distributed among 509 participants from Saudi Arabia. Two weeks were spent collecting the data. About 67 messages have been sent by email to my friend, lectures and doctors. The lectures and doctors were from King Saud University. Also, lectures and doctors were used to distribute the survey to their students. The email contained four sections: identifying m-commerce with an example to make it clear; the research objectives; the web survey link; and the participation request. The results of the primary data are discussed in the results chapter below.

8.4.2 Secondary data

The secondary data are the information which has been published for some purpose by researchers in books and academic papers to analyse and assess the field on which the project is focused, with a view to using this to solve problems, explore issues and ultimately make recommendations (Crowther and Lancaster, 2005). This study used these data and explained them in the literature review section. This study also depended on unpublished reports, which were integrated in various documents analysing the ICT sector in Saudi Arabia. In addition, the Internet was used to collect data from different sites concentrating on surveys and journals to explore m-commerce globally.
8.5 Questionnaire

The questionnaire contains two sections. The first section gathers demographic information such as age, gender, education level and occupational status. The second section asks about respondent attitudes regarding adoption and acceptance of m-commerce technology. A five-point Likert scale was used for statements and ranged from 1 for strongly agree, to 5 for strongly disagree. This scale was used in previous TAM-related research such as Pikkarainen et al., 2004.

8.6 Validity and reliability

The use of reliability and validity are familiar in quantitative research and now it is reconsidered in the qualitative research paradigm. Validity and reliability use to reduce the risk of obtaining incorrect answers from survey (Golafshani, 2003).

8.6.1 Validity

Validity refers to what the ways and data extent to receive and ensure that data are real and accuracy. Joppe (2000) explained validity as whether the research truly measures that which it was intended to measure or how truthful the research results are (Golafshani, 2003). It concerns the degree to which a question measures (Siniscalco and Auriat, 2005). This thesis used a pilot study to ensure that all the questionnaire statements were understandable. A pilot study is defined as an experimental, exploratory, test, preliminary, trial investigation. Conducting a pilot study for the main study can improve the probability of success of the main study and avoid errors (Thabane et al., 2010; Yin, 2009). A pilot study was conducted in many places such as the doctor in the university, employees and some online banking users who have used a credit or debit card to buy online.

8.6.2 Reliability

Joppe (2000) defines reliability as the extent to which results are consistent over time; an accurate representation of the total population under study is called reliability and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered reliable. Reliability concerns the measure of consistency (Golafshani, 2003). The
aim of reliability is to reduce the errors and biases in a study. This study uses Cronbachs Alpha to measure the reliability of the questionnaire.

Cronbachs Alpha reliability coefficients were used in this study to ensure that measures of factors are reliable. After analysing the data, all reliability measures were well above the recommended level of 0.70, which revealed that the reliability of factors was adequate for internal consistency (Yang, 2005; Rigopoulos and Askounis, 2007; Mallat et al., 2008).

These alphas were 0.918, 0.869, 0.918, 0.938, 0.814, 0.908, 1.00 and 0.835 for perceived usefulness, perceived ease of use, attitude towards, behavioural intention, quality of Internet connection, security and privacy, cost and social influence respectively.
9 Results Analysis

This chapter presents and statistically analyses the data, which were collected through the survey. It contains three levels. The first level of the analysis describes the survey categories; the second level involves descriptive statistics; and the third level involves test hypotheses.

9.1 Web Survey development

The aim of developing a survey is to capture all the information that serves this investigation to meet its objectives. This survey contains two sections:

First section:
A) Six demographics questions on the subjects personal information, the availability of WAP (Wireless Application Protocol) and m-commerce usage.

Second section:
B) Two questions on attitude and opinions towards using new technology.
C) Two questions on the quality of Internet connection concentrating on capability and technical concerns.
D) Two questions on security and privacy concerns.
E) One question comparing the cost factor with other technologies in the same field.
F) Nine questions revealing the precision of Saudi people towards using m-commerce, covering adoption behaviour.

The majority of questions had a five-point Likert scale, ranging from strongly agree to strongly disagree to measure the factors such as social influence, perceived usefulness, internet connection quality and perceived ease of use.

