USING THEORETICAL PERSPECTIVES TO EXAMINE THE ADOPTION OF MOBILE INTERNET AND WIRELESS PAYMENTS SERVICES

by

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A thesis submitted to the Faculty of Graduate Studies and Research

in partial fulfillment of the requirements for the degree of

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ABSTRACT

The objective of this research is to examine 17 cases of the adoption of mobile Internet and wireless payments services using the constructs of three theoretical perspectives: Christensen's disruptive innovation, Roger's diffusion of innovation, and Chesbrough's business model for open innovation. Using a method that involved the active participation of an industry partner, insights about the adoption of the mobile Internet and wireless payments were generated, a set of variables that can be used to predict the outcomes of similar future services were identified, and propositions that can be used to examine the adoption of wireless transactions were developed. This research contributes a method that incorporates the synthesis of insights from multiple theoretical perspectives with the involvement of an industry partner.

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GLOSSARY

2G	2nd Generation Mobile Network
2.5G	2nd Generation (enhanced data) Mobile Network
3G	3rd Generation Mobile Network
ACH	Automatic Clearing House
ARPU	Average Revenue Per User
ATM	Automatic Teller Machine
B2B	Business to Business
BREW	Binary Runtime Environment for Wireless
C2C	Customer to Customer
CDMA	Code Division Multiple Access
CDMA2000	Code Division Multiple Access 2000
1xEV-DO	CDMA 1x Evolved Data Optimized
1xEV-DV	CDMA 1x Evolved Data and Voice
CDPD	Cellular Digital Packet Data
cHTML	Compact Hyper Text Mark-up Language
CP	Content Provider
EFT	Electronic Fund Transfer
GPRS	Generalized Packet Radio Service
GSM	Global System for Mobiles
HDML	Handheld Devices Mark-up Language
HTML	Hyper Text Mark-up Language
IP	Internet Protocol

IrDA	Infrared Data Association
IrFM	Infrared Financial Messaging
ITU	International Telecommunication Union
J2ME	Java 2 Micro Edition
MMS	Multimedia Messaging Service
NFC	Near Field Communication
PCS	Personnel Communication Services
PDA	Personnel Digital Assistant
PIN	Personnel Identification Number
PKI	Public Key Infrastructure
POS	Point of Sale
PTD	Personnel Trusted Device
RFID	Radio Frequency Identification
SAT	SIM Application Toolkit
SIM	Subscriber Information Module
SMS	Short Messaging Service
TCP/IP	Transmission Control Protocol/ Internet Protocol
TDMA	Time Division Multiple Access
UMTS	Universal Mobile Telecommunications System
USSD	Unstructured Supplementary Service Data
WAP	Wireless Application Protocol
WML	Wireless Mark-up Language

1 INTRODUCTION

The mobile Internet refers to the use of a mobile device to access content available on the Internet, send and receive e-mails and multimedia messaging. Wireless payments refer to the use of a handheld mobile device to make payments at attended and unattended points of sale terminals and making online payments on the Internet.

The mobile Internet and wireless payments have been widely adopted in Japan and South Korea. These two nations provide users with unique mobile experiences of mobile Internet and wireless payments. Elsewhere, mobile operators, content providers and handset manufacturers are introducing similar services and the products required to support these services, with less enthusiastic results.

1.1 Objectives

This research has three objectives:

- To generate insights about the adoption of the mobile Internet and wireless payments services using a method that engages employees of an industry partner and multiple theoretical perspectives.
- To identify the variables that can be used to predict outcomes of the adoption of mobile transaction services.
- To develop propositions that can be used for future research on the adoption of mobile transaction services.

The outcomes of this research are:

- A method that can be used to examine the adoption of mobile services.
- An inventory of the mobile Internet and wireless payments services deployed globally.
- Insights generated from using three theoretical perspectives to examine 17 instances of the adoption of the mobile Internet and wireless payments services.
- Variables that can be used to predict the adoption of similar future services.
- Propositions that can be used for future research.

1.2 Relevance

This research demonstrates how multiple theoretical perspectives can be applied to explain the present and to predict the future outcomes in situations when abundant and convincing data is not available. This approach may reduce the cost of formulating what to do and avoid making costly mistakes when a technology is at an early stage.

The insights generated from this research may help better explain the adoption of existing mobile services and predict their future.

1.3 Contribution

This research makes at least two contributions. First, this research contributes a method that synthesizes insights from multiple theoretical perspectives and engages multiple stakeholders when abundant and convincing data is not available. The method can be

used to make sense of new business opportunities and perform environmental scanning for the purpose of saving time, avoiding costly mistakes, and reducing people burnout.

Second, it adds to the scant literature on the adoption of mobile Internet and wireless payments services. The literature on mobile transactions is at its early stages of growth.

1.4 Organization

The thesis is organized into seven chapters. Chapter 1 is the introduction. Chapter 2 reviews the literature on the adoption of information and communication technologies, mobile data and mobile commerce services. It also describes the three theoretical perspectives and the technologies that support the mobile Internet and wireless payments services. Chapter 3 describes the research method. Chapter 4 describes the different mobile Internet and wireless payments services that were examined. Chapter 5 provides the insights. Chapter 6 discusses the insights, makes cross case comparisons, identifies the variables that can be used to predict future outcomes in similar situations and develops propositions for future research. Chapter 7 draws conclusions, presents the limitations of this research and identifies opportunities for future research.

2 LITERATURE REVIEW

One often meets the argument that the adoption of mobile Internet and wireless payments services is difficult to understand due to a lack of relevant research. While there is much qualitative and quantitative work on the adoption of fixed line Internet and electronic payment services, this does not hold true for the mobile Internet and wireless payments services. However, much research has already been conducted on the adoption of traditional mobile phones and Internet services that are likely to converge into the services provided by and the mobile Internet. As mobile Internet and wireless payments is a young field, quantitative data is scarce and several companies that are involved in the deployment of these applications are not willing to publish details.

2.1 Mobile Internet

What is the mobile Internet? This is a vital question that needs to be clarified prior to engaging in any theoretical or empirical discussions. There are a number of definitions of mobile Internet. One broad recurring theme is shared by most definitions: "access to the Internet with devices that offer wireless connectivity". Access to the Internet is enabled by the following three interrelated units: the mobile device, the mobile network, and the mobile content. Examples of different forms of mobile devices are mobile phones, smart phones, personnel digital assistants (PDAs) etc. It is important to note that laptops or electronic notebooks are not included in this study. Mobile Internet is the ability to access targeted content available on the Internet from a mobile device. Many people misuse the term to imply access to all Internet content, but this is not possible due to hardware and

mobile infrastructure limitations. Much of the content accessible by Mobile Internet devices is formatted for access by specific mobile devices.

2.2 Adoption of information and communication technologies

In studies of information and communication technologies (ICT) adoption, different concepts, such as diffusion, adoption, appropriation and domestication are used. While these concepts are sometimes used to distinguish research on adoption in one direction from another, they have much in common. Also, researchers studying adoption share a common interest in understanding how information technologies and services are being adopted by end users of different kinds and in different contexts. Diffusion research has its foundation in marketing and economics, and studies the aggregate diffusion or adoption of a technology or service in an industry, a community, or in a society in general. Adoption research has its foundation in information systems research, and studies the adoption and use of traditional ICT in general and their use in organizations in particular. Uses and gratifications research has its foundation in media and communication theory, and studies the gratifications sought by adopters of different kinds of media. Domestication research has its foundation in sociology and studies the adoption, use and domestication of technology in a society with a particular focus on the societal consequences of technology domestication. From the review of the literature, we find that the research directions are quite different in level of analysis and in focus on the adoption process. For example, while diffusion research studies adoption at the aggregate level, adoption research studies adoption at the individual level, and while adoption research

focuses the description and explanation of adoption, domestication research is more concerned with the individual and societal consequences of adoption.

Most of the previous research on adoption of new technologies and innovations has focused on technology acceptance model TAM (Davis, 1989), theory of reasoned actions TRA (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980), theory of planned behavior TPB (Ajzen, 1991), and diffusion of innovations (Rogers, 1995). Technology acceptance model, TAM, introduced by Davis (1989) and Davis et al. (1989) is one of the most applied model explaining technology adoption and use within information services (IS) research. Developed to predict individual users' technology acceptance of a new technology, Davis (1989) defines the perceived ease of use as "the degree to which a person believes that using a particular system would be free of effort" and the perceived usefulness as "the degree to which a person believes that using a particular system would enhance his or her performance".

Davis (1989) proposes that these two particular beliefs, ease of use and usefulness, form a person's attitude towards using the technology. Tornatzky and Klein (1982) presented a meta-analysis on 75 articles on innovation research and concluded that especially three of the innovation characteristics, relative advantage, ease of use and compatibility, appear as constant determinants of adoption. Based on Rogers' earlier work, Moore and Benbasat (1991) applied the diffusion of innovations theory and developed a model of eight perceived characteristics of innovation which predict its adoption. The constructs include relative advantage, ease of use, compatibility, trialability, image, visibility, result

demonstrability, and voluntariness, first four attributes being the same as identified by Rogers (1995). Agarwal and Prasad (1997) noted in their study of World Wide Web (WWW) adoption that visibility, compatibility, trialability, and external pressure (voluntariness) were the most important factors affecting current use while future use was determined by only two factors, relative advantage and result demonstrability. From the previous research, some other antecedents of adoption include prior experiences with similar technology use (Taylor and Todd, 1995; Agarwal and Prasad, 1999), demographics such as age or education (Morris and Venkatesh, 2000; Agarwal and Prasad, 1999) and personal innovativeness (Agarwal and Prasad, 1998).

2.3 Adoption of mobile data and m-commerce services

Explanations for the adoption of mobile data services span from focusing on specific factors to suggesting general systemic explanations, such as the dynamics of industry ecosystems (Vesa, 2003). Henten et al. (2003) suggest technology, economy, market development and structure, marketing, socio-cultural, policy intervention and regulation as the relevant explanatory factors for the success of mobile data services. Pedersen (2001) suggested three general requirements for successful adoption of mobile data services; technology, business strategic, and behavioral requirements. Bohlin et al. (2003) compare the developments of mobile data services in Japan and Europe and oppose popular assumptions that differences in adoption rates may be explained by differences in technology, regulatory regimes, or cultural differences. Instead, they suggest the important differences are the coordinated and vertically integrated service concepts and the revenue models offered by Japanese operators. Empirical research on mobile banking

and WAP adoption supports both the importance of ease of use and usefulness in determining attitude towards using the technology and the effect of attitude on behavioral intention (Hung et al., 2003; Teo and Pok, 2003; Klejnen et al., 2004). Another construct prevailing in the recent studies is the intrinsic motivation, which describes the perceived enjoyment or fun associated to the use of the technology. Bruner and Kumar (2004) found that fun was especially important in determining attitude towards using handheld Internet devices. Pedersen (2005) found that technological attribute or innovation related properties, i.e. mobile Internet satisfaction, mobile content perception, mobile network stability, download/ upload quality, mobile Internet data transfer safety, and consideration of m-transactions are significantly correlated with perceived relative advantage contributing to pioneering users' decisions of adoption of mobile Internet.

The primary reason for adopting the mobile Internet is to reach and to be reached anytime and anywhere (Pedersen, 2005). Barnes and Huff (2003) have established that the trusted, branded, useful, easy to use and holistic package of services are the main factors contributing to the success of I-mode mobile Internet service in Japan. They argue that intense competition, technology fragmentation and lower vertical integration are the main reasons for failure of mobile Internet services elsewhere. Ishii (2004) argues that the mobile Internet serves distinctly different social functions from the PC Internet and it has positive effects on sociability with friends, while the PC Internet does not have such effects. Email via a mobile phone is exchanged mainly with close friends or family, whereas email via a PC is exchanged with business colleagues. Neither technological advantages nor telecommunication policy have promoted mobile Internet, it is the user

needs which have brought about the high penetration rate and unique usage patterns of the mobile Internet in Japan (Ishii, 2004). A recent study on the use of mobile Internet (A. T. Kearney, 2004) indicates that mobile Internet functionality is still too technical for average user and a majority of people, both business and residential users are confused about technology. They argue that the main challenge for mobile operators is to create product and service offerings that are simple to use and easily accessible for the mass market mobile Internet services.

2.4 Business models of mobile data and m-commerce services

The term business model has been used mostly in traditional electronic commerce. Timmers (1998) suggests that a business model describes the architecture for the product, service and information flows, including a description of various business actors and their roles, a description of potential benefits for the various actors, and a description of the sources of revenue. Thus, it includes infrastructure, value proposition and financial dimensions. Similarly, Weill and Vitale (2001) suggest that a business model is the "description of the roles and relationships among a firm's consumers, customers, allies and suppliers that identifies the major flows of products, information and money, and the major benefits to participants". Methlie and Pedersen (2002) included three operational dimensions in their business model concept; integration model, collaboration model and revenue model. They focus that individual providers' business model options are restricted by structural determinants and value network considerations because value creation in both mobile Internet and mobile electronic commerce requires a shared understanding of the business model of each network member. In some industries the

business models options of each value network member are indirectly determined by the business model of the dominant members (e.g. operators in some mobile services industries and operating system developers in the software industry). Recently, several authors have applied the business model concept to mobile services exploring the relationship between mobile data services business models and end-user adoption (Campanovo and Pigneur, 2003; Faber et al., 2003; and Bouwman, 2003). With some variations in propositions, these authors mainly suggest four dimensions of business models; the product innovation, the customer relationship, the infrastructure and the financial dimensions, covering the product related value proposition, the customer related value proposition, the structural dimension and the revenue dimension.

2.5 Evolution of mobile phones and mobile Internet services

Mobile phone services were started in the United States, Japan, Europe, and other industrialized countries in the early 1980s. Phones were initially based on analog technology and the digital services were introduced in the 1990s such that by the mid 1990s, most major industrialized countries had introduced digital services. Furthermore, the growth patterns were similar over most parts of the world. In each country, it began with business users in their thirties and forties and gradually expanded such that in countries with penetration greater than 60%, most people between the ages of 15 and 65 own mobile phones (Funk, 2004).

Mobile service providers have long dreamed of making money from data transmission. With the growth in the fixed-line Internet in the late 1990s, may firms saw a natural

convergence between the Internet and the mobile phones. Service providers dreamed of higher data traffic while handset manufacturers dreamed of selling more expensive phones. Mobile phone manufacturers saw both the potential of the mobile Internet and the danger in the form of Microsoft and, to a lesser extent, Palm Computing (then part of 3Com). They were afraid of that Microsoft may transfer its dominance of the desktop computer market to the mobile phones, and they did not want to see PDAs become the dominant method of accessing the mobile Internet (Funk, 2001). Nokia, Motorola, Ericsson, and Phone.com (formerly Unwired Planet) joined their forces and created the Wireless Application Protocol (WAP) Forum in June 1997, Symbian and Bluetooth in mid-1998 to fight both Microsoft's Windows CE and Palm Computing's operating system and browsers. The WAP Forum was charged with creating an open standard for mobile browsers that was based on WML (wireless mark-up language), Symbian was charged with creating an open operating system (called EPOC) for mobile phones and PDAs. Bluetooth was charged with creating an open standard for wireless communications in close proximity environment. By 1999, most of the mobile operators and handset manufacturers, including those in Japan and South Korea, had joined these organizations. Service providers in Japan began introducing mobile Internet services in 1999 and most of the other countries in 2000 with very different results. NTT DoCoMo Japan took a different path and started its proprietary service I-mode while the other operators based their services on the WAP standards. Accessing the Internet through the use of mobile phones has already become integrated into daily life for a significant proportion of the Japanese and South Korean population (Barnes & Huff, 2003). By the end of February 2005, more than 74 million Japanese out of 86 million mobile phone

subscribers and more than 33 million Koreans out of 37 million mobile phone subscribers were able to access the Internet through their mobile phones (Telecommunication Carriers Association, Japan; Ministry of Information and Communication, South Korea). I-mode is the most popular mobile Internet service, followed by the WAP (Wireless Application Protocol) based mobile Internet services in Japan and South Korea.

In the Europe and the United States, mobile Internet services were launched in a blaze of glory, by promoting WAP as the fairy tale marriage between the mobile phone and the PC-based Internet but the reality has fallen well short of such rosy expectations. User expecting something akin to the experience of the World Wide Web on their mobile phones were seriously disappointed (Vincent, 2001). Initial mobile Internet services in these markets were launched on top of the existing 2nd generation networks and users were disappointed by the long times (up to 40 seconds) that it took to establish a connection, the poor content, the small displays and the high price tags for the phones (Funk, 2001). The failure of WAP led to the unkind, but widely used phrases by the media such as: "WAP is crap", "Worthless Application Protocol", and "Wait And Pay".

Although the failure of WAP in Europe and the United States has been widely associated with the technical flaws and its implementation problems, the WAP has seen a huge success in Japan and South Korea. While the largest operator NTT DoCoMo has famously disdained WAP in favor of its in-house system I-mode, rival operators KDDI and Vodafone have both been successful with the WAP technology. South Korea is also

leading the world in providing advanced WAP services where the WAP on top of the cdma2000 network has been proven to be the state of the art wireless data infrastructure.

2.5.1 Wireless application protocol (WAP)

Wireless Application Protocol (WAP) is a technology which provides a mechanism for displaying Internet information on a mobile phone or any wireless device. This is done by translating Internet information in to a format which can be displayed within the constraints of a mobile device. WAP is an open standard, developed by the WAP Forum, which has over 500 members. Its founder members include the major wireless equipment vendors like Nokia, Ericsson and Motorola, plus the US software company, Phone.com (formerly Unwired Planet). The WAP Forum released version 1.0 in early 1998, version 1.1 in June 1999, and upgraded to version 2.0 in the 3rd quarter of 2000. The WAP Forum has now been consolidated into the Open Mobile Alliance (OMA) since 2002 and no longer exists as an independent organization. To obtain Internet access on a mobile device, the device should be WAP-enabled and the web site information should be described in WML (Wireless Mark-up Language) format.

2.5.2 I-mode

I-mode is a wireless technology developed by a Japanese company NTT DoCoMo, which enables users to access Internet services via their cellular phones. I-mode can be used to exchange e-mails with computers, personal digital assistants (PDAs) and other I-mode cellular phones. I-mode's underlying technology is uncomplicated, which makes it easy for content providers to create new I-mode services and easy for customers to find and

use them. It uses compact hyper text mark-up language (cHTML) which is basically a scaled down version of HTML. It is relatively easy and it takes little time to rewrite HTML into cHTML. I-mode was started with simple applications at transmission speed of just 9.6 kbps on a packet-switched network, which means that customers were allowed to pay not for time elapsed but only for the packets of data they download.

2.6 Current wireless technologies and transition to 3G

The wireless technologies currently in use are mostly 2.5G and higher. However, there exist a variety of standards that reflect the efforts of companies all over the world to establish wireless networks. Eventually, 3G will form the basis for mobile applications for the following years.

2.6.1 CDMA-2000

CDMA-2000 is the evolution path for operators of CDMA networks on their way to 2.5G and 3G. It is a further development of the CDMA-One standard widely used in the U.S. and some other parts of the world. CDMA2000 1X supports an average of 144 kbps of packet data in a mobile environment. The networks are packet-switched, allowing network operators a billing option according to the data that is transferred rather than based on the connection time. With the introduction of CDMA2000 1X EV-DO (Evolved Data Optimized), data rates ranging from 384 kbps to 2.5 Mbps are supported and finally CDMA2000 1X EV-DV (Evolved Data and Voice) will offer even higher data throughput with features such as simultaneous voice and data traffic. The CDMA standard family offers backward compatibility whereas support for IP and multimedia

capabilities will enable new services. The transition to 3G within this standard family is facilitated by the fact that all CDMA2000 networks rely on frequency bands of 1.25 MHz. A part of the frequency spectrum can be used for 3G, whereas the remaining frequency bands will still carry 2.5G wireless traffic. The CDMA standard supports both GSM/GPRS and UMTS networks.

2.6.2 GSM, GPRS and EDGE

The GSM standard was first published in 1990 by the European Telecommunication Standards Institute. It is the most popular standard as over 170 countries use GSM. It was extended to a more efficient standard called Generalized Packet Radio Service (GPRS) that is packet switched rather than circuit switched. GPRS is overlaying the GSM technology which results in backward compatibility of the new technology. The migration from GSM to GPRS, i.e. from 2G to 2.5G, is the first step to 3G. The advantage of GPRS is that it provides always on functionality, more efficient capacity utilization, flexible billing options and faster data rates. Enhanced Data for GSM Evolution (EDGE) is also intermediate standard for path towards 3G. It is based on packet switching and offers three times faster data transmission speeds than the GPRS networks.

2.6.3 W-CDMA

Wideband Code Division Multiple Access (W-CDMA) is a technology for wideband digital radio communications of Internet, multimedia, video and other capacity-demanding applications. WCDMA is the dominating 3G technology, providing higher

capacity for voice and data and higher data rates. The gradual evolution from today's systems is driven by demand for capacity, which is required by new and faster data based mobile services. WCDMA enables better use of available spectrum and more cost-efficient network solutions. The operator can gradually evolve from GSM to WCDMA, protecting investments by re-using the GSM core network and 2G/2.5G services.

2.7 Wireless payments

Wireless payment is the ability of a device such as mobile phone to conduct the payments wirelessly. We use the terms wireless payments and mobile payments interchangeably throughout the research. Krueger (2001) defines a mobile payment merely as "a payment carried out via a mobile phone". According to Soramaeki and Hanssens (2003), mobile payments represent a subset of electronic payments which they define as "the transfer of an electronic means of payment from the payer to the payee through the use of mobile device and an electronic payment instrument". The electronic payment instrument is further defined as "a payment instrument where the forms are represented electronically and the processes to change the ownership of the means of payment are electronic".

2.7.1 Background of payments

A payment is a transaction of a monetary value from one party to another party. This can be done through one or many intermediaries, such as a bank or a card company. Traditionally, in the real world, the most popular modes of payments are cash, cheques, debit cards and credit cards. With the possibilities created by the data networks and the public Internet, a new generation of payments appeared, such as electronic payments,

digital payments and virtual payments. A logical evolution occurred in the monetary value transaction environment due to the progress of technology. In fact, at the beginning, payments were mostly conducted on a face-to-face basis (cash, paper and card-based). As technology progressed, remote transactions gained in popularity with the development of data wired networks. The current trend is now to implement wireless systems that can handle remote as well as face-to-face mechanisms of payments with a single device.

2.7.2 Characteristics of wireless payments

Mobile phones have several characteristics that make them suitable for payment purposes. First, people have their mobile phones with them most of the time, which makes the new payment method easily accessible. Second, compared to computers, mobile devices are more personal in nature, which facilitates their use as a payment method and enables storing personal information in them (Begonah et al., 2002). Kreyer et al. (2003) divide mobile POS to manned and unmanned and note that customer demand for mobile payments is higher for unmanned service points, such as vending machines. Mobile payments are used in the physical environment at attended and unattended Point of Sale (POS) terminals by utilizing the technologies such as Radio Frequency Identification (RFID), Infrared Communications, Bluetooth, and Near Field Communications (NFC). In the virtual environment, mobile payments are conducted via telecommunication networks to purchase digital content such as ring tones, logos, wall-papers, horoscopes, and information and to make payments for physical goods via mobile Internet.

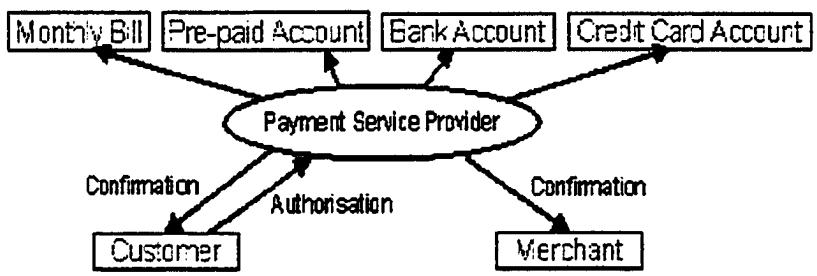
2.7.3 Micropayments and macropayments

An important strategic issue for mobile payment service providers is to choose the type of payment dimension they want to focus on. Although there is no strict bifurcation between the two, general understanding among different studies is that micropayments represent a payment which is below 10 Dollars and is usually not supported by cash or debit cards. Merchants are reluctant to accept credit card transactions for small amounts because of transaction fees. Consequently, mobile payments could be attractive substitutes for these types of transactions. On the other hand, macropayments, which are thus logically every payment above 10 Dollars, represent a real challenge for mobile payments. They need stronger security mechanisms because of the large amount of money involved and the greater possibility of fraud.

2.7.4 Structure of wireless payments

In spite of the differences between the various wireless payment systems, most of them are similarly structured. As we can see, in most cases a customer needs a payment intermediary.

Figure 1: Structure of wireless payments



(Source: Kruegner, 2001)

There are different reasons why a mobile phone has the potential to become a payment device in the future. The number of users of mobile phones are already considerable, and mobile payments can be made in all types of payment transactions, such as manned (any merchant), unmanned (vending machines, parking meters etc.), point of sale POS and e-commerce via a mobile phone.

2.7.5 Proximity and remote wireless payments

The location of purchase is another dimension that electronic payment has already changed. Face-to-face or proximity payments are the most common way to purchase goods. However, considering the explosion of e-commerce, remote payments are going to become more and more popular. A mobile phone can replace a wallet for small expenses at the point of sale (POS). Proximity payment transactions usually involve two parties using an ad-hoc network based on wireless technologies such as Bluetooth, infrared and radio frequency identification (RFID) which enable short range wireless payments.

2.8 Lessons learned from the literature review

The following lessons were learnt from the literature review.

Ease of use and usefulness

It is evident from the adoption literature that the products and services having ease of use and usefulness are adopted much faster by the end users.

Relative advantage, ease of use and compatibility

Relative advantage, ease of use and compatibility are very important factors that drive the adoption and appear as constant determinants of adoption of products and services in a large number of information services (IS) and information and communication technologies (ICT) research.

Image, visibility, and results demonstrability

Image, visibility and result demonstrability are also the important factors considered by the end users for the adoption of products and services.

Trialability and voluntariness

Trialability and external pressure (voluntariness) contribute towards affecting the current use of a product or service.

Demographics (age, education)

Demographics such as age, sex and education are the important factors that effect the adoption of IS and ICT products and services.

Intrinsic motivation

Intrinsic motivation is another construct prevailing in the recent studies, which describes the perceived enjoyment or fun associated to the use of the technology.

Mobile Internet – a disruptive innovation and foundation of a new industry

Mobile Internet is a disruptive innovation and the foundation of a new industry introducing new value chains, which requires mobile operators to play a more central and orchestrating role to coordinate the incentives of all participants in the value chain.

Micropayments

Micropayments are very small amount payments which are used to charge the users for the downloading of digital content on their mobile phones and are aggregated to the monthly bills of the users. The implementation of micropayments is prerequisite for the success on mobile Internet services.

Wireless proximity payments

The important factors for the adoption of wireless proximity payments are speed of transaction and ease of use.

Business models of mobile data and m-commerce services

The research on mobile data and m-Commerce services indicates that these services have business models that are significantly different from the traditional business models of mobile telephone service providers.

Lack of research on the adoption of mobile Internet and wireless payments

Most of the studies on adoption of mobile Internet are single case based. There is a lack of research on the adoption of mobile Internet and wireless payments.

2.9 Theoretical framework

Diffusion of innovations has historically frequently been an incredibly slow process. Slow diffusion of new ideas is still a great problem despite the fact that information can be moved around the globe in seconds. Diffusion of Innovation has a very great significance for the introduction of new products and new services. Significant uptake of new products and services can take many years despite the extremely great availability of information. The expansion of a market for a new product (and especially for products involving significant novelties) most often follows the laws established by the innovation diffusion research.

We have used the following three theories to generate the insights about the adoption of mobile Internet and wireless payments systems.

1- Theory of disruptive innovations by Clayton M. Christensen.

2- Capturing value from innovation by business models by Henry Chesbrough.

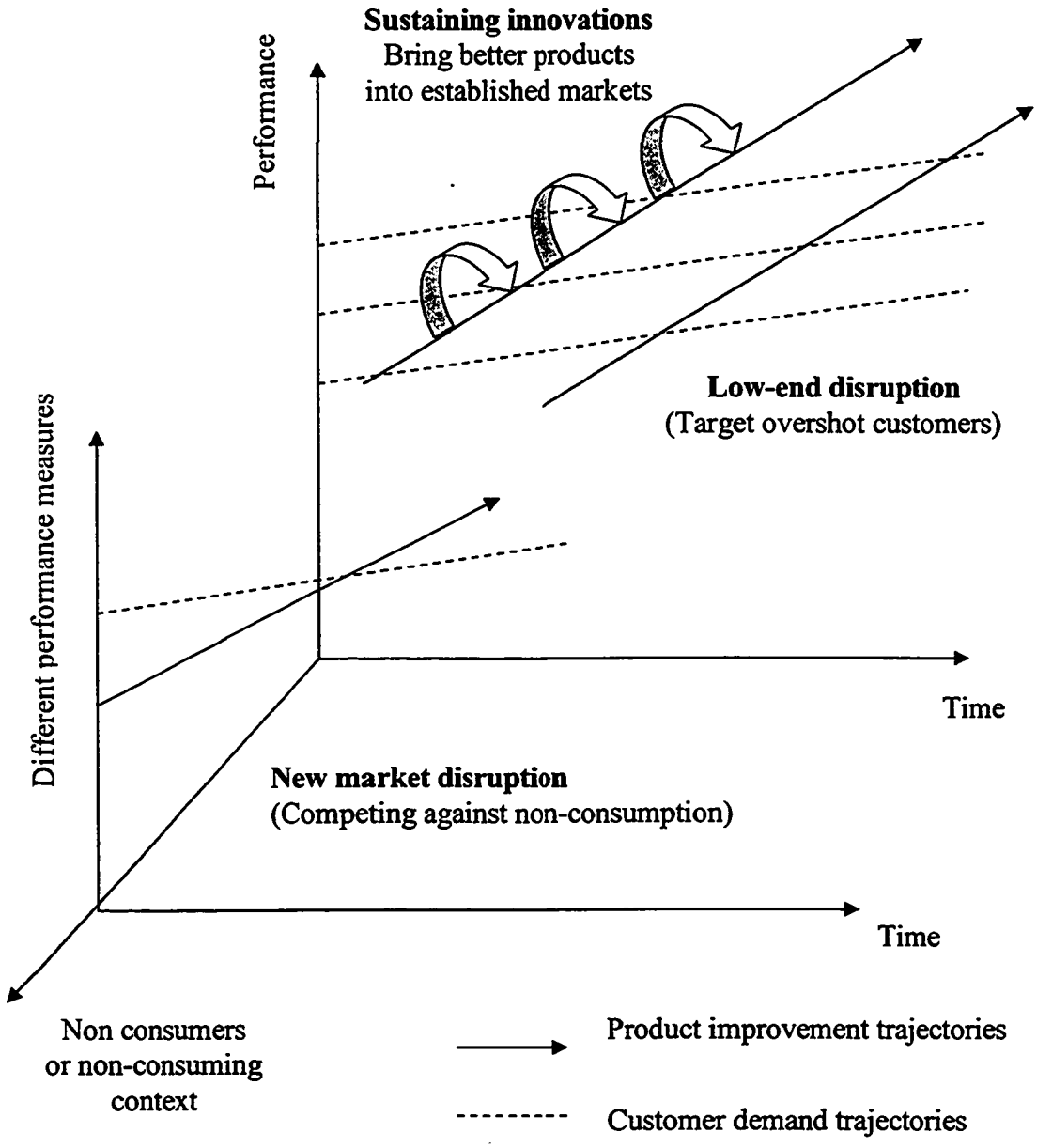
3- Theory of diffusion of innovations by Everett M. Rogers.

2.9.1 Theory of disruptive innovations

Disruptive innovations create an entirely new market through the introduction of a new kind of product or service, one that's actually worse, initially, as judged by the performance metrics that mainstream customers value (Christensen et al., 2004). Sustaining innovations are what move companies along established improvement trajectories. They are improvements to existing products on dimensions historically

valued by customers (Christensen et al., 2004). Disruptive innovations introduce a new value proposition. They either create new markets or reshape existing markets.

Figure 2: Disruptive innovations

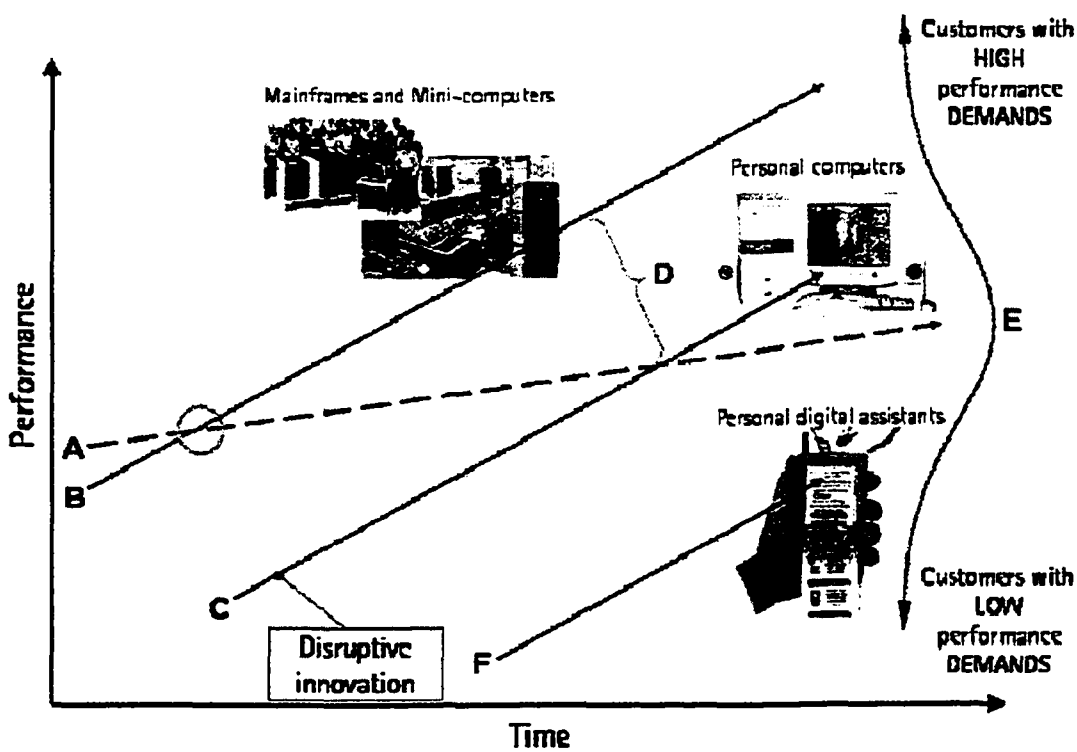


(Source: Christensen et al., 2004)

There are two types of disruptive innovations: new market and low-end. New market disruptive innovations occur when characteristics of a new product attract a large number of new users. Low-end disruptive innovations occur when existing products and services are "too good" and hence overpriced relative to the value existing customers can use.

- Low-end disruptions, which deliver a low-priced alternative to customers who are overshot by existing offerings (i.e. Dell's direct-to-customer business model); or
- New-market disruptions, which create new growth by making it easier for people to do something that historically required deep expertise or great wealth (i.e. eBay online marketplace, Kodak's original personal camera).

Figure 3: Mobile Internet – a disruptive innovation



(Disruptive innovation model adapted from Christensen et al., 2004)

2.9.2 Capturing value from innovation with business models

A successful business model creates a heuristic logic that connects technical potential with the realization of economic value. The business model unlocks latent value from the technology (Chesbrough and Rosenbloom, 2002). The functions of a business model to capture the value from innovation include:

- Articulate the value proposition, i.e. the value created for users by the offering based on the technology;
- Identify a market segment, i.e. the users to whom the technology is useful and for what purpose, and specify the revenue generation mechanism for the firm;
- Define the structure of the value chain required to create and distribute the offering, and determine the complementary assets needed to support the firm's position in this chain;
- Estimate the cost structure and profit potential for producing the offering, given the value proposition and value chain chosen;
- Describe the position of the firm within the value network linking suppliers and customers, including identification of potential suppliers of complementary products and competitors;
- Formulate the competitive strategy by which the innovating firm will gain and hold advantage over rivals.

The process begins with articulating a value proposition latent in the new technology, by defining what the product offering will be and in what form a customer may use it. The business model then specify a group of customers or market segment to whom the

proposition will be appealing and from whom resources will be received. A customer can value a technology according to its ability to reduce the cost of a solution to an existing problem. Identification of a market is also required to define the architecture of the revenues- how a customer will pay, how much to charge and how the value created will be appropriated between customers, the firm itself and its suppliers of the complementary products. Once the value chain needed to deliver the offering has been identified, it must then address how it will appropriate some portion of the value for itself. The value network created around a given business shapes the role that suppliers, customers and third parties play in influencing the value captured from commercialization of an innovation. The value network increases the supply of complementary goods on the supply side, and can increase the network effects among consumers on the demand side. Positive alignment with the value network can leverage the value of a technology and failure to align with the value network can dissipate potential value. The firm has to play dominating role in the value chain to coordinate the incentives of all the elements of the value network.

2.9.3 Rogers' theory of diffusion of innovation

According to Rogers (1995), diffusion is the process by which (1) an innovation (2) is communicated through certain channels (3) over time (4) among the members of a social system. Diffusion is a special type of communication concerned with the spread of messages that are perceived as new ideas. The four main elements in the diffusion of new ideas are (1) the innovation, (2) communication channels, (3) time, and (4) the social system.

2.9.3.1 Innovation

An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. The characteristics of an innovation, as perceived by the members of a social system, determine its rate of adoption. Why do certain innovations spread more quickly than others? The characteristics which determine an innovation's rate of adoption are: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability.

Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes. The degree of relative advantage may be measured in economic terms, but social prestige, convenience, and satisfaction are also important factors. It does not matter so much if an innovation has a great deal of objective advantage. What does matter is whether an individual perceives the innovation as advantageous. The greater the perceived relative advantage of an innovation, the more rapid its rate of adoption will be.

Compatibility is the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters. An idea that is incompatible with the values and norms of a social system will not be adopted as rapidly as an innovation that is compatible. The adoption of an incompatible innovation often requires the prior adoption of a new value system, which is a relatively slow process.

Complexity is the degree to which an innovation is perceived as difficult to understand and use. Some innovations are readily understood by most members of a social system;

others are more complicated and will be adopted more slowly. New ideas that are simpler to understand are adopted more rapidly than innovations that require the adopter to develop new skills and understandings.

Trialability is the degree to which an innovation may be experimented with on a limited basis. New ideas that can be tried on the installment plan will generally be adopted more quickly than innovations that are not divisible. An innovation that is trialable represents less uncertainty to the individual who is considering it for adoption, who can learn by doing.

Observability is the degree to which the results of an innovation are visible to others. The easier it is for individuals to see the results of an innovation, the more likely they are to adopt it. Such visibility stimulates peer discussion of a new idea, as friends and neighbors of an adopter often request innovation-evaluation information about it.

In summary, innovations that are perceived by individuals as having greater relative advantage, compatibility, trialability, observability, and less complexity will be adopted more rapidly than other innovations (Rogers, 1995).

2.9.3.2 Communication channels

The second main element in the diffusion of new ideas is the communication channel. Communication is the process by which participants create and share information with one another in order to reach a mutual understanding. A communication channel is the means by which messages get from one individual to another. Mass media channels are

more effective in creating knowledge of innovations, whereas interpersonal channels are more effective in forming and changing attitudes toward a new idea, and thus in influencing the decision to adopt or reject a new idea. Most individuals evaluate an innovation, not on the basis of scientific research by experts, but through the subjective evaluations of near-peers who have adopted the innovation.

2.9.3.3 Time

The third main element in the diffusion of new ideas is time. The time dimension is involved in diffusion in three ways. First, time is involved in the innovation-decision process. The innovation-decision process is the mental process through which an individual passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision. An individual seeks information at various stages in the innovation-decision process in order to decrease uncertainty about an innovation's expected consequences. The second way in which time is involved in diffusion is in the innovativeness of an individual or other unit of adoption. Innovativeness is the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a social system. The third way in which time is involved in diffusion is in rate of adoption. The rate of adoption is the relative speed with which an innovation is adopted by members of a social system. The rate of adoption is usually measured as the number of members of the system that adopt the innovation in a given time period.

2.9.3.4 Social system

The fourth main element in the diffusion of new ideas is the social system. A social system is defined as a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal. The members or units of a social system may be individuals, informal groups, organizations, and/or subsystems. The social system constitutes a boundary within which an innovation diffuses. A change agent is an individual who attempts to influence clients' innovation-decisions in a direction that is deemed desirable by a change agency. A final crucial concept in understanding the nature of the diffusion process is the critical mass, which occurs at the point at which enough individuals have adopted an innovation that the innovation's further rate of adoption becomes self-sustaining. The concept of the critical mass implies that outreach activities should be concentrated on getting the use of the innovation to the point of critical mass. These efforts should be focused on the early adopters, as they are often opinion leaders and serve as role-models for many other members of the social system. Early adopters are instrumental in getting an innovation to the point of critical mass, and hence, in the successful diffusion of an innovation.

There are five adopter categories, or classifications of the members of a social system on the basis on their innovativeness: (1) innovators, (2) early adopters, (3) early majority, (4) late majority, and (5) laggards.

3 RESEARCH METHOD

3.1 Unit of analysis

The unit of analysis is a mobile Internet or wireless payments service.

3.2 Study period

The study period is from January 1999 to April 2005.

3.3 Research method

Table 1 provides the steps of the method used in this research. For each step, the dominant activity undertaken and the reason for the step are identified. The method shown in Table 1 was adapted from that described by Eisenhardt (1999).

Table 1: Research method

No	Step	Activity	Reason for the step
1	Getting started	Define a research question and the reasons why it will help understand the adoption of the mobile Internet and wireless payments. Question does not favor a theory or defines a set of hypotheses.	Focuses efforts. Provides grounding for measures.
2	Select first wave of cases	Specify population of services to be examined. Define success of service adoption. Identify first set of services to examine based on their data	Focuses on available service deployments. Allows investigators to identify the unique features of service deployments.

		availability and contribution to insights, not randomness	Provides flexibility to decide what type of service deployments to examine later.
3	Select different theoretical perspectives	Identify the theories that will provide the multiple lenses for the analysis.	Retains theoretical flexibility.
4	Define data collection protocols	Identify method that will be used to collect data and the role of investigators and employees of industry partners.	Strengthens grounding and foster different perspectives.
5	Collect data on first wave of service deployments	Collect news releases and other information publicly available on specific service deployments.	Shortens the time required for analyses and reveals the breadth and depth of data. Gains familiarity with the data.
6	Analyze the adoption of each service using multiple theoretical perspectives	For each service deployment, obtain insights for each construct of the selected theories.	Examines data and generate insights through theoretical lenses.
7	Shape insights	Iterate tabulation of evidence for each insight. Replicate logic across service deployments.	Sharpens insight definition, validity, and measurability. Confirms, extends and sharpens theory. Builds validity.
8	Compare with the literature	Sharpen constructs, insights and definitions.	Sharpens insights and raises theoretical level.
9	Retain theoretical flexibility	Keep theoretical flexibility; add theories that generate good insights and drop those which don't.	Improves the generation of insights from multiple cases.

10	Collect data on 2nd, 3rd and 4th waves of service deployment	Fix what did not work Repeat steps 5 to 9	Improves analysis with the help of industry participants. Sharpens insights and raises theoretical level.
11	Cross case comparison	Make cross case comparison about the insights generated from different cases.	Replicates logic across service deployments
12	Research closure on insights about the past	End process when incremental improvements about the insights become minimal.	Reaches theoretical saturation.
13	Identify variables that can be used to examine the adoption of other mobile transaction services	Identify different variable from the present research that can be used to predict the adoption of other mobile services.	Generalizes findings.
14	Develop propositions for future research	Develop propositions that can be used for future research on the adoption of mobile services.	Helps to predict the outcomes for similar cases in the future

3.4 Research question

Initially, the research question for this thesis was selected to be: "How to use multiple theoretical perspectives to examine the adoption of the mobile Internet and wireless payments services".

An initial definition of the research question, in broad terms, is very important to keep the research focused and to avoid becoming overwhelmed by data. Although early identification of the research question is helpful, it is equally important to recognize that

it is tentative and may shift slightly during the research. In this instance, the research question did not change significantly. It was modified to read: "How to use multiple theoretical perspectives to examine the adoption of the mobile Internet and wireless payments services, a space where abundant and reliable data is not available."

3.5 Selection of cases

Selection of cases is an important aspect of any research. The cases for this research were chosen for theoretical, not statistical reasons. Given the limited number of cases available, random selection was not used. Cases which were likely to replicate or extend theoretical abstractions and the cases which were of interest to the industry participants were selected for examination. The cases were selected from different regions of the world to maintain generalizability and to examine the adoption of different mobile Internet and wireless payments services.

The seventeen cases listed below were selected. Data was collected in four waves of cases. For each case, the name of the service is provided and the name of the operator and the country where the service was deployed is included inside the brackets.

1. I-mode (NTT DoCoMo, Japan)
2. M-mode (AT&T Wireless, United States)
3. Mobipay (Mobipay International, Spain)
4. Smartpay (Smartpay; China)
5. Dexit (Dexit, Canada)

6. FeliCa I-mode (NTT DoCoMo, Japan)
7. Sonera Shopper (TeliaSonera, Finland)
8. Zoop (LG Telecom, South Korea)
9. Moneta (SK Telecom, South Korea)
10. Octopus (Octopus Cards Ltd., Hong Kong - China)
11. Vodafone Live (Vodafone Group, Europe)
12. Vivo Wap (Vivo, Brazil)
13. EZweb (KDDI, Japan)
14. Vodafone Live (Vodafone Japan)
15. Nate (SK Telecom, South Korea)
16. EZi (LG Telecom, South Korea)
17. Magic-N (Korea Telecom freetel, South Korea)

Twelve cases of wireless payments were identified but not included in the sample of cases examined. Preliminary data was gathered and the cases were discussed with industry participants in monthly meetings. These cases were not included in the research due to: (a) their limited scope and horizon, (b) non availability of data (most of the cases were pilots and trials), and (c) minimal incremental learning.

The twelve cases identified but not included in the sample are:

1. DirectBill (Cingular Wireless, United States)
2. M-parking (Mobilkom, Austria)
3. Paybox (Paybox, Germany)

4. PayMint (Mint Ab, Sweden)
5. SpeedPass (ExxonMobil, United States)
6. Qpass (QPass, United States)
7. K-merce (Korea Telecom Freetel, South Korea)
8. PayPass (MasterCard International, United States)
9. M-pay bill (Vodafone, Europe)
10. Edy (BitWallet, Japan)
11. Payitmobile (Payitmobile, Germany)
12. Mondex (MasterCard International, United States)

3.6 Selection of theoretical perspectives

Initially, the following seven theoretical perspectives were selected to guide the generation of insights from this research:

1. Theory of disruptive innovation (Christensen et al., 2004)
2. Theory of diffusion of innovations (Rogers, 1995)
3. Value chain evolution theory (Christensen et al., 2004)
4. Idea inspection (Goldenberg et al., 2001)
5. Profiting from technology (Gans and Stern, 2003)
6. Perspective for using business models to capture value from innovations (Chesbrough & Rosenbloom, 2002)
7. Demand-based perspective on technology life cycles (Adner, 2002)

The theoretical perspectives of all seven theories were discussed with the industry partners in the preliminary sessions. It was decided to utilize only three theoretical perspectives due to three reasons: (a) high educating cost of industry employees in terms of time and resources, (b) high cost of acquiring the data, and (c) expected complexity of data analysis when using a larger number of theoretical perspectives. Data analysis was started with the following three theoretical perspectives:

1. Theory of disruptive innovation (Christensen et al., 2004)
2. Theory of diffusion of innovations (Rogers, 1995)
3. Value chain evolution theory (Christensen et al., 2004)

After the analysis of first wave of service deployments, it was decided to drop Christensen's value chain evolution theory and replace it with Chesbrough's theory of using business models to capture the value from innovation.

3.7 Data collection

The data was collected from public sources of information. Proprietary or classified information was not used in this research.

The following search engines were used to identify mobile Internet and wireless payment services that had been deployed worldwide.

1. Google (www.google.com)
2. Yahoo (www.yahoo.com)
3. Excite (www.excite.com)

4. Alta Vista (www.altavista.com)
5. Business Source Premier (www.library.carleton.ca)

The following phrases were entered into the search engines:

Mobile Internet, wireless application protocol, WAP, mobile data services, wireless applications, web phones, web enabled phones, mobile payments, wireless payments, micropayments, macropayments, contactless payments, proximity payments, remote payments, mobile commerce, and m-commerce.

The names of different mobile Internet and wireless payments services were attained as a result of these searches. This writer then entered the name of each service in different search engines and collected all the news releases, white papers and online articles relevant to the service. For each service, the information in the website maintained by the operator that delivered the service was examined.

3.8 Data analysis

The data collected for each case was examined using each of the three theoretical perspectives. The process allowed the unique patterns of each case to emerge and enabled the comparison among cases for different patterns.

3.9 Multiple investigators

The insights generated from each wave of cases were discussed with industry participants and the thesis supervisor. The use of multiple investigators has two key advantages. First, the convergent perceptions added to the sharpening of insights for empirical and theoretical grounding while conflicting perceptions kept the group from premature closure. Second, multiple investigators enhanced the creative potential of study as their complementary insights and different perspectives added to the refinement of constructs. The convergence of observations enhanced confidence in the findings.

3.10 Enfolding the literature

An essential feature of this research is the comparison of the insights generated with the extant literature. A key to this process is to consider a broad range of literature. The literature discussing similar findings is important as it ties together literatures normally not associated with each other. This results in better ability to generalize and a higher conceptual level.

3.11 Research closure

Two important questions pertaining reaching closure need to be answered: when to stop adding cases and when to stop iterating between theory and data. Adding the number of cases was stopped when the employees of the industry partners suggested that the incremental learning was minimal. The iterations between theory and data were stopped when the supervisor decided that the incremental improvement and refinement to the insights were minimal.

4 INVENTORY AND WRITE-UPS OF CASES

Seventeen cases of mobile Internet and wireless payments services were studied during this research. The cases were selected from different regions of the world. The data was collected in four waves of cases. The data was analyzed within-case by the multiple investigators after each wave by iterations between data and theoretical perspectives. In order to cope with the staggering volume of data, it was considered helpful to prepare the write-ups of cases. These write-ups are simply pure description but they are central to the generation of insights because they help us to cope early in the analysis process with enormous amount of qualitative data. The write-ups provide a brief description of the cases which gives us a rich familiarity with each case which in turn is helpful for the cross case comparison to generate the insights.

4.1 I-mode (NTT DoCoMo, Japan)

Introduction

I-mode is the mobile phone Internet service offered by NTT DoCoMo in Japan. It was started in February 1999 and offers easy access to more than 82,000 Internet sites. As of February 2005, NTT DoCoMo has 48.34 million cellular subscribers out of which 43.51 million subscribers are I-mode users. I-mode was started with simple applications like ring tones, logos, and news at low data rates 9.6 kbps on PDC network. The content has evolved from simple applications to more rich graphics and games. With I-mode, cellular phone users get easy access to Internet sites and digital content as well as specialized services such as e-mail, mobile banking, ticket reservations, and restaurant advice.

Type

I-mode service is based on the proprietary technology and protocol and has a micro-payment system and the access charges for downloading the digital content are aggregated to the monthly bill of the user.

Technology

I-mode is based on a foundation of technological advances and by embracing packet transmission, the service offers continuous access to the Internet. The content is created in cHTML that allows existing sites available in HTML to be converted to mobile content with ease.

Characteristics

Users can access sites and download digital content such as ringtone, games and entertainment content at very low rates, because their charges are based on the volume of data transmitted, not the amount of time spent connected. There are two types of web sites accessible through I-mode, official and unofficial. NTT DoCoMo takes care of the billing or micropayments for official sites only and has complete control over the quality of content. One of the key strengths of I-mode is the fact that it remains connected to the Internet at all times. This means there's absolutely no need to dial up to access the Japanese and English-language web sites. I-mode didn't just generate new revenue for the company, it is a resounding success with customers and has redefined the meanings of mobile communications.

Target market

I-mode targeted the teenager, young, active and fun loving users who have excessive time to kill while traveling on mass transit or out of home.

Business model

I-mode has been phenomenally successful in Japan because it has created a "win-win" situation for all partners and stakeholders. The business model of I-mode is a revenue sharing model between content providers and NTT DoCoMo with a ratio of 91:9. The company collects information access fees on behalf of content providers by presenting subscribers with a single consolidated bill. I-mode offers a win-win situation for both developers and subscribers. Content providers are free to concentrate on the provision of information while NTT DoCoMo takes care of all billing on their behalf, while more and more subscribers are attracted by the constantly updated wealth of exciting and convenient content. NTT DoCoMo not only earns revenue from the 9% commission but also from the increased data traffic on its cellular network.

Stakeholders

NTT DoCoMo created new value chain of service provider, content providers and handset manufacturers. It synchronizes the entire I-mode value chain, in order to develop ever-better mobile service for subscribers. The close collaboration with equipment manufacturers, content providers, and other platforms ensures that wireless technology, content quality, and the user experience evolve at the same optimal pace. Ultimately, this synchronization guarantees that customers, partners and shareholders have their interests

aligned with the end-user's, enabling all parties involved in the value chain to maximize value and continually improve the quality of all products and services connected with I-mode.

Drivers of adoption

Mobile Internet access and digital content downloads are the main drivers of adoption. NTT DoCoMo controls the quality of the content and handset specifications. All content is continually updated, kept as comprehensive as possible, and designed for maximum clarity and attractiveness. Since subscribers judge the value of mobile Internet services on the basis of the quality of content, the provision of high-quality content is crucial for attracting more customers. The company has also kept up the quality of content by setting high standards for operability and the nature of services. Other content providers offer services through their own sites in response to demand, thus energizing the I-mode service, attracting more subscribers, and serving as an impetus for additional high-quality content.

Innovation diffusion

Handsets are heavily subsidized by the company which is a big incentive for the young users. In addition, users pay low monthly fees variable packet fees. These usage charges are based on the volume of data sent / received rather than on time spent connected. For multimedia services, the company has introduced a flat rate plan.

4.2 Mobile Internet services in Japan

The other two mobile operators in Japan who saw the initial success of I-mode service quickly followed its revenue sharing business model and offered their mobile Internet services with different underlying technologies. The mobile operators implemented the micropayments services to charge for the downloading of digital content created by different content providers and charged 8-12% as service charges leaving a good piece of the pie for the content providers. As of February 2005, Japan has 86.14 million mobile subscribers out of which 74.27 million subscribers are mobile Internet users (Source: Telecommunication Carriers Association, Japan). When people talk about Japan's wireless Internet market and its success, I-mode is the term that immediately comes to mind. However, NTT DoCoMo's I-mode service is not a monopoly, but only one part of Japan's wireless picture. As of February 2005, I-mode has 58.6% of the wireless Internet market, EZweb has 24% and Vodafone Live (former J-Sky) has 17.4%.

4.2.1 EZweb (KDDI, Japan)

EZweb is the mobile Internet service offered by KDDI, the second largest mobile operator in Japan. It was started in April 1999, just after two months of the launching of I-mode. KDDI introduced packet services at the end of 1999 and micropayments services in April 2000. As of February 2005, KDDI has 17.85 million users of EZweb out of 22.70 million mobile subscribers. EZweb is based on WAP standard and utilizes WML (wireless mark-up language). The service was enhanced to CDMA2000 1x service in April 2002 that allows downstream data transmission at speeds of up to 144kbps and upstream data transmission at 64kbps and to CDMA 1X EV-DO in November 2003,

enabling high speed data communications of up to 2.4Mbps. KDDI introduced the flat rates for mobile Internet service in December 2003. A new range of services including downloading of the full track music, sending video clips with emails and picture messaging were introduced. EZweb targeted the teenagers and young users who have excessive time to kill while traveling on mass transit or out of home. The students were offered 50% rebates than the ordinary users to attract a large number of students. The initial business model of EZweb was based on charging per KB of data but KDDI introduced a flat rate charging model when it launched its 3G services. The company collects information access fees on behalf of content providers by presenting subscribers with a single consolidated bill.

4.2.2 Vodafone Live (Vodafone, Japan)

Vodafone Live (formerly known as j-sky) mobile Internet service was launched by Vodafone (then J-Phones) Japan in December 1999. The service is based on WAP standard and MML (Mobile Mark-up Language). As of February 2005, Vodafone Japan has 12.91 million Vodafone Live users out of 15.10 mobile subscribers. Vodafone Live includes the most popular email service, Sha-mail introduced in November 2000. Vodafone introduced the first phone with an internal camera and complementary mail service in early 2001 and movie Sha-mail which is video messaging in March 2002. Vodafone Live has been upgraded to 3G multimedia services since November 2004. Vodafone has exclusive arrangements with content providers based on revenue sharing business models. The Mobile Mark-up Language (MML) used for its content is very similar to cHTML used by I-mode so the Vodafone Live users can also access I-mode's

un-official web sites. Initial pricing plans were based on the event basis but now with the launch of 3G networks, flat rate pricing plans have been introduced.

4.3 Mobile Internet services in South Korea

The mobile operator of South Korea launched their mobile Internet services following partially the revenue sharing business model of the I-mode service. The penetration of mobile Internet service in South Korea is too high. At the end of 2004, there were 36.92 million mobile phone subscribers out of which 33.68 million were mobile Internet users (Source: Ministry of Information and Communications, South Korea). There are three mobile operators in the country and all offer the mobile Internet services. The operators have revenue sharing business models and partnerships with content providers.

4.3.1 Nate (SK Telecom, South Korea)

Nate is the mobile Internet service launched in October 2001 by SK Telecom, the largest mobile operator in South Korea. The service is based on WAP standard and runs on CDMA network. At the end of March 2005, there were 17.53 million users of Nate service from a total 18.93 million mobile subscribers. The network was upgraded to 3G, CDMA 1X EV-DO in August 2002 enabling high speed data communications of up to 2.4Mbps. The mobile Internet service was enhanced to 3G multimedia through streaming video, multimedia messaging service (MMS), video on demand (VOD), and mobile broadcasting service that provide real time news and information on entertainment, games, movies and music. SK Telecom is the largest operator with market share of 51.3% and offers innovative content services through mobile Internet platform. SK

Telecom retains a revenue share with CPs on 10:90 basis (that is, 10:90 = SK Telecom: CPs) for its 2G services. In case of 3G multimedia services, the company has established partnerships with content providers and invested in content creation business and has increased its share to 30% with 70% going to content providers.

4.3.2 Magic-N (Korea Telecom Freetel, South Korea)

Magic-N mobile Internet service was started by Korea Telecom Freetel, the second largest mobile operator is South Korea in April 2000. There are 10.80 million users of mobile Internet service out of 11.95 million mobile subscribers at the end of March 2005 (Source: Ministry of Information and Communication, South Korea). The initial services were based on 2.5 G CDMA networks and were enhanced to 3G multimedia services in November 2001 based on Binary Runtime for Environment for Wireless (BREW).

4.3.3 EZi (LG Telecom, South Korea)

EZi is the mobile Internet service launched in May 1999 by the third largest mobile service provider, LG Telecom in South Korea. The service is based on WAP standard and runs over a CDMA network. At the end of March 2005, there were 5.35 million users of EZi service out of 6.04 million mobile subscribers (Source: Ministry of Information and Communication, South Korea). The EZi services include multimedia messaging, chatting, dating, club, stocks, banking, lottery, weather, traffic, news and games. LG Telecom is the third largest mobile operator in Korea with a market share of 16.3 % and offers easy to use mobile Internet service targeted at young users.

4.4 M-mode (AT&T Wireless, United States)

Introduction

Mobile Internet service "M-mode" was launched by AT&T Wireless in 2002 in the United States. The service itself is modeled on the popular "I-mode" wireless service offered by the Japanese mobile carrier NTT DoCoMo who owns 16 percent shares of AT&T Wireless. According to AT&T Wireless report, M-mode has passed the early adopter stage and 40% of the new users also subscribe for M-mode service.

Type

M-mode is a mobile Internet service based on WAP and it has a micropayments billing system to take care of the billing for downloading the digital content and charging to the monthly bill of the subscriber.

Technology

M-mode is based on WAP standards and runs on 2.5 G network. The service has been enhanced to multimedia services with the launch of 3G networks in some cities in 2004.

Characteristics

The M-mode service includes features such as instant messaging, content downloads like ring tones, music, sports scores or news stories, and the ability to connect with personalized data like address books and calendars.

Market segmentation

M-mode is a mobile Internet service and has five different packages. The monthly fee and transmission charges of data packets depend on the type of package subscribed.

Target users

With the M-mode service, AT&T Wireless has gone after two markets: business users and young users. They have geared many of the communication and entertainment functions to young people, while the informational and organizational functions to business types.

Business model

AT&T Wireless has signed contractual agreements with content providers to supply the content for M-mode service and to share the revenue. AT&T Wireless does not establish or control a new value chain with the content providers so there is no specifiability of the content and the same content is available to other operators too.

Drivers of adoption

Due to the interoperability problems among different carriers using multiple wireless systems in the United States, the adoption of SMS text messaging remained low as compared to Europe and other Asian nations so a small number of users were familiar with text services. It is too expensive for the young users who have down time as they need a GPRS compatible handset to access the M-mode service and there is no subsidization on the handsets. For business users, the relative advantage of M-mode

compared to sophisticated devices such as Palm pocket pc and Blackberry remains low. Mobile Internet service is usually used by the commuters who have ample time to kill. In the United States, most of the mass transit in big cities is underground having no cellular communication and most of the commuters drive their own vehicles and they cannot use the M-mode service while driving.

Innovation diffusion

M-mode's content features the usual suspects: news headlines, sports scores, stock quotes, weather updates, and so on. M-mode content's main problem is that it's not sticky. Very few of the services, including those that have a premium charge over and above the M-mode monthly fee bring users back repeatedly. And another problem is that many of the useful content services are available to AT&T Wireless subscribers for free (costing only airtime) from the carriers' #121 service. Users simply dial #121 from their mobile and use a voice-driven system to get things like stock quotes, sports scores, movie times, driving directions, and even shopping. The user is offered very little incentive to use the M-mode service, not only when it's duplicated by an existing and cheaper option, but also when that cheaper option is even easier to use.

4.5 Octopus (Octopus Cards Limited, Hong Kong-China)

Introduction

Octopus payment card was launched in September 1997 by Creative Star Limited renamed as Octopus Cards Limited in 2001, share-held by major public transportation companies in Hong Kong. It is the world's leading and most pervasive contactless smart

card payment system. There are over 11 million cards in circulation, and the system handles an average of 8.7 million transactions per day, valued at HK$60 million amounting to a total of US$ 2.2 billion (HK$ 17.2 billion) a year. It is also available in over 300 other organizations including car parking, fast food chains, convenience stores, supermarkets, vending machines, photo booths, pay phones, cinemas, leisure facilities and schools. There are over 30,000 Octopus processor terminals.

Type

It is a card based wireless payment service used primarily as mass transit pass, payment of fare at transportation system and shopping in virtually all of Hong Kong. The card can be pre loaded with cash value of up to HK$ 1000.

Technology

Octopus card uses the built-in microchip contactless smart card technology developed by Sony to store the account information of user.

Characteristics

Octopus card has multi function applications. It can be used mass transit pass and to pay for purchases at convenience stores. With contactless card, the handling time is sharply reduced and the passengers need not remove the card from their wallets or purses—they simply wave their wallets and purses over the reader.

Target market

Octopus card is targeted at daily commuters who travel on mass transit, busses, trains and fairies in Hong Kong. It has the widest scope of usage and more than 95 per cent of the population aged 16 to 65, is using Octopus.

Drivers of adoption

At present, it is the world's first and largest multiple-purpose contactless smartcard system with the highest circulation of more than 11 million cards. It makes traveling in Hong Kong simple and convenient. Adding money to the card is very simple and can be done at ticket counters or card machines available all over the country. Moreover twenty major financial institutions (banks and credit card companies) offer automatic add value service. Octopus card is a successful example of applying chip or smart card technology to everyday life and make life more convenient. Hong Kong is a small place where the population density is very high and the transport network is very well-developed. This enables the Octopus system to be widely used and remain highly popular. Card users can use their cards in almost all modes of public transportation.

Stakeholders

It is operated by Octopus Cards Limited, a joint venture of five public transportation companies. Hong Kong has numerous transport firms plying its roads, rails and waterways and most agreed to sign on to the Octopus system instead of trying to come up with their own card.

Business model

Octopus was first orchestrated by the Mass Transit Railway Corporation (MTRC), which subsequently became the first company to implement the system. The ability of MTRC to coordinate with the other transport operators to deploy the same system was critical to the success of Octopus because it laid the foundation of standardization, which is usually the most difficult step in deploying any sector-wide system. It offers a win-win situation for all the stakeholders and users. It is not used by the operators as a product differentiator, but as a common service for all customers.

Innovation diffusion

Although Hong Kong is partly spread across islands, the territory is compact and densely populated, making it easier and cheaper to implement a system to which nearly everyone will have access. Like other metropolitan-area residents, Hong Kong residents have to commute some distance to work, often using multiple forms of transport. Before the Octopus card, it was possible to use a magnetic strip ticket within the railway systems, but customers paid for connecting services in coins. Octopus represented a win-win for all involved and removed the hassle of coins. Experiences of other countries making similar infrastructure transitions suggests that if the system being phased out coexists with new system, it jeopardizes adoption of the new system, because of existing infrastructure and habitual usage. In the case of Octopus, the deployment was a quick, direct conversion over several months with public announcements of the expiration date of the old stored-value tickets. Users had no choice but to buy a new card as quickly as possible.

4.6 Moneta (SK Telecom, South Korea)

Introduction

Mobile payment system "Moneta" was launched in 2001 by SK Telecom in South Korea. The IC Credit Cards were issued by prominent banks and credit card companies which can be inserted into dual slot mobile phones and included all conventional credit card functions and others such as e-money (Visa Cash), loyalty, and SK Telecom membership. In early 2003, the upgraded version of Moneta was introduced as 'Moneta Chip' - also recognized as a 'Credit Card in a Cellular Phone'.

Type

Moneta is a wireless payments service to make small amount payments at point of sale by linking the debit or credit card account to the IC chip installed inside the mobile phone. Moreover, SK Telecom also offers mobile Internet service "Nate" and 3G multimedia service "June" which are used to access Internet, download digital content, music, streaming videos, mobile banking and stock trading.

Technology

It is a plug-in type IC credit card inserted into the mobile phone that contains the credit card information, which enables subscribers to use their mobile phone to pay for goods and services by IrFM (Infrared Financial Messaging) or RF (Radio Frequency) at physical point of sale terminals called "dongles".

Characteristics

Moneta links a consumer's mobile phone to his credit or debit account for payments at a retailer's point-of-sale. To make payments over Moneta, consumers point their mobile phones at an infrared device called 'dongle', which sits on the retailer's POS equipment, after keying in a four-digit PIN on their phone's keypad.

Stakeholders

SK Telecom introduced mobile phone-based credit card payments to its Moneta service by teaming with five credit card firms, Woori, Shinhan, Hyundai, LG and Korea Exchange Cards.

Drivers of adoption

A 10 million dollar fund was set up by SK Telecom to install the reader terminals at small businesses and shops. At the end of 2004, there were more than 470,000 point of sale terminals able to accept Moneta payments, which represent approximately 80 % of all payment points in South Korea. Users can also use their mobile phones to pay their fare for public transit. They simply wave their mobile phone over the receiver and the money is debited from their bank accounts. Moreover, mobile Internet penetration in Korea is too high. At the end 2004, the company has 18.93 million total mobile subscribers out of which 17.52 million users are mobile Internet users. 3G services were started in October 2000 and upgraded to cdma200 1x-EV-DO in 2002 that featured 2.4 Mbps transmission rate. Mobile Internet, music and game downloads, and multimedia content are driving the micropayments.

Business model

One seeming commonality between Korea and Japan has been the apparent convergence on the most suitable business and revenue share models for wireless Internet content. The original NTT DoCoMo revenue share model seems to have found its way to Korea as the most pragmatic and attractive scheme available to all parties. Fundamentally, SK Telecom retains 10% revenue from the content gives away 90% revenue from the content to the content providers. In the early days, SK Telecom simply accepted prefabricated content from content providers. Nowadays, SK Telecom and content providers jointly participate in producing, planning and marketing innovative content. As such, the business model changed when multimedia initiatives needed a heavy up-front investment. In these cases, SK Telecom has invested substantial capital in creation of multimedia content and increased its share from 10% to 30%.

Innovation diffusion

There are now over 470,000 dongles in locations ranging from retailers to restaurants and subway stations. In August 2004, the service was enhanced to allow online payments when buying from Internet sites. After purchase, an SMS is sent to the subscriber who connects to the Moneta Online Service and inputs a password. In January 2005, South Korea's three mobile operators, SK Telecom, Korea Telecom Freetel and LG Telecom have agreed on payment standards and set up a joint venture for mobile payments. It will allow customers of all three operators to make payments at point of sale terminals using different dongles and will save on overlapping investment.

4.7 Vodafone Live (Vodafone, Europe)

Introduction

Vodafone Live mobile Internet service was launched by Vodafone, world's largest mobile operators, in October 2002 initially in six European countries. In November 2004, the upgraded version Vodafone Live 3G was launched in thirteen European markets. It has approximately 16 million users at the end of 2004.

Type

Vodafone Live is a mobile Internet service and has a micropayments system to charge for the mobile Internet access and downloading digital content, full track music, games and entertainment content.

Technology

The service operates on Vodafone's GPRS and 3G networks and uses Wireless Application Protocol (WAP) standard. Micropayments for downloading digital content are aggregated and charged to the monthly bill of the mobile phone.

Characteristics

Vodafone Live is entertainment oriented with such features as chat, downloadable ring tones, games, access to e-mail and information services such as latest news, local maps and traffic reports. Customers are able to take and send picture messages, download and play the latest mobile games and polyphonic ring tones, send and receive voice, text and

e-mails, explore instant chat with friends, get the information they want and shop online with their mobile phones.

Target market

Vodafone Live is a mobile Internet service targeted to the young, active and fun loving users who want to use mobile multimedia services. It is initially aiming its 3G services at 18 to 34-year-olds whom it has labeled young, active and fun (YAF). Vodafone has created a new pricing model for Vodafone Live 3G service which is different from Vodafone Live service operating on 2G networks. This model is designed to charge the content purchase on an event basis and browsing is included in the bundles of services.

Drivers of adoption

Vodafone Live requires expensive, high-end handsets which are not subsidized by the operator and are usually differentiated by the handset manufacturers. Moreover, the mobile operators paid too high prices to the respective governments in all over the Europe for 3G spectrum allocations and they want to recoup their amounts through mobile data services and are unable to drop the prices below a certain level.

Business model

Vodafone has signed agreements with content providers. The special Vodafone live sites enable customers to retrieve news, entertainment and other information directly to their telephone screen -24 hours a day as a result of agreements with content partners. The most popular knock on the service is that it's built to generate per-transaction revenues,

whereas I-mode is designed to maximize traffic revenues. So, instead of being geared to generate traffic in volume like I-mode, Vodafone Live is dependent on encouraging individual transactions. With the Live! 3G portal, users do not pay for finding and downloading content, but only for the content itself which caused a shake-up in business models. Vodafone wants new revenue-sharing deals with its content providers, to 'partly offset' the lost traffic revenues.

Stakeholders

Vodafone, handset manufacturers and content providers are the main stakeholders in the mobile Internet business. Vodafone live was the first mobile service in Europe to integrate handsets, networks, content and services to produce an end to end, easy to use customer proposition.

Drivers of adoption

With 3G, the customer experience is transformed by faster download speeds and improved quality of sound and images. In the age of I-Pod, the promise of quick access to music is one of the most interesting of 3G's possibilities. Vodafone live started offering full-length downloads, initially from a choice of about 3,000 tracks which has been increased to 50,000 as of February 2005. Vodafone is charging £1.50 a song, nearly twice as much as Apple's i-Tunes, the online music store.

4.8 I-mode FeliCa (NTT DoCoMo, Japan)

Introduction

I-mode FeliCa mobile wallet service was launched by NTT DoCoMo in Japan on July 10, 2004. The company has sold 1 million FeliCa handsets by December 15, 2004 and 2 million by February 12, 2005. The wallet phone is the next stage in the evolution of mobile phones which can be used as prepaid electronic cash, tickets, access control cards, authorizations to access corporate networks, membership cards for clubs and loyalty programs. There are two ways to charge the FeliCa mobile phone with electronic money. It can be loaded with pre-paid cash amount of up to US$ 480 or can be linked to a credit card account.

Type

It is wireless payment service to make payments at point of sale, online shopping, mass transit ticket and commuter pass using a FeliCa enabled mobile phone.

Technology

It is a new service made possible by the synergy of two platform technologies, NTT DoCoMo's mobile Internet I-mode and Sony's contactless IC chip FeliCa which uses near field communication (NFC) technology jointly developed by Sony, Phillips and Nokia to transmit and receive the data to/ from the reader/ writer terminal.

Characteristics

The three distinct characteristics of I-mode FeliCa are network function, viewer function and multi-application function. Users can enjoy online services like charging or paying with electronic money or buying tickets, checking remaining balance and purchase history, and the convenience of several other services on a single mobile phone. There is a crucial difference between I-mode service and I-mode FeliCa service. In the case of I-mode FeliCa service, NTT DoCoMo takes advantage of the FeliCa-service infrastructure, which Sony has developed and expanded.

Target market

NTT DoCoMo targeted the users who want to pay at point of sale, mass transit ticket or as a commuter pass just by waving their FeliCa enabled mobile phones at the reading/writing terminal.

Stakeholders

NTT DoCoMo is collaborating with JCB, the international payment brand and AEON Credit Service, the retail affiliated credit card company to facilitate the linking of credit card accounts of users to their FeliCa mobile phones. FeliCa Networks, set up in January 2004, is a joint venture of NTT DoCoMo, Sony Corporation and East Japan Railways. Recently on 20th April 2005, NTT DoCoMo has bought 33.4% controlling stakes of Sumitomo Mitsui which is the second largest credit card company of Japan. NTT DoCoMo has also bought 10% stakes in JCB, another popular Japanese credit card

company. This provides DoCoMo a greater control of the value chain for mobile payments.

Drivers of adoption

In order to make operational the handset embedded with a contactless IC chip, it is necessary to install in shops and other facilities readers capable of reading data from the IC chip and writing new data into the chip. NTT DoCoMo has launched a 10 billion yen fund to cover the expenses for small businesses that want to install FeliCa reader/ writer hardware at point of sale. The company wants to help out small businesses that may want to support FeliCa but can't justify the investment in the equipment which will accelerate the adoption of its FeliCa service.

Business model

There are already two payment card networks in operation in Japan, Edy (Euro, Dollar and Yen) network by BitWallet Inc. which has around 4.5 million users and Suica card network by East Japan Railways which has around 10 million users. NTT DoCoMo is collaborating with both companies to leverage their existing customer base and networks and has made the FeliCa compatible with these both large networks. The company wants to make FeliCa as a defecto standard of payments as quickly as possible. It retains a small amount of commission from each transaction. Its primary initiative is to establish and manage platforms that enable service providers to offer user-friendly, high security mobile payment service.

Innovation diffusion

The Edy card is being used at 9,000 convenience stores and other shops in Japan and Suica card is being used to pay for mass transit tickets and as a commuter pass. Unlike the contactless IC card where the users have to go to a charging machine installed inside railway stations and convenience stores in order to charge the card with electronic money, the FeliCa enabled mobile phone users can charge their phones with e-money online via the I-mode network. Another advantage of the handset over the IC card is that its users can easily check the current balance of their e-money account and their payment records on the device's display. NTT DoCoMo introduced FeliCa because its service infrastructure has already been established, and the use of the infrastructure would enable the company to spread its new service in a short period of time. The new I-mode FeliCa service and I-mode smart-card handsets are among the latest examples of how DoCoMo is expanding the scope of wireless culture, turning I-mode mobile phones into multifunctional tools for everyday life.

4.9 Zoop (LG Telecom, South Korea)

Introduction

Mobile payments system "Zoop" was launched by LG Telecom in South Korea in April 2002. It is accepted at 80,000 point of sale terminals in South Korea. The mobile Internet service "EZ-I" was launched in 2000 and LG Telecom is the third largest wireless operator in South Korea and has 5.35 million users of its mobile Internet service "EZ-i"

Type

Zoop is a wireless payment service which provides various features including credit card purchases at point of sale and mobile coupon service. Users can make credit card payments with their mobile phones at such places as gas stations, restaurants and department stores. It is also used for mass transit ticket payments and for small purchases at point of sale.

Technology

The hand held devices and mobile phones are equipped with an infrared transmitter. Credit card information is integrated into cell phone chip which can be read by a special point of sale terminal called "dongle". Users point the phone at an infrared receiver attached to a store's register and enter a personal identification number (PIN). An infrared beam transmits credit card info via a secured standard called Universal Mobile Payment Service (UMPS) and the designated merchant service bills the users.

Characteristics

Zoop is a service that can completely replace the wallet with a mobile phone as it allows multi-card and multi-service functions. The credit card or debit card information is stored in the IC chip and the mobile phone becomes an electronic wallet.

Target market

The company has targeted the young and teenagers who have ample free time. Handsets are heavily subsidized by the operator to attract young customers.

Drivers of adoption

The government launched a three year plan in 2002 to transform the entire city of Seongnam, a densely urbanized suburb of Seoul, Korea into the first digital city. LG Telecom installed 10,000 dongles (readers/ writers) at point of sales and toll gates as a pilot project in the city which gave a boost to its usage. Moreover, Zoop also allows subscribers to pay for online goods using authorization codes sent over SMS. The option is particularly popular with younger Koreans who can add the cost to their mobile bills rather than needing a credit card.

Business model

LG Telecom has revenue sharing model with content providers. The company collects the amount for downloading digital content from content providers through its micropayments system and shares it with content providers. The game providers pay around 6% of the fee to the LG Telecom.

Innovation diffusion

In South Korea, almost every teenager and adult has a wireless handset. There are 36.92 million cellular subscribers in the country of 48 million and unlike the rest of the world, the mobile phone in Korea is a lot more than a tool for talking. The government also gave a boost to the telecom industry by selling 3G licenses on very cheap rates allowing Korean carriers to use the extra cash for building better networks and to subsidize the mobile phones. South Korea's three mobile players, SK Telecom, Korea Telecom Freetel (KTF) and LG Telecom have recently formed a joint venture in January 2005 and agreed

on one standard for interoperability of their mobile payments systems. LG Telecom has leveraged the ubiquity of mobile phones and the popularity of the mobile Internet to roll out Zoop. South Korea's Ministry of Information and Communication (MIC) recently laid down plans for interoperability in mobile payments at the point of sale for the country's mobile operators and banks.

4.10 Sonera Shopper (TeliaSonera, Finland)

Introduction

Sonera mobile payment service was launched by mobile operator Sonera in Feb 2000 in Finland. The service was upgraded to "Sonera Shopper" in March 2002. The Sonera Shopper service allows for payment at attended and unattended point of sales through Visa and Eurocard, as well as Sonera Shopper accounts by transferring money in advance.

Type

It is a wireless payment service which allows users to pay at attended and unattended point of sale. It reduces the need for cash and works as a complement to cash and credit cards.

Technology

It is primarily SMS based mobile payment system. To make payment at a point of sale, a customer sends a SMS message and personal code to a service number and in return receives his six-digit payment code that he shows to the cashier. He receives an ordinary receipt for his payment as well as a SMS message confirmation.

Characteristics

It is implemented in vending and parking applications as well as in kiosks and restaurants which allows customers to receive a specific product or service immediately by making a regular phone call, with payments being directed to the customer's phone bill, credit card or bank account. It offers a wide variety of applications from different vending machines to canteen services and from parking systems to new experiments like tunes from a jukebox, clean up services or even electricity.

Target market

The service operates by means of a conventional mobile phone and mobile phone subscription. There is no need to change the handset to use this service so all the mobile users can use it. The payment is aggregated until the end of the month and is charged either to the customer's credit card invoice or debited to his pre-paid Sonera Shopper account.

Drivers of adoption

The main benefit from the Shopper service is easiness of payment: payment is quicker, the need for cash is reduced and the consumer can be sure he is charged correctly. It is also integrated with the parking payment system where the payment is made by dialing a number and purchasing parking time. Sonera Shopper service can also be used to take care of bills, do shopping, check bank balance, buy tickets and pay for transport with a mobile phone regardless of place or time. For public transport system, a commuter sends

a text message to an advertised number which sends a text message in return that works as a ticket.

4.11 Vivo Wap (Vivo, Brazil)

Introduction

Vivo Wap mobile Internet service was launched in March 2003 in Brazil by the largest mobile operator VIVO, which is joint venture of Portugal Telecom and Telefonica Moviles.

Type

Vivo Wap is a mobile Internet service and has a micropayments system to charge the downloading of digital content to the monthly bill of the subscriber.

Technology

Vivo Wap mobile Internet service is based on the WAP standard and is offered on CDMA 1xRTT network. VIVO is further expanding its network to support multiple spread-spectrum technologies including 1xEV-DO and 1xEV-DV. The company has deployed BREW (from Qualcomm) for downloading the games to mobile phone.

Characteristics

The service enables users to download applications like ring tones, images, games and video clips directly to the mobile phone. Users can choose among more than 600

exclusive ringing tones. VIVO also introduced the premium video and TV content in the mobile phone.

Target market

The service has targeted both pre-paid and post-paid subscribers. Vivo's post-paid base has grown little, while the pre-paid base has grown rapidly - an indication that Vivo is benefiting from strong subscriber growth, but at the lower end of the market. At the end of Q2 2004, VIVO had 18.64 million pre-paid and only 4.87 million post-paid subscribers.

Business model

Due to the overwhelming growth of prepaid subscribers, ARPU levels in Brazil are lower than the rest of the world. Vivo has approximately 80% of its subscribers as pre-paid. Vivo has exclusive arrangements with some large content providers for 3G multimedia applications. There are not a large number of local content providers in the country.

Target market

The service targets both post paid and pre-paid users. The service is charged according to the coverage. Within the CDMA 2G area, the value is equivalent to a voice call to another VIVO mobile phone, following the plan of the user, and within the CDMA 1x RTT area, the user pays according to the volume of traffic, R$0.04/Kb in VIVO Post-paid plan, or R$0.05/Kb in VIVO pre-paid plan.

Drivers of adoption

VIVO has invested to put in place the CDMA2000 1x EV-DO technology for high speed data transmission which makes possible high-resolution streaming video. Demand for services delivering CDMA 2000 1X EV-DO is uncertain, particularly in a country with modest personal income, such as Brazil. The majority of new subscribers are pre-paid and the revenue from non voice services is around 4% of total revenue. Moreover, SMS interoperability was introduced in 2003 in Brazil and more than 180 million SMS messages sent per month.

4.12 Mobipay (Mobipay International, Spain)

Introduction

The mobile payment service "Mobipay" was launched in Spain by Mobipay International in January 2003. The service is a collaborative model of major financial institutions and all three mobile operators. It has the largest merchant base with over 54,000 retailers and has also been extended to 10,000 taxis in Spain.

Type

It is a wireless payments service via mobile phone for face to face transactions at attended and unattended point of sale (POS) and remote transactions (Internet shopping). The system allows users to pay for their purchases both online and offline, with their bank-issued credit and debit cards, or with e-cash drawn from prepaid accounts.

Technology

Mobipay is a mobile payment system based on messaging technology using Unstructured Secondary Service Data (USSD) control channel in the GSM network. Each transaction using Mobipay activates a message session (using USSD technology), which along with the bank cards allows an interactive exchange of messages between the financial institution and the payee (similar to the way ATMs work).

Characteristics

The Mobipay payment system functions as an activator of existing payment products (debit, credit, pre-paid; physical or virtual) using existing mobile phones. The Mobipay service allows mobile users to carry out a number of transactions like pay for the purchases at any point of sale, online shopping, cinema or concert tickets, recharge mobile pre-paid account, food orders placed by phone for home delivery, soft drinks or cigarettes bought from certain vending machines, pay taxis and other professional services which do not accept electronic payment.

Business model

Mobipay offers value proposition to all partners. Transaction volume is increased for financial institutions, credit card companies and banks, usefulness of cellular phone is increased for users and data traffic is increased for mobile operators.

Stakeholders

Mobipay payment service is operated by Mobipay International, which is a joint venture company of the leading Spanish Banks BBVA and SCH and all Spanish mobile operators, Telefonica Moviles, Vodafone and Amena.

Drivers of adoption

It enables the establishment of a single technology standard for mobile payment service avoiding the fragmentation of multiple technologies and platforms. It is not used as a product differentiator by the operators but as a common platform service. Mobipay users do not need to carry cards or provide others with their details. All they need is a mobile phone, and to be signed up to the Mobipay service at the financial institution they usually deal with. The onscreen dialogues relative to Mobipay payments are similar to those used by ATMs, so they are familiar to any regular cash point user. Security: Mobipay users have a personal code (similar to a payment card PIN) which only they know, and which must be keyed in to confirm every transaction ordered by mobile.

4.13 Smartpay (Smartpay, China)

Introduction

Smartpay mobile payment service was launched by Smartpay Ltd. in China in July 2004. The service had around 100,000 users as of December 2004 and offered in five provinces. The service allows its users to make the payments of monthly utility bills and mobile phone bills by SMS messaging from their cellular phones.

Type

It is a wireless remote payment service based on SMS text messaging addressing a niche market.

Technology

Smartpay uses SMS technology and works by linking a mobile phone number to a bank account. The mobile phone then acts as a "digital certificate", certifying a user's identity to allow processing of many kinds of payments.

Characteristics

The system allows mobile users to pay their utility bills, phone bills, top up their pre-paid accounts, purchase online gaming time, long distance VOIP minutes, ISP access, and other products and pay for them electronically by sending an SMS message.

Stakeholders

Smartpay has partnerships with the largest mobile operators China Mobile and China Unicom and seven commercial banks including Industrial and Commercial Bank of China (ICBC), China Merchant Bank and Agricultural Bank of China (ABC).

Business model

Smartpay gets customers from mobile operators China Mobile and China Unicom and shares with them the revenue collected from service charges on payment of bills.

Drivers of adoption

People in China are still getting a raw deal from banks and consumer services after more than 20 years of market reforms. China is mainly a cash based country, cheques are rare and there are only two million credit cards in a country of 1.3 billion. People have to wait in line for hours to pay for their monthly utility and telephone bills. China is the biggest mobile nation in the world with over 325 million mobile users. The payment system is based on SMS technology which is very popular among mobile users in China.

4.14 Dexit (Dexit Inc., Canada)

Introduction

Dexit is a small payment service launched in the fall of 2003 in Toronto Canada. At present, Dexit is accepted at around 350 locations within downtown Toronto and there are around 32,000 users.

Type

Dexit is a card based wireless payments service that lets users make small payments at convenience stores and other vendors using radio frequency identification (RFID) tags, which can be attached to their key chains or Telus Mobility cell phones.

Technology

Dexit was built around the 14443 protocol, which uses a passive tag with a read-range capability up to 10 cm using RFID technology.

Characteristics

The Dexit service enables consumers to pay for coffee, muffins, lunch and other low-cost items quickly and conveniently with the tap of a RFID (radio frequency identification) tag linked to a pre-paid account. It provides a service that complements existing cashless payment methods such as debit and credit by replacing cash payments in transactions too small for those other payment types. The money if refilled by using the reimbursement trough the bank or by using the automatic top-up feature.

Stakeholders

Bell Canada signed an agreement with Dexit in April 2004 to become Dexit's exclusive representative to merchants across Canada. The Bell Merchant Dexit Service is a solution designed to help merchants address many of the problems that are associated with cash transactions. Response times can be crucial to businesses, particularly with small cash transactions (under $25) where turnover and speed are important.

Target market

Dexit provides a service that complements existing cashless payment methods such as debit and credit by replacing cash payments in transactions too small for those other payment types. The service has been launched in the downtown Toronto and targets the thousands of office workers who have to wait in lines at busy convenience stores, coffee shops and fast food restaurants.

Drivers of adoption

The Dexit system is convenient as it avoids the carrying around heavy pockets full of toonies and loonies. Secondly, the tag is easy to refill by using the "automatic top-up feature" or, electronically through Internet banking.

5 INSIGHTS

The data regarding seventeen cases of mobile Internet and wireless payments was collected in four waves of four or five cases each. Multiple investigators through the lenses of three theoretical perspectives analyzed the data.

The use of various theoretical perspectives to generate insights was the most important part of this research. Theoretical flexibility was retained throughout this research. The theoretical perspectives which did not generate valuable insights were dropped and new theories were added as the research progressed. The insights were generated from the data by analyzing the data using following three theoretical perspectives:

1- Theory of disruptive innovations (Christensen, 2004)

2- Capturing value from innovation by business models (Chesbrough, 2002)

3- Theory of diffusion of innovations (Rogers, 1995)

The insights are organized in Table 2 to Table 16 using the three theoretical perspectives that generated them and the key constructs of each perspective.

Table 2: I-mode (NTT DoCoMo, Japan)

Theory	Insights
Innovation	Type: • Combination of (i) more access points relative to PC, (ii) new benefit to sustain mainstream cell phone market and (iii) new market for cell phones comprised of young users. Drivers of technology advances: • Cell phone advancements, mobile Internet and entertainment content drive mainstream market. Drivers of market: • Consumers who need to reduce time spent shopping drive new market • Consumers who need to derive benefits from downtime (e.g., teenagers, subway travelers) drive new market. Start: • Started with simple applications over low data speeds which were attractive to young users and then is being sustained with improvements such as more graphics, rich content, and multimedia applications.
Business Models	New value chain: • Operator established a new value chain of content providers, handset manufacturers, portals and technology providers. Control of value chain: • Operator orchestrates the value chain, defines specifications for handset vendors and requires exclusivity and quality of content. Revenue structures: • Operator shares revenue with content providers (9% ~ 91%) and offers win-win situation for all the participants of the value chain. Seeding startups: • Operator has more openness policies and seeded a large number of start-ups that created innovative and interesting content and applications.
Diffusion of Innovation	Advantage: • Relative to PC: ability to send and receive emails and other information anywhere anytime and to pay when out and pay without using a PC. • Relative to doing nothing while waiting: entertain, shop on the Internet, pay bills, obtain information, and complete stock trades etc. • High advantage to teenagers who want to kill time playing games and accessing information while on the move and away from home. Compatibility: • A large number of consumers were using SMS text messaging already. Complexity: • Started with simple, easy to use and interesting applications. Trialability: • Handsets are heavily subsidized by the operator. Observability: • High due to dense population centers and use of mass transit.

Table 3: EZweb (KDDI, Japan); Vodafone Live (Vodafone, Japan)

Theory	Insights
Innovation	Type: • Combination of (i) new benefit to sustain mainstream cell phone market and (ii) new market for cell phones comprised of young users. Drivers of technology advances: • Cell phone advancements, mobile Internet and entertainment content drive mainstream market. Drivers of market: • Consumers who need to derive benefits from downtime (e.g., teenagers, subway travelers). Start: • Started with simple applications over low data speeds which were attractive to young users and then improved by more graphics, rich content, and multimedia applications.
Business Models	Creation of new value chain: • Operator established a new value chain of content providers, handset manufacturers, portals operators and technology providers. Control of value chain: • Operator controls the value chain by orchestrating the incentives of all the participants. • Operator defines specifications to handset vendors and requires exclusivity of content accessible through its portal. Revenue structures: • Operators emulated I-mode's revenue sharing model with content providers (operator keeps 8-12 % and the rest of revenue goes to content providers) • Operator offers win-win situation for content providers, vendors and portals. Seeding startups: • Operator has more openness policies and seeded a large number of start-ups that created innovative and interesting content and applications.
Diffusion of Innovation	Advantage: • Relative to PC: ability to send and receive emails anywhere and anytime, shop online, pay bills and perform stock trading. • Relative to doing nothing while waiting: access entertainment content, obtain information, play games and listen music. • High advantage to teenagers who want to kill time playing games and accessing information while on the move and away from home. Compatibility: • A large number of consumers were using SMS text messaging already. Complexity: • Started with simple, easy to use and interesting applications. Trialability: • Handsets are heavily subsidized by the operators by $300 to $350. Observability: • High observability due to dense population centers and use of mass transit in large cities.

Table 4: Nate (SK Telecom, South Korea); Magic-N (Korea Telecom Freetel, South Korea); and EZi (LG Telecom, South Korea)

Theory	Insights
Innovation	Type: • Combination of (i) new benefit to sustain mainstream cell phone market and (ii) new market for cell phones comprised of young users. Drivers of technology advances: • Cell phone advancements, mobile Internet and entertainment content drive mainstream market. Drivers of market: • Consumers who need to derive benefits from downtime (e.g., teenagers, subway travelers). Start: • Started with simple applications over low data speeds which were attractive to young users and then improved by offering multimedia services.
Business Models	Creation of new value chain: • Operator established a new value chain of content providers, handset manufacturers, portals and technology providers. Control of value chain: • Operator controls the value chain by orchestrating the incentives of all the participants. • Operator has its own subsidiary manufacturing handsets and defines specifications to other handset vendors. Revenue structures: • Operator started with revenue sharing models with content providers taking 10-12% share for simple content applications. Seeding of start-ups: • Operator invested heavily in the creation of multimedia content by establishing partnerships with content providers and raised its revenue share to 30%.
Diffusion of Innovation	Advantage: • Relative to PC: ability to send and receive emails anywhere and anytime, access information, pay bills, bank and perform stock trading. • Relative to doing nothing while waiting: access entertainment content, shop online, obtain information, play games, download and play music, and watch streaming videos etc. • High advantage to teenagers who want to kill time, playing games and accessing information while on the move and away from home. Compatibility: • A large number of consumers were familiar with SMS massaging already. Complexity: • Started with simple, easy to use and interesting applications. Trialability: • Handsets supplied at very low prices. Operator has its own subsidiary manufacturing handsets. Observability: • High observability due to dense population centers and use of mass transit.

Table 5: M-mode (AT&T Wireless, United States)

Theory	Insights
Innovation	Type: • Combination of (i) new benefit to sustain mainstream cell phone market and (ii) new market for cell phones comprised of consumers with down time. Drivers of technology advances • Cell phone advancements and mobile Internet drive the technology. Drivers of market: • Business personnel who need to access information. • Gamers and consumers with downtime. Start: • Started with complex applications that require more device functionality and faster data speeds.
Business Models	Creation of new value chain: • Operator did not establish a new value chain. Control of value chain: • No organization controls the value chain. • Operator does not define specifications to handset vendors who can differentiate and control the price of handsets. Revenue structures: • Operator's initial emphasis was on the in-house creation of content. Operator does not have generous revenue sharing with content providers. Seeding of start-ups: • Operator did not seed a large number of content providers. Operator has less openness in its policies towards content providers.
Diffusion of Innovation	Advantage: • Relative to sophisticated devices such as Pocket PCs and Blackberry is low • Relative to free #121 voice based information access service is low • Relative to PC: ability to send and receive emails and other information anywhere and anytime and to pay when out and pay without using a PC. Compatibility: • A small number of consumers were using SMS text messaging already. Complexity: • Started with complex applications targeted for business users. Trialability: • No subsidization of costly handsets. • The service is too expensive for young users so there is low triability. Observability: • There is no cellular coverage in underground mass transit where users need to kill time.

Table 6: Mobipay (Mobipay International, Spain)

Theory	Insights
Innovation	Type: • Sustains existing payment methods by increasing the number of access points used to complete credit/ debit card transactions. Drivers of technology advances: • Phone and interactive text messaging are driving the technology advancements. Drivers of market: • Consumers who wish to pay using cell phone at attended and unattended POS and merchants who do not have point of sale (POS) terminals (e.g., taxis) and wish to accept credit/debit card payments.
Business Models	New value chain: • Mobipay International is a joint venture and a model of collaboration of all three mobile operators, leading banks and credit card companies. Control of value chain: • Payment solution is not operator specific i.e. all the three cellular operators of Spain use the same payment service. Revenue structures: • Mobipay is a joint venture of cellular operators and financial institutions based on revenue sharing among participants.
Diffusion of Innovation	Advantage: • Relative to point of sale (POS): more access points to complete credit/ debit card transactions. • Relative to cash: works with attended/ unattended point of sale (POS). Compatibility: • A large number of consumers were using SMS text messaging already. Complexity: • Requires interactive messaging, user code and personnel identification number (PIN) to complete a transaction. Trialability: • Available to all cell phone users who register to the service Observability: • Existing electronic payment systems has been extended to 10000 taxis and 4000 other merchants.

Table 7: Smartpay (Smartpay, China)

Theory	Insights
Innovation	Type • Provides new benefits to sustain mainstream cell phone market. Drivers of technology advances: • Cell phones and SMS messaging drive the technology. Drivers of market: • Consumers who wish to avoid waiting in long lines and to save time making bill payments (e.g., utility payments, mobile top-up, lottery ticket purchases etc.) drive the market.
Business Models	New value chain: • Operator did not establish a new value chain. Control of value chain: • Payment solution is not mobile operator specific but it has been offered by an independent payment service provider. Revenue structures: • The company gets commission ranging from 2% to 3% from utility companies to facilitate the bill payments using a mobile phone.
Diffusion of Innovation	Advantage: • Relative to cash or cheque: Users pay bills with cell phones without wasting time in long lines at bank counters. Compatibility: • A large number of consumers were using SMS text messaging already. Complexity: • Simple payment solution based on SMS text messaging. Trialability: • Available to all cell phone users