2.0 Literature Review

2.1 Innovation

The introduction of a new product is vital to both consumers and the marketers. For the consumers, a new product represents an increase opportunity for them to satisfy their personal, social and environmental needs. For the marketers, new product provides an important mechanism for them to remain competitive and profitable.

According to Hoyer and MacInnis (1997), a new product or an innovation, is an offering that is new to the market place. More formally, an innovation is a product, service, attribute or idea that is perceived as new by consumers within a market segment and that has an effect on existing consumption patterns. Although we usually think of product as innovations, services can also be new to the market and thus considered as an innovation. For example, J.C Penney has plans for a new service that offers some of its catalogue merchandise to consumers via interactive TV (Howcroft, Coney. 2004). Ideas can also be described in terms of their innovativeness. For example, social marketers have been active in persuading consumers to adopt such ideas as energy conservation, smoke-free workplaces, and abstinence from drugs. In the third world countries, social marketers have been involved in ideas such as family planning, encouraging safer and more nutritious food preparation practices (Howcroft, Coney. 2004).

In addition, Hoyer and MacInnis (1997), stated that a second aspect of the definitions of an innovation is that products, services, attributes, and ideas are regarded as innovation if consumers perceive them as new, not whether they are actually new or old to the market place. A calculator with a special chip that allows more advanced mathematical programming
may not be technically new, but it is not regarded as an innovation if it is not perceived as such by consumers.

An innovation is also defined with respect to a market segment. For example, Converse sneakers have been around for many years but were recently a hot item among teens that valued a “retro” style (Smith, 1995).

Finally innovations involve changes in consumption patterns. Some innovations change how, where, when we acquire products. For example, innovations like home shopping and direct mail have altered the way consumers buy products. Other innovation may change how we use the product or service. Microwave oven have changed how consumers cook, and fax machines and e-mail have changed how consumers communicate with others (Hoyer, MacInnis, 1997).

Robertson (1971) has classified innovation into three different categories; continuous innovation, dynamically continuous innovation and discontinuous innovation. A continuous innovation has the least disrupting influence on established patterns. It involves the introduction of a modified product rather than a totally new product. Fluoride-toothpaste, cholesterol-free eggs and fat-free ice cream are among the example of continuous innovation. A dynamically continuous innovation is somewhat more disruptive than a continuous innovation, but it still does not alter the established behavioral patterns. It may involve the creation of new product or modification of an existing product. Electric toothbrush and erasable-ink pen can be classified under the dynamically continuous innovation. A discontinuous innovation is a product that is so new but the consumers have never known anything about the product before. Adoption of the product requires the establishment of new
behavioral pattern. Products like airplanes, automobiles, computers, television, cell phone were all at one time discontinuous innovation. These innovations involve dramatically different behaviors or radical changes in behaviors. For example, the invention of airplanes has fundamentally affected how, when and where consumers travel.

2.2 Diffusion of Innovation

The diffusion process is concerned with the general dimension of how innovations spread and how they are assimilated within a market. According to Schiffman and Kanuk (1983), the diffusion process can be defined as the process by which the acceptance of an innovation of (a new product, new service, new idea, new practice) is spread by communication (mass media, sales people, informal conversations) to members of a social system (a target market) over a period of time.

Rogers (1995) defines diffusion as the adoption of an innovation ‘over-time by the given social system’; as a consequence diffusion processes result in acceptance or penetration of a new idea, behavior, or physical innovation. Rogers suggested that explanation of the factors that affected the acceptance of new product could be found in attributes of innovation adopted. Research that has investigated the products’ characteristics of innovation has generally endorsed evaluating the innovation along the product characteristics that involve five constructs: relative advantage, compatibility, complexity, trialability and observability. Traditionally, the Rogers’s adoption continuum recognizes five categories of consumers that differ in terms of adoption rate; innovators, early adopters, early majority, late majority, and laggards.
2.2.1 Personal Innovativeness and The Innovation Diffusion

Research indicates that the success of an IT/IS innovation implementation depends as much on individual differences as on the technology itself (Harrison and Rainer, 1992; Nelson, 1990; Zmud, 1979). The theoretical relationship between individual differences and their beliefs are also discussed in social psychology and learning theories. Prior experience has long been regarded as a factor identifying individual differences in technology acceptance (Zmud, 1979). In consumer research, it is believed that past experience of using similar technologies contributes greatly to favorable attitudes towards using a new technology and actual adoption (Dabholkar, 1992; Dickerson and Gentry, 1983; Kargoankar and Moschis, 1987).

Personal innovativeness is a variable identified as influential on usefulness perception (Argarwal and Prasad, 1998). Personal innovativeness epitomizes the risk-taking propensity that is higher in certain individuals than in others. In general innovation diffusion research, it has long been recognized that highly innovative individuals are active information seeker of new ideas. They are able to cope with high levels of uncertainty, and develop more positive intentions towards acceptance (Rogers, 1995). Agarwal and Prasad (1998) defined personal innovativeness in the domain of information technology as the willingness of an individual to try out any new information technology. They postulated that individuals with higher level of innovativeness with respect to information technology are expected to develop more positive perception about the innovation in terms advantage, ease of use, compatibility and therefore have higher intentions towards the adoptions of new technology. Preferred information sources may differ across different adopter categories and individual propensities for relying on marketer provider information sources may differ across different adopter categories.
Individuals may have different propensities for relying on marketer provider information, independent third party information and information from personal sources.

Many researches have traditionally analyzed consumers’ adoption of innovation using Rogers five categories of adopters; namely innovators, early adopters, early majority, late majority and laggards. This distinction, which is built on innovativeness, suggests targeting new products and services to innovators who start the diffusion process by communicating to other adopter segments (Black, Lockett, Winklofer, Ennew, 2001).

The innovators who are the first adopters tend to be interested in technology itself, with positive technology attitudes (Mohr, 2001). Innovators tend to be a heavier user of professional communication sources such as sales person, government and etc. Saaksjarvi (2003) described the innovators as the people that are the first one to adopt new technology. These consumers are thought as leaders and technology pioneers. They are the people, who recognize the benefits new technology earlier than others, adopts it, and communicate these benefits to other adopter segments. They are willing to test and reduce errors in innovative products just to get access to the latest technologies. According to Parasuraman and Colby (2001), access to the new technologies brings innovators mental stimulation. Rogers (1995) stated that the perquisites of innovators involve having substantial financial resources to absorb possible loss from an unprofitable innovation, the ability to understand and apply complex technical knowledge and coping with a high degree of uncertainty. An innovator’s position makes them more expose to the technological innovation than other adopter segments. Exposure is important to innovators who are interested in technology for its own sake and enjoy examining technological innovations. Innovators can be classified as early adopters, early majority, late majority and laggards.
Early adopters are visionaries. They admire a technologically new product not so much for its features but for its abilities to create a revolutionary breakthrough in the way things are normally accomplished. (Hoyer and MacInnis, 1997). According to Loudon and Bitta (1984) early adopters are younger than late adopters, higher in social status, and above average in education. They tend to subscribe to more magazines than later adopters, and yet not as many as innovators. They also have been found to have the greatest contact with sales people. General Electric (GE), for example, obtained data from warranty cards for the new product and through personal interviews with early buyers. GE found that these early buyers directly influenced other consumers by talking about the product and by having it in their homes (Olshavsky, 1980).

The early majority is the next group to adopt an innovation. Those in the early majority group may consider an innovation for some time before adopting then therefore, their adoption period is longer than that of the two previous groups. They adopt an innovation just before the average member of a social system, which puts them in a crucial position to legitimize other people’s new ideas (Loudon and Bitta, 1984). According to Olshavsky (1980) those in the early majority are slightly above average in age and education, and social and economic status. Although they belong to formal organizations, they are likely to be active members rather than the earlier adopters. The early majority subscribes to fewer magazines and journals than the previous adopters, but they have considerable contact with salespeople. They are frequently neighbors and friends of early adopters.

The late majority adopts an innovation just after the average consumer in the market place. This group can be described as “skeptical” about new ideas, and may yield only because of economic necessity or increasing social pressures. Those in the late majority are
above average in age and below in education, social status, and income. They belong to few formal organizations and exhibit little opinion leadership with communication patterns oriented primarily toward late majority members in their neighborhood. There is little use of the mass media but heavy reliance on informal sources of information and influence (Loudon and Bitta, 1984).

Laggards are the last group to adopt an innovation. They are tradition-bound, with decisions based on what has been done in the past. Laggards are suspicious of innovations and perhaps of those who offer them. The length of adoption process for this group is quite long; when adoption finally comes, a new innovation has likely superseded the previous innovation. Laggards have the least education, the lowest social status and income, and are the oldest of any adopter category. They are most local in orientation, which tend to be their immediate neighborhood, and they communicate mostly with other laggards who are their main sources of information. Laggards possess almost no opinion leadership, have little participation in formal organization, and subscribe to few magazines (Loudon and Bitta, 1984).

2.2.2 Demographic Profile and Innovation Diffusion

According to Kwon and Zmud (1987), gender is an important individual variable that are often neglected in the previous research. Venkatesh and Morris (2000), recently investigated gender differences in the context of individual adoption and sustained usage of technology. They found gender as an important determinant of individual adoption and sustained usage. According to Target Group Index (Target Group Index Europe Survey, 2000) in Germany which has the lowest level of mobile phone ownership compared to other
European countries, the market was split 60% men and 40% women. A recent survey conducted in the UK found that men spend more time on mobile phones than women (NST, 2002).

Besides gender, Venkatesh and Morris (2000) also suggested that gaining a better understanding of age differences is important, particularly as it relates to user acceptance and usage of new information technologies. Early adopters of new products are commonly thought to be young in most technology market. According to Polatoglu and Ekin (2001), demographic factors that describe electronic banking services adopters include young, affluent and highly educated. A study in Finnish (Matilla, 2001) reported that the Internet banking user is middle aged, relatively wealthy and highly educated.

Income and social economic status has also been recognized to have a strong effect on technology adoption and diffusion (June, Shun, Chang, James, 2003). In some rapidly developing countries and regions, stronger payment ability and higher income level is enabling more people to spend more on mobile phones.

2.2.3 Innovation Characteristics and Innovation Diffusion

Several characteristics of the innovation, such as its perceived value, the uncertainty associated with it and the extent to which consumers must learn new patterns of use to adopt it, affect resistance, adoption and diffusion process (Hoyer and MacInnis, 1997). La Bay and Kinnear (1981), Holak (1998). Lockett and Litler (1997) has demonstrated that it is the perceived attributes of the innovation itself rather than the characteristics of the innovators that becomes the stronger predictors of the adoption decision. Rogers (1995), outlined a
schema for evaluating the perceived attributes of innovation that involves five constructs: relative advantage, compatibility, trialability, observability and complexity. In addition, a large number of studies have also employed the concept of perceived risk, which was highlighted by Bauer (1960). The first four characteristics of innovation: relative advantage, compatibility, trialability and observability are positively related to the adoption of an innovation, while the remaining two characteristics of the innovation; complexity and perceived risk are negatively related to the adoption of an innovation (Rogers 1995; Bauer 1960).

2.2.3.1 Relative Advantage

Relative advantage is concerned with the degree to which the an innovation is perceived by potential adopters as being better than the idea, product or service it supersedes (Rogers 1995, 1983). According to Schiffman and Kanuk (1983), relative advantage is the degree to which the potential customers perceived a new product as superior to existing substitutes. In addition, Schiffman and Kanuk (1983) stated that the product or services offers relative advantage only if it can help consumers avoid risk, fulfill their need, or achieve their goals and values. Relative advantage is not something that exists in the product. It is something that a product does for the consumers. For example, many consumers who are hard of hearing think that wearing a hearing aid is embarrassing; hence many consumers try to avoid wearing hearing aids. Following this, a hearing aid that sits in the entrance of the ear canal thus making the product nearly invisible. This offers the consumers a relative advantage as it allows consumers to avoid the social risk that accompany the use of hearing aid (Loudon and Bitta, 1984).
A key issue is that it is not the superior performance of an innovation in an objective sense that matters, but rather the superiority of performance as perceived by the customers (Szymigin and Bourne, 1999). The relative advantage associated with the convenience of being able to conduct one’s banking outside branch opening hours has been found to be important in both the case of the adoption of ATMs (Marr and Prendergast, 1993) and telephone based direct banking services (Lockett and Lliter 1997).

2.2.3.2 Compatibility

Compatibility of an innovation is the degree to which an innovation is perceived as consistent with the past values, experiences and the needs of the potential adopter (Rogers, 1995). An innovation that has resonance with a consumer, and makes the consumer feel comfortable or familiar with the innovation, will have greater likelihood of adoption than an innovation with lacks of this attribute. In the case of internet banking, this concept of compatibility may simply refer to consumer’s familiarity with the use of the internet (Black, Lockett, Winklofer, Ennew, 2001). According to Suoranta and Matilla (2003), in Finland, the use of Internet banking has already spread to masses of banking customers. On that basis, they drew conclusions that Internet banking services can serve as related product to mobile banking services and that innovators of mobile banking are drawn from heavy users of Internet Banking.

According to Saaksjarvi (2003) low compatibility will affect potential adopters in a negative manner (i.e. they are less willing to adopt) since the innovation does not fit into their lifestyle or current situations. An example could be consumers that values interpersonal contact that are unwilling to switch to Internet shopping or electronic banking due to the lost
of social contact. For technovators, the innovation represent new technology, so they will try it out of curiosity. If they feel that the product or service are not compatible with their current lifestyles, needs and past experience, they will stick to the products or services that allow them to construct more fully relation-based mappings.

Saaksjarvi (2003) also mentioned that compatibility is likely to enhance every segment's adoption propensity. A consumer who realizes that an innovation would be compatible with his or her lifestyle or values is more willing to adopt the innovation. For example, a photographer who is used to sending a large number of pictures over the Internet might realize that digital camera would be more suitable for his or her needs than the regular camera. Thus she or he might realize that there will be a number of benefits associated with the digital camera such as time saving and better quality pictures. Gatignor and Robertson (1985) made an interesting finding on the basis of their review of adoption research. They found that the new products innovators in technology-based product are likely to be drawn from heavy users of other products within the same category. Additionally, it is argued that the adoption of complex products depends on the adopter's ability to develop new knowledge and new patterns experience. This ability can be enhanced by the knowledge gained from the related products.

2.2.3.3 Trialability

Trialability refers to the degree to which an innovation is perceived as being trialable on the limited basis prior to any decision to adopt (Rogers, 1995). The opportunity to trial adoption is an effective mechanism for reducing perceived risk and thus might be expected to have a positive impact on the adoption decision. The more the product can be tried, the more
consumers will find out if they really like it, hence there will be less resistance and greater adoption. However, for some products or services, such as radial keratotomy (a form of outpatient eye surgery designed to correct nearsighted) the trial is impossible.

According to Hoyer and MacInnis (1997) some research has found that the importance placed on trialability depends on the type of adopters. For people who tend to adopt early, trialability may be very important because these people do not have a wide reference to base the value of innovation. Trialability may be less important for late adopters who are likely to know many people who have already adopted the innovation and can therefore speak to its efficacy. Black, Lockett, Winklofer, and Ennow (2001) in their study of the adoption of Internet financial service, found that trialability is crucial. The respondents emphasized that demonstrations facilities offered by the banks are very helpful and useful to them.

2.2.3.4 Complexity

The complexity of an innovation is the degree to which it is perceived as relatively difficult to understand and use by members of a social system (Rogers, 1995). Researchers across technology adoption, adoption theory and social psychology domains have noted that the effects of experience with a technology on perceptions and attitudes towards the technology is related to complexity (Lee, 2003). Bandura (1982), suggested that experience with a product will lead to positive or negative expectations about one’s personal abilities to use the related technologies. This is termed as self-efficacy. Self-efficacy effects are at their strongest when a new behavior is similar to other, previous experiences.
Lee (2003) found that previous experience of other mobile phone systems might generalize to beliefs about the ability to adopt 3G technologies. This is likely to transfer to technologies and products that are perceived to be similar. She suggested that negative or positive memory and experience with a similar product might influence them to form a negative or positive evaluation of the new product. Thus, she suggested that the negative experience with previous mobile banking services could impair the adoption of later services.

Rugimbara and Iversen (1994) found that the perceived complexity of the innovation was an important negative influence on adoption of automated teller machine (ATM). According to Black, Lockett, Winklofer and Ennew (2001) the perception of the complexity involve when conducting financial transactions on the Internet was inversely related to the respondents’ experience with computers. Some of the respondents described it as a straightforward process while others noted that it was complicated as many forms needed to be completed and this appeared to be “daunting task” to them. Thus, they suggested that the perception of complexity seems to be related to the previous experience.

2.2.3.5 Observability

Observability of an innovation describes the extent to which an innovation is visible to other members of social system (Rogersss, 1995). The more visible an innovation and its benefits, the greater the likelihood of the adoption, simply because the gains from adoption will be more easily recognized. In general, the more consumers can observe others using the innovation, the more likely they are to adopt it. (Fisher and Price, 1992). Consumers are more likely to learn about the existence of the new products and their potential benefits when the
new products are visibly consumed by others. Observability may also influence diffusion by affecting the social rewards consumers believe may accrue from using the innovation. By using a highly visible product, the consumers may believe he or she will experience social approval from others.

In the case of Internet banking, Block, Lockett, Winklofer and Ennew (2001) suggested that the observability does not appear to be a contribution to the adoption. This is because the use of mobile device for purchasing financial services is not visible to other members of the society. It is not even widely discussed in a social setting. Thus, it appears that using Internet banking for financial transactions has little associated with social esteem and thus the extent to which others can observe its use do not appear to be a contributor to the adoption.

2.2.3.6 Perceived Risk

A large number of studies have also employed the concept of perceived risk, as highlighted by Bauer (1960). Perceived risk can be thought of as the degree of uncertainty or fears as to the consequences of a purchase that consumer feels when considering the purchase of a new product (Schiffman and Kanuk, 1983). For example, consumer experience uncertainty when they are concerned that a new product will not work properly or will not be as good as other alternatives.

According to Schiffman and Kanuk (1983), research on perceived risk and the trial of new products overwhelmingly indicates that the consumer innovator is a low risk perceiver. Consumers who perceived little or no risk associated with the purchase of a new product are
more likely to purchase it than consumers who perceived a great deal of risk. In other words, high-risk perception limits innovativeness.

According to Mitchell (1998), another factor that has been found to be important in the consumer decision-making process is the perception of risk associated with the product or service, its purchase or its use. Purchase of services because of their intangible nature, is thought to carry higher risk perceptions than the purchase of goods. Furthermore, several government-related studies, suggested that consumer risk perceptions are primary obstacle to the future growth of e-commerce (Culnan, 1999).

According to Lee (2003), intuitive risk perceptions found in the Internet banking industry might similarly affect the growth of 3G mobile phone financial services, because of their analogous characteristics (physical, psychological, performance, financial, time lost and social). Black, Lockett, Winklofer and Ennew (2001) found in their studies that perceived risk is negatively related to the Internet banking adoption. It appears that respondents who lack self-confidence perceived a higher degree of risk and found that purchasing financial services through Internet is a daunting responsibility. The respondents appear to have more thrust on the bank clerks than Internet banking system.

2.3 Mobile Commerce Application

Mobile commerce, also known as m-commerce and m-business is basically any e-commerce or e-business done in wireless environment, using wireless devices such as PDA, cell-phone and etc (Turban, 2004). Mobile business is positioned in a business ecosystem, consisting of mobile telecommunication company, content providers, mobile solution
providers, customers and etc. (Choon, Hyung, Dae, 2004). Among the business players, the customers are said to have an immense influences on the mobile technology and network technologies, participating contents providers and etc.

Mobile business models are divided into B2C (business to consumer) and B2B (business to business). The mobile B2C model is divided into commerce, intermediary and information model. A commerce model provides mobile contents and services for direct commercial transaction such as e-mail, banking, game and etc. An intermediary model delivers mobile contents and services from other sources to customers such as stock related sites, news weather, and entertainment. An informational model provides personalized information to customers’ mobile terminals generally on a push basis such as SMS, coupon, banner, location information and etc. A mobile B2C business model is illustrated in figure 2.1

![Mobile B2C Business Model](image)

Figure 2.1: Mobile B2C business model

### 2.2.1 Mobile Commerce Development

Telekom Trend Report has estimated that there are almost 200 million people who are using mobile commerce application today, and their numbers are expected to increase more
than double (Primedia Business Magazine, 2004) (figure 2.2). Most of them concentrated in Europe and Asia. The main consumptions are digital content and marketing promotions and advertising that carrier or partners are tossing at them. It accounts for 6.8 million in revenue today and will account for half a trillion in 2008.

According to Haque (2004), the U.S has the lowest percentage of households using alternative devices for Internet access besides computer as compared to other industrialized countries. In U.S, only 7.6 million households have alternative Internet access, devices enable cell-phone, net-enable PDA and interactive TV. Market Research Company Reckoms reported that almost 60% of the U.S population would be using wireless web terminal by 2007 (Rudkin, 2001).

The use of mobile phones and applications are popular in the entire Asia-Pacific region (Haque, 2004). Japan, Australia, Hong Kong and Singapore are the most ready market for wireless data in the Pacific Region. According to Fitchard (2004) the percentage of the adoption of mobile commerce will increase from 48% in 2003 to 54% in 2008. The Japanese market, which has over 4 million wireless Internet users, becomes the largest cellular market in Asia-Pacific (figure 2.3).

In Malaysia, Malaysians are generally excited about using mobile technology, as reflected by the astonishingly growing numbers in the adoption of wireless technology (Haque, 2004). According to the IDC Malaysia, the numbers of mobile users in Malaysia expected to grow rapidly from 4 million users in year 2000 to 9.3 million by the end of 2003 (Hamman, 2001). However, even though the usage of mobile phone is high, m-commerce is
still relatively low and new compared to the European and other Asia-Pacific countries such as Japan, Taiwan, Hong Kong and Singapore.

In Malaysia, most Malaysian organizational leaders are still lagging in providing m-commerce services because of the low penetration Internet rate in Malaysia (Tan, 2002). However, with the growing numbers of mobile users, the m-commerce market has good potential. Because of the m-commerce is still at its early stage in Malaysia, its customer application is confined to services such as e-mail, mobile information provisioning, ticketing, advertising and entertainment (New Strait Times, 2002). By the end of 2003, the wireless services that are made available include SMS, WAP, GPRS Bluetooth and WLAN. Nevertheless, the market prospects for m-commerce in Malaysia is high and emphasis is on the wireless device for shopping activities. The lack of confidence over security standard practices by merchants contributes to the low penetration in the region (Tan, 2002).

![Graph showing the number of global m-commerce users from 2003 to 2008.](image.png)

Figure 2.2 Global m-commerce users
Source: Primedia Business Magazines (April, 2004)
2.3 Mobile Banking

Mobile banking can be defined as the provision of information and services by a bank to its customers via mobile devices in a wireless environment (Suoranta and Matilla, 2003). According to them, mobile banking is a subset of e-banking, which utilizes mobile phone technology. Innovations in telecommunication have led to the use of mobile devices in banking services. Mobile banking is among the newest electronic delivery channels to be offered by banks. Currently, conducting an account balance and transaction history inquiries, funds transfer, bill payments, stock trades and quotes, portfolio management as well as insurance ordering are technologically enabled via a mobile devices. Even though technology and applications for these services are available, the usage rates internationally have been fairly low and in fact, in most developed countries, financial institutions have only recently begun to offer mobile services to customers.
For banks to attract new business era and maintain its existing customers, consumers must be able to reach financial institution through multiple channels. Most of the banks now are not yet using wireless channels as a means to conduct bank transactions. For now, they are only focusing on information provision; using the wireless channels as a tool to disseminate information on banking transactions rather than using it to conduct banking transactions (Ramasaran, 2004). Most of the banks claimed that by employing the wireless channels, the opportunity to reach customers that couldn’t be reached before has increased. Bumiputera-Commerce Bank (BCB) expects to attract 15,000 mobile banking customers within a year following its new collaboration with Maxis Communication Bhd. The bank expects exponential growth in the take-up rate of the service with up to 50,000 customers utilizing mobile banking facility in the future. Bank Simpanan Nasional (BSN) on the other hand is working with Celcom Bhd to provide a wider range of mobile banking services for their respective customers (Sadna, 2003).

For customers, the existence of mobile banking services facilitate the provision of information or services (Durkin, Howcroft, O’Donnell, Quinn, 2003). Customers now are presented with more alternatives to access the bank services. They are free of being in front of their PCs. According to O’Connel (2004), the demand for wireless banking services are increasing; the culture is changing; people want the services to be served when they want it and where they want it. They may have to check their accounts all day because of waiting for specific funds. The freedom being away from PCs, and doing business without being tied to the bank offers them convenient. The popularity of cell-phones and text messaging are the drivers to the development of mobile banking services. The trend now is that the consumers only tend to use mobile banking services to get information on bills and payments, not transactions (Tan, 2002).
In Malaysia, the mobile banking service market is still in its infancy (Sadna, 2003). The newly emerged mobile banking services represent an innovation, where both intangible service and an innovative medium of service delivery employing high technologies are present. Thus the concept of innovation diffusion is even more intricate as technology and service aspect have an effect on the characteristics of mobile banking service (Mohr, 2001). The new technologies are expected to open up business opportunity in B2C market. Mobile banking is considered to be one of the most value-added and important mobile services (Lee, Mc Goldrick, Keeling, Doherty, 2003). Therefore, banks and financial institutions play an extremely important role in the m-commerce value chain (figure 2.4).

Figure 2.4: The position of banks and financial services in the overall m-commerce value chain
Source: DataMonitor Technology (May 2000)
3.1 Drivers of the Mobile Banking

This section discusses the drivers of mobile banking.

1. High penetration of mobile phone

The high penetration of the mobile phone throughout the world becomes an opportunity for the mobile banking to be developed. In Malaysia, the numbers of mobile users is rapidly growing from 5.1 million users in year 2000 to 14.6 million by the end of 2004 (Sidhu, 2005)(figure 2.5). The widespread use of cell phone is becoming a social phenomenon, especially among the younger group of consumers. The growing numbers of cell phone users makes a good promising in mobile banking market.

![Graph showing mobile subscriber growth in Malaysia from 1998 to 2004](image)

Figure 2.5: Malaysia’s mobile subscriber growth
Source: TheStar (Feb 2005)
2. **Technology advancement**

The development of mobile communication technology in the last few decades has been dramatic. 3G is the most recently developed mobile technology, providing advantages over the previous technologies in terms of bandwidth, packet routing, guaranteed quality of services and location based service (Cellular-News, 2000). The 3G technologies which offers the new capabilities are expected to open up business opportunities in business-to-consumer markets, especially in banking markets (Datamonitor, 2000). The technologies offers customers an added value services at a faster speed, networks with full multimedia capabilities and new generation mobile multimedia terminals could encourage real growth in the wireless financial services market. CIT Publications (2001) predicted that the growth of 3G subscribers would gradually increase after its launch to reach 15 million by the year 2010 (table 2.1). The dramatic development in communication technologies gives an opportunity for mobile banking development.

<table>
<thead>
<tr>
<th>Year</th>
<th>Business ('000s)</th>
<th>Consumer ('000s)</th>
<th>Total ('000s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>201</td>
<td>343</td>
<td>844</td>
</tr>
<tr>
<td>2004</td>
<td>1,159</td>
<td>1,896</td>
<td>4,194</td>
</tr>
<tr>
<td>2006</td>
<td>2,232</td>
<td>4416</td>
<td>8,455</td>
</tr>
<tr>
<td>2008</td>
<td>3,037</td>
<td>7060</td>
<td>11,990</td>
</tr>
<tr>
<td>2010</td>
<td>3,744</td>
<td>9554</td>
<td>15,001</td>
</tr>
</tbody>
</table>

Source: CIT Publications (2001)
3. **Consumers’ demands**

The changing consumer behavior will see a shift from transaction focus to relationship focus. Customer management now, becomes increasingly important (Harvey, 1997). According to her, the society is changing, especially the trend towards greater consumer empowerment; individuals are being given more responsibility for financial affairs. These changes have placed customers in a position to control almost all of their financial transactions over electronic channels. Patricio, Fick, and Falcodo (2003) stated that customers want the service to be available regardless of place and time. They demand a flexibility service; results produced for them at their convenient time and location. The changing attitudes of the customers are forcing the financial services to invest in information technology.

Bank Negara Malaysia has initiated a nation-wide survey in 2003 to assess the requirements, expectations and the satisfaction level of consumers on the quality of products and services offered by banking institutions (www.bnm.gov.my, 3rd January, 2005). The study has found that customers are looking for banking relationship. One of the main factors is product innovativeness with value-added features. Mobile banking represents potential leverage factors that can be used to substantially improve overall customer relationship.

4. **Competitive advantage**

Bank that provides the mobile banking services to the customers can differentiate itself from its competitors (Harvey, 1997). Traditionally, bank’s main channels are based on dealing over-the counter and through their branches. In order to
meet the customers' demands, the bank has to provide an alternative channel to the consumers. Besides meeting the customers’ demands, mobile banking services also offers the traditional players in the industry to use an extremely low cost distribution channels (Durkin, Howcroft, O'Donnell, Quinn, 2003). O'Connell (2004) stated that the goal which, financial institutions should set themselves is to create services to cater the needs of the customers: anytime, anywhere and any channels. More competitive banking system therefore, should produce benefits to their customers and the business in terms of easy access, quality service and competitive prices. In addition, O'Connell (2004) also mentioned that banks, which do not invest in information technology, may find itself losing customers to the banks that invest in information technology.

### 2.3.2 Architecture of Mobile Banking

The entities involves in mobile banking application are (figure 2.6):

1. Core banking applications that contain account information
2. Mobile banking applications that interface with the network
3. Service provider application that sends SMS to the wireless carrier
4. The wireless carrier who transports the messages to the mobile devices.
5. The mobile devices that is the end user interface to the bank
Figure 2.6 High level block diagram shows the participants in mobile banking
Source: Paladion Knowledge Series (January 2004)
There are three components of mobile banking applications involved in the mobile banking architecture; e-mail to mobile application (E2M), database to mobile application (D2M) and pull application (Paladion Knowledge Series, January 2004).

1. **E-mail to Mobile Application (E2M)**

The email in mobile (E2M) application is used to send promotional and informational messages to the bank’s customers. In this, the bank sends e-mail to the application in the required format. The E2M application then formats the message and sends it to the service provider who then sends the message to the wireless carrier. The wireless carrier delivers the message to the bank’s customers.

2. **Database to Mobile Application (D2M)**

The database in mobile (D2M application is used to send event driven messages to the bank’s customers. An event in this case may be crediting of money in account, payment of credit card, etc. The D2M application continuously checks for relevant changes in the database, and when a change is detected, it constructs a message in the correct format and sends it to the service provider who then sends the message to the wireless carrier. The wireless carrier delivers the message to the bank’s customers.

3. **The PULL Application**

The PULL application is used to receive customer request and to forward them to the core banking application. The customer first sends a pre-defined request code via SMS to the service provider’s registered mobile number. Depending on the message code, the service
provider forwards the SMS to a PULL application. The PULL application receives the request and forwards it to the core banking application for further processing.