9.2 Demographics analysis

The survey results showed that the majority of respondents were male (277) which represents 54% and there were 232 women respondents, which represent 46% of the total participants. The age distribution of the total survey is as expected. Out of the sample, 73% were between 18-27 years. The average age of the respondents was roughly 24 years. The participants were divided into four educational levels. Among the respondents, those with undergraduate and
postgraduate degrees were the majority of respondents; 221 had undergraduate degrees and 172 had postgraduate degrees, which represented together 77% of the total participants. The rest of respondents, which represented 23% of the total participants, were high school and PhD students. Other education levels only represented 1% of the total participants. A high percentage of respondents (55%) were currently students. Employees represented 32% and others might be unemployed or have a private business and both together represented 13% of the respondents.

The number of respondents who currently use m-commerce in Saudi Arabia was 94 users, which represents 18% of the respondents. As a result, m-commerce usage in Saudi Arabia can be seen to be in its earlier stages; although, most respondents (97%) had WAP enabled on their mobile phone. This percentage shows that respondents had good chances and opportunities to use m-commerce technology. Overall, the demographic analysis and descriptive statistics from the study’s participants is shown in table 1.

<table>
<thead>
<tr>
<th>Respondents characteristics</th>
<th>Number of respondents who answered (n=509)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>277</td>
<td>54</td>
</tr>
<tr>
<td>Female</td>
<td>232</td>
<td>46</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under 18</td>
<td>27</td>
<td>5</td>
</tr>
<tr>
<td>18-22</td>
<td>188</td>
<td>37</td>
</tr>
<tr>
<td>23-27</td>
<td>183</td>
<td>36</td>
</tr>
<tr>
<td>28-32</td>
<td>74</td>
<td>15</td>
</tr>
<tr>
<td>More than 32</td>
<td>37</td>
<td>7</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High School</td>
<td>96</td>
<td>19</td>
</tr>
<tr>
<td>Undergraduate</td>
<td>221</td>
<td>43</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>172</td>
<td>34</td>
</tr>
<tr>
<td>PhD</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employee</td>
<td>162</td>
<td>32</td>
</tr>
<tr>
<td>Student</td>
<td>280</td>
<td>55</td>
</tr>
<tr>
<td>Other</td>
<td>67</td>
<td>13</td>
</tr>
<tr>
<td><strong>WAP Enabled</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>496</td>
<td>97</td>
</tr>
<tr>
<td>No</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td><strong>Using m-commerce</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>94</td>
<td>18</td>
</tr>
<tr>
<td>No</td>
<td>415</td>
<td>82</td>
</tr>
</tbody>
</table>

Table 4: Demographic profile.
9.3 Hypothesis analysis

Data analysis involved analyses of the structure model and the measurement model using StatPlus 9.8.2.0 software. There are many studies which examined their hypotheses using the R-square value and the regressions path coefficients, such as Yang (2005) and Mallat et al. (2008).

In this study, examining the results for the structural model and the hypothesis formed for each factor depends on testing the regressions path coefficients and the R-square values. The regressions path coefficients demonstrate how strong the relationships between the independent and the dependent variables are and the R-square values show the amount of variance explained by the independent variables. Using the R-square and the regression path coefficients displays how well the model is performing. In addition, the R-square values show the predictive power of the model. Furthermore, the values should be interpreted in the same way as R-square in a regression analysis.

9.3.1 Perceived Ease of Use

In the proposed model, the quality of Internet connection is an essential variable to examine the perceived ease of use of adopting m-commerce in Saudi Arabia. In addition, perceived ease of use should be free from effort.

The survey found that 81% of the respondents tended to strongly agree with the statement that it is easy to conduct m-commerce transactions through their mobile phones and roughly 60% agreed that using m-commerce is clear and understandable. In addition, the survey confirmed that most respondents intended to become skilful at using m-commerce technology. As a result, approximately 62% of the respondents agreed that m-commerce is easy to use, and agreed that the perceived ease of use is free from effort.

9.3.2 The Quality of Internet Connection

The availability and quality of an Internet connection is an important factor to assess. M-commerce needs easy access to the Internet and certainty that the financial transactions are completed, just as do other technologies such as e-commerce and online banking. The results from survey showed that roughly 70% of respondents agreed that access to the Internet was easy. However, many respondents disagreed that the Internet guarantees that all online transactions
are completed which represents 45% and about 30% of the respondents were not completely satisfied.

A study by Al-Somali et al. (2009) found that the quality of the Internet connection has significant impacts on customer attitudes towards online banking. Similarly, Internet quality has no statistically significant impacts on the acceptance of online banking (Pikkarainen et al., 2004). This was the prime reason for putting hypothesis H6 into this study.

After analysing the data, according to linear regression, the quality of Internet connection positively influences the perceived ease of use and the p-value equals 0.005, which means the relationship is statistically significant and the regressions coefficient is 0.216. As a result, the hypothesis Quality of Internet has a positive impact on the perceived ease of use of adopting m-commerce in Saudi Arabia is supported (table 12). The Cronbachs Alpha, mean and deviation are presented in table 4.

<table>
<thead>
<tr>
<th>Use</th>
<th>Quality of Internet Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2.77</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1.28</td>
</tr>
<tr>
<td>Cronbachs Alpha</td>
<td>0.814</td>
</tr>
</tbody>
</table>

*Table 5: Cronbachs Alpha, Mean and Standard Deviation for Quality of Internet connection.*

### 9.3.3 Perceived Usefulness

The procedure to test the factor of perceived usefulness is the same as for testing perceived ease of use. The related variable is social influence. Furthermore, m-commerce performance is correlated with perceived usefulness. There are many studies which reported that perceived usefulness is a critical factor to adopting m-commerce and other technologies such as online banking (Zahid et al., 2010; Al-Somali et al., 2009).

The majority of respondents, roughly 80%, agreed that m-commerce technology is useful and 72% agreed that buying products or services through mobile phones or PDAs is useful. In addition, 305 of the respondents, which represent 60%, strongly agreed that having wireless
Internet on a mobile phone or PDA is convenient. In addition, most of the respondents tended to strongly agree that having m-commerce capabilities on their mobile phone or PDA would save time.

9.3.4 Social influence

Social influence changes an individuals feeling, attitude or behaviours due to the influence of other individuals or another group. It has an indirect influence on intention to adopt technologies via perceived usefulness (Molina et al., 2008). The largest category within the participants agreed that family and friends are the greatest influence on their attitude towards accepting and adopting m-commerce technology which represented approximately 42%, . The remaining percentage was influenced by other elements, such as intuition and other peoples influences which together amounted to 58%.

A studied by Mallat et al. (2008) found that social influence is a strong determinant of the adoption of technologies. A prior study found that social influence impacts behavioural intention through perceived usefulness. It is a significant influence and an important factor influencing perceived usefulness in mobile payment (Khalifa and Shen, 2008). A study by Al-Somali et al. (2009) found that social influence had the most impact on the perceived usefulness of online banking services. Mallat et al. (2008) also reported that social influence on behavioural intention had significant impacts on the rapid adoption of different mobile service categories (Mallat et al., 2008).

Referring to linear regression, social influence positively impacts on the factor perceived usefulness, which is statistically significant (p-value=0.038) and the regressions coefficient is 0.148. The hypothesis, Social influence has a positive influence on perceived usefulness to adopt m-commerce in Saudi Arabia is therefore supported (table 12). The Cronbachs Alpha, mean and standard deviation are presented in table 5.

<table>
<thead>
<tr>
<th>Use</th>
<th>Social Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2.12</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1.09</td>
</tr>
<tr>
<td>Cronbachs Alpha</td>
<td>0.835</td>
</tr>
</tbody>
</table>

Table 6: Cronbachs Alpha, Mean and Standard Deviation for Social influence.
9.3.5 Attitude towards use

The main factors which influence attitudes towards using technology, as found in a study by Venkatesh et al. (2003), are perceived to be usefulness and ease of use. Furthermore, there are many other factors that impact attitude towards using m-commerce; for instance, education level, age and experience.

In the proposed model, there are two variables added to the TAM of Venkatesh et al. (2003), which are cost, and security and privacy. These factors were used by Zahid et al. (2010) to reveal the acceptance of online banking.

The survey results found that 73% of the participants had a positive attitude toward using m-commerce technology in Saudi Arabia. Moreover, most of them believed that people should adopt m-commerce. In addition, R-square of their attitude towards it was 0.628 and the regressions coefficient was 0.862, which is close to one. As a result, there is a strong correlation between attitude towards and intention to use m-commerce technology in Saudi Arabia.

In the past, research reported that attitude towards technology had a positive association with the adoption decision (Mallat et al., 2008). In this study, attitudes towards use explain 63% of the variance in intention to use. According to the linear regression, the p-value of attitude towards using m-commerce was 0.000. As a result, the hypothesis: The attitude towards using m-commerce has a positive impact on the behavioural intention to adopt m-commerce technology in Saudi Arabia was also supported. Moreover, perceived ease of use, perceived usefulness, cost, and security and privacy explained roughly 40% of the variance in attitude towards uses m-commerce technology in Saudi Arabia (table 12). The Cronbachs Alpha, mean and standard deviation are presented in table 6.

<table>
<thead>
<tr>
<th>Use</th>
<th>Attitude Towards Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2.05</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1.2</td>
</tr>
<tr>
<td>Cronbachs Alpha</td>
<td>0.918</td>
</tr>
</tbody>
</table>

Table 7: Cronbachs Alpha, Mean and Standard Deviation for Attitude Towards Use.
9.3.5.1 Perceived Ease of Use

The Internet connection quality is a critical variable for the perceived ease of use factor which affects the likelihood of adopting m-commerce, because access to applications, commercial websites and services cannot be achieved without an Internet connection. As previously mentioned, the quality of Internet connection has a significant influence on the adoption of m-commerce technology. Furthermore, perceived ease of use positively impacts on attitude toward using m-commerce technology, which is statistically significant (p-value=0.000) and the regressions coefficient is 0.268. Consequently, the hypothesis, Perceived ease of use has a significant impact on adopting m-commerce in Saudi Arabia is supported (table 12). The Cronbachs Alpha, mean and standard deviation are presented in table 7.

<table>
<thead>
<tr>
<th>Use</th>
<th>Perceived Easy Of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2.33</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1.2</td>
</tr>
<tr>
<td>Cronbachs Alpha</td>
<td>0.869</td>
</tr>
</tbody>
</table>

Table 8: Cronbachs Alpha, Mean and Standard Deviation for Perceived Ease Of Use.

9.3.5.2 Perceived Usefulness

A previous study by Mallat et al. (2008) found that perceived usefulness and ease of use had a statistically significant influence on the adoption decision. These factors play an important role on the adoption of new technology in much research. Perceived usefulness is critical and one of the most influential factors in technology acceptance (Al-Somali et al., 2009). A study by Zahid et al. (2010) found that a key measure in developing a positive attitude towards online banking was perceived usefulness. In this study, this finding has also been validated; perceived usefulness impacts more than any other factors on attitude towards technology.

A case similar to perceived ease of use was implemented to test perceived usefulness. Social influence has a positive impact on perceived usefulness to influence adopting m-commerce technology. In addition, it is impacting positively on attitude towards. According to linear regression, the p-value of perceived usefulness is 0.000 and its coefficient is 0.310, which means that the hypothesis Perceived usefulness has a significant impact on attitude towards adopting
m-commerce in Saudi Arabia was supported. As a result, perceived usefulness and its variable, which is social influence, impact positively on the adoption of m-commerce technology in Saudi Arabia. The Cronbachs Alpha, mean and standard deviation are presented in table 8.

<table>
<thead>
<tr>
<th>Use</th>
<th>Perceived Usefulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>1.95</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1.28</td>
</tr>
<tr>
<td>Cronbachs Alpha</td>
<td>0.918</td>
</tr>
</tbody>
</table>

**Table 9:** Cronbachs Alpha, Mean and Standard Deviation for Perceived Usefulness.

### 9.3.5.3 Security and Privacy

The results showed that security and privacy issues are quite unimportant in m-commerce technology, with 70% of study participants believing that security and privacy are not a major problem for conducting m-commerce transactions. According to linear regression the p-value of security and privacy factors is 0.863 and the coefficient is 0.01, which means that the hypothesis Privacy and security have a significant impact on attitude towards adopting m-commerce in Saudi Arabia is rejected (table 12). The Cronbachs Alpha, mean and standard deviation are presented in table 9.

<table>
<thead>
<tr>
<th>Use</th>
<th>Security and Privacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>3.71</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1.2</td>
</tr>
<tr>
<td>Cronbachs Alpha</td>
<td>0.908</td>
</tr>
</tbody>
</table>

**Table 10:** Cronbachs Alpha, Mean and Standard Deviation for Security and Privacy.
9.3.5.4 Cost

Cost has an insignificant impact on adopting m-commerce technology in Saudi Arabia. The web survey result showed that 22% of participants disagreed that conducting m-commerce transactions allows the user to save money, as they can benefit from the same services at cheaper prices than with other channels. Furthermore, it was unclear for 38% of the participants because they had not tried to use m-commerce because, as mentioned above, m-commerce is still in its earlier stages in Saudi Arabia. According to linear regression, the p-value of cost is 0.656 and coefficient is 0.045, which is close to zero. This means that the hypothesis Cost has a significant impact on attitude towards adopting m-commerce in Saudi Arabia was rejected (table 12). The Cronbachs Alpha, mean and standard deviation are presented in table 10.

<table>
<thead>
<tr>
<th>Use</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2.72</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1.00</td>
</tr>
<tr>
<td>Cronbachs Alpha</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Table 11: Cronbachs Alpha, Mean and Standard Deviation for Cost.

9.3.6 Behaviour Intention

Behavioural intention has a direct influence on adopting m-commerce technology. This study had two questions to reveal behaviour intention. The first question asked whether the participant would be willing to conduct m-commerce transactions in the future. The second question asked whether it was likely that the participant would use m-commerce in the near future. Both questions explored the intention towards using m-commerce technology.

The survey results showed that 72% of the total participants were willing to conduct m-commerce technology in the future. Most of the participants who were not willing to use m-commerce technology, said they might be using m-commerce in the near future.
According to linear regression, the hypothesis Behavioural intention has a significant impact on using m-commerce technology in Saudi Arabia was supported because the p-value of behavioural intention was 0.000. The Cronbachs Alpha, mean and standard deviation are presented in table 11.

<table>
<thead>
<tr>
<th>Use</th>
<th>Behavioral Intention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2.01</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1.29</td>
</tr>
<tr>
<td>Cronbachs Alpha</td>
<td>0.938</td>
</tr>
</tbody>
</table>

*Table 12:* Cronbachs Alpha, Mean and Deviation for Behavioral Intention.
10 Discussion of findings

The study’s objective is to test the suitability of TAM in explaining m-commerce technology adoption in Saudi Arabia. The proposed model is tested by regression analysis that integrates both prime TAM elements and other added factors to reveal information about the consumer adoption decision. This study shows that the major factor that impacts m-commerce acceptance and adoption in Saudi Arabia is perceived usefulness. According to the results, cost and security and privacy concerns do not have any significant influence on m-commerce technology adoption. Most of respondents were satisfied with the privacy and security issues in m-commerce technology. Experience in the field of e-commerce could be one of the reasons that made the consumers less concerned about the security and privacy issues. In addition, awareness of m-commerce technology in Saudi people could be high. Consequently, they prefer to use m-commerce to buy and sell goods and run applications over traditional commerce. Surprisingly, cost was an insignificant determinant of m-commerce adoption in this study's data. This can largely been explained by the charging structure of telecommunication companies in Saudi Arabia as a result of the competitive business environment.

There are many factors that have a good correlation with attitude towards using m-commerce in Saudi Arabia. A high correlation value is that between perceived usefulness and attitude towards using m-commerce technology, which shows that when consumers feel that m-commerce technology is useful, they are willing to use it rather than traditional commerce. Moreover, many studies have shown that perceived usefulness was the determinant factor to adopt technologies such as Zahid et al. (2010) on online banking. The second high correlation is with perceived ease of use. It is influenced by the quality of Internet connection, which has a significant impact on it. Participants indicated that access to the Internet is easy. As mentioned earlier, the mean age of the participants was 24, from which can be interpreted that most consumers already have a great knowledge of how to use m-commerce devices and other electronics. However, they are not satisfied because when using m-commerce they are not sure whether the financial transaction process has been completed. This is as a result of the quality of Internet connection in Saudi Arabia not being well developed yet.

Greater adoption of m-commerce technology is resulting from increasing the number of communication towers, which support 3G or advanced generation and the broadband connection availability, which supports wireless technology throughout Saudi Arabia.
The current lack of infrastructure plays a critical role in the adoption of m-commerce technology. In addition, they also indicated that using m-commerce is clear and understandable; it is easy to become skilful at using m-commerce. Thus, perceived ease of use supports m-commerce technology adoption.

11 Summary of results

A number of factors which impact consumer attitudes towards m-commerce technology acceptance and adoption in the Saudi Arabia have been identified in this study, including: social influence and quality of Internet connection. It is important to emphasise the high explanatory power R-square achieved in this study in which attitudes towards use (ATU) explain 63% of the variance in behavioural intention.

Moreover, Al-Somali et al. (2009) affirm that if the model which is proposed is correct, it should have R-square not far away from 100%. This study confirmed that the extended TAM model correctly explains the adoption of m-commerce technology in which all R-square values were close to 100%.

This study used an extended TAM to reveal the factors that impact the adoption of m-commerce technology in Saudi Arabia. The results indicated that most hypotheses are supported in relation to adopting m-commerce technology and approximately 72% of participants are willing to use it. As a result, m-commerce in Saudi Arabia has the capability to be accepted by individuals.
<table>
<thead>
<tr>
<th>Hypothesis No.</th>
<th>Hypothesis path</th>
<th>$R^2$</th>
<th>$\beta$</th>
<th>t Stat</th>
<th>p-Value</th>
<th>Support?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Perceived Usefulness $\rightarrow$ Attitude towards use</td>
<td>0.381</td>
<td>0.310</td>
<td>17.680</td>
<td>0.000*</td>
<td>Yes</td>
</tr>
<tr>
<td>H2</td>
<td>Perceived Easy Of Use $\rightarrow$ Attitude towards use</td>
<td>0.226</td>
<td>0.268</td>
<td>12.163</td>
<td>0.000*</td>
<td>Yes</td>
</tr>
<tr>
<td>H3</td>
<td>Attitude towards use $\rightarrow$ Behavioral Intention</td>
<td>0.629</td>
<td>0.862</td>
<td>29.296</td>
<td>0.000*</td>
<td>Yes</td>
</tr>
<tr>
<td>H4</td>
<td>Cost $\rightarrow$ Attitude towards use</td>
<td>0.002</td>
<td>0.045</td>
<td>0.445</td>
<td>0.656</td>
<td>No</td>
</tr>
<tr>
<td>H5</td>
<td>Security and Privacy $\rightarrow$ Attitude towards use</td>
<td>0.0001</td>
<td>0.01</td>
<td>0.172</td>
<td>0.863</td>
<td>No</td>
</tr>
<tr>
<td>H6</td>
<td>Internet connection quality $\rightarrow$ Perceived Easy Of Use</td>
<td>0.016</td>
<td>0.216</td>
<td>2.836</td>
<td>0.005**</td>
<td>Yes</td>
</tr>
<tr>
<td>H7</td>
<td>Social Influence $\rightarrow$ Perceived Usefulness</td>
<td>0.008</td>
<td>0.148</td>
<td>2.073</td>
<td>0.038***</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Note: *Significance at $p<0.0001$, **Significance at $p<0.01$. ***Significance at $p <0.05$.

**Table 13:** The results of the variables that impact the adoption of mobile commerce technology in Saudi Arabia.
12 Conclusion and Recommendations

It is clear that the majority of m-commerce adoptions in Saudi Arabia are to increase the revenue of companies. Also, Saudi Arabia provides an appropriate environment to implement m-commerce.

Last decade, IT witnessed a rapid growth in developed countries, such as Japan and the United Kingdom, and in the Middle East, in countries such as Saudi Arabia. Many companies of different scale confirm that developed nations show a rapid adoption and acceptance of m-commerce. However, in Middle Eastern nations, such as Saudi Arabia, the growth of m-commerce is very slow, and most companies have not created a suitable environment for the implementation of m-commerce services, such as a mobile web or applications. Also, there are many obstacles facing m-commerce advancement, such as the security issue. Wireless technology influences the business environment, as well as the growth of online services and the Internet. It provides strong benefits, such as the ability to share data and information. In Saudi Arabia, the latest generation of wireless technology adopted is the 3G, which reveals that Saudi Arabia might be ready to accept and adopt m-commerce. There are many features that can only be implemented in a mobile environment, such as mobility and localisation, which indicates the importance of m-commerce services. In addition, m-commerce provides opportunities, allowing consumers to purchase things from a distance, and at a time of their choosing. Clarke (2008) found that the loyalty of consumers might be increased by making services more appropriate for m-commerce.

On the other hand, m-commerce faces challenges, such as security and the lack of ubiquitous, wireless network areas. Some individuals and businesses still have concerns about using wireless technologies because of health concerns. However, there is little evidence to confirm the validity of such concerns.

M-commerce affects the economic development of countries in a positive way. Statistics confirm that in the United States mobile purchases grew from around $396.3 million in 2008 to $1.4 billion in 2009.

As an emerging technology, the success of m-commerce in Saudi Arabia still relies on many other factors. These factors include the policies of the Saudi government, the marketing strategies of service providers and telecommunications infrastructure.

This research is a study of the adoption of m-commerce technology in Saudi Arabia, which is based on the model proposed by Venkatesh et al. (2003) in identifying the theoretical technology
acceptance model. Furthermore, this study extended the original model in order to support it. The proposed model has been divided into two sections. First, the proposed attributes by Venkatesh et al., which are: perceived usefulness, perceived ease of use, attitude towards using the system and intention to use the system. Second, it used the theory of the proposed model to explain the adoption of m-commerce technology, which contains cost, quality of Internet connection, social influence, and security and privacy. All the factors are interpreted in the literature review.

The major purpose of this study was to explore the factors affecting consumer adoption of m-commerce technology in Saudi Arabia. The framework developed for the study proposed that the adoption of m-commerce technology is impacted by perceived ease of use, perceived usefulness, social influence, quality of the Internet connection, attitude towards use and behavioural intention. The proposed model was examined with 509 respondents through an online web survey. The attributes of the original model proposed by Venkatesh et al, had a positive impact on adopting m-commerce technology. All the original factors had a significant influence. The most effective factor on attitude towards using m-commerce technology was perceived usefulness. In addition, 80% of participants agreed that m-commerce technology was useful. Perceived ease of use did not have as much impact on attitude towards using m-commerce technology as did perceived usefulness. The results showed that 81% of the respondents tended to strongly agree with the importance of ease of conducting m-commerce transactions through mobile phones and roughly 60% agreed that using m-commerce is clear and understandable. Furthermore, the impact on attitude towards use of behavioural intention was positive and roughly 73% of the participants have a positive attitude towards use. Thus, the adoption process is likely to be acceptable for Saudi people.

Social influence was a significant influence on perceived usefulness as well as quality of Internet connection influencing perceived ease of use.

On the other hand, there are many factors which did not impact the adoption of m-commerce technology. The results confirm that cost, and security and privacy did not influence the adoption of m-commerce technology in Saudi Arabia. Consequently, awareness of technology and the competitive environment of the telecommunications business support the adoption of m-commerce.
The quality of Internet connection is critical in the technology field in areas such as Cloud computing, m-commerce and online banking. Many recommendations address the quality of Internet connection in Saudi Arabia. First, the telecommunications companies in Saudi Arabia should build a high quality infrastructure. Second, new technology services such as WiMAX (Worldwide Interoperability for Microwave Access) should be introduced which provide up to 40 Mbps. This would guarantee that access to the Internet through mobile devices or PDAs would be easy and that financial transactions would be completed. On the other hand, the Saudi government should put in place a strategic plan to achieve a new and high quality infrastructure. The government of Saudi Arabia should improve Internet quality by increasing investment in ICT infrastructure. Furthermore, the Saudi government should issue more licenses via the communications and information technology commission for public communication network operators and ICT service providers. This would, consequently, create a competitive business environment, which would lead to enhance Internet quality.

12.1 Limitations and Further research

It is an important to mention that this study has several limitations that influence the validity and reliability of the findings and much still needs to be done to better understand the adoption and acceptance decision to use m-commerce among Saudi Arabian consumers. The first limitation concerns the limited sample size, although the sample size was quite large compared to the sample sizes of other TAM studies. Second, there is the limited availability of published reports. Furthermore, there are many gaps uncovered in this study, which give opportunities to other researchers to reveal with further studies how to improve the knowledge of m-commerce in Saudi Arabia. Moreover another study could be to explore the influence of e-commerce adoption on m-commerce adoption or whether there is a relationship between e-commerce and m-commerce consumers. In addition, a further study could reveal the attitude of companies in Saudi Arabia to conducting and using m-commerce.
13 References

References


14 Appendices

14.1 Appendix A: Questionnaire

Questionnaire

Demographics Section

Gender
Male
Female

Age
Under 18
18-22
23-27
28-32
More than 32

Education
High School
Undergraduate
Postgraduate
PhD
Other

Occupation
Employee
Student
Other
Is your cell phone Wireless Application Protocol (WAP) enabled?
Yes
No

I am currently using M-commerce for purchasing products or services.
Yes
No

Section two: Your attitudes and opinions
(This section implements the five likert scale (1) Strongly Agree to (5) Strongly Disagree)

[1] Security breach is a major problem for conducting m-commerce transactions.
[2] Privacy violation is a major problem for conducting m-commerce transactions.
[3] Conducting m-commerce transactions allows me to save money, as I can benefit from the same services at cheaper prices than with other channels.
[4] My attitude toward using m-commerce is positive. (Attitude toward: Your feeling about using m-commerce)
[5] It is easy to use a mobile phone to conduct m-commerce transactions.
[6] It would be easy for me to become skillful at using m-commerce.
[7] Using m-commerce is clear and understandable.
[8] Overall, m-commerce is easy to use.
[9] I believe that m-commerce will be useful.
[10] Buying products or services through mobile phones or PDAs is useful.
[11] Having wireless Internet on my mobile phone or PDA is convenient.
[12] Having m-commerce capabilities on my mobile phone or PDA would save time.
[13] Internet access through mobile devices or PDAs is easy.
[14] The Internet guarantees that all online transactions are completed.
[15] If someone personally recommends me to use m-commerce in the future, I would use it.
[16] If everyone is using M-commerce, then I most probably am going to use it.
[17] I trust my intuition more than advice from others when I am attempting to use new technology.
[18] I believe that people should adopt m-commerce.
[19] I am willing to conduct m-commerce transactions in the near future.
[20] It is likely that I will use m-commerce in the near future.
14.2 Appendix B: Project Plan

The project plans explain the worth time has taken to finish this stage of dissertation.

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Start Date</th>
<th>Duration</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Searching References</td>
<td>2/19/11</td>
<td>28</td>
<td>3/19/11</td>
</tr>
<tr>
<td>Writing literature review</td>
<td>3/20/11</td>
<td>28</td>
<td>4/17/11</td>
</tr>
<tr>
<td>Writing Survey</td>
<td>5/27/11</td>
<td>7</td>
<td>6/3/11</td>
</tr>
<tr>
<td>Collecting survey results</td>
<td>6/4/11</td>
<td>14</td>
<td>6/18/11</td>
</tr>
<tr>
<td>Understanding statistical functions</td>
<td>6/19/11</td>
<td>14</td>
<td>7/3/11</td>
</tr>
<tr>
<td>Searching and understand TAM model</td>
<td>7/4/11</td>
<td>14</td>
<td>7/18/11</td>
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<td>Writing dissertation</td>
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<td>8/15/11</td>
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<td>3</td>
<td>8/21/11</td>
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<td>Submit the dissertation</td>
<td>8/17/11</td>
<td>1</td>
<td>8/18/11</td>
</tr>
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</table>

Figure 4: Project plan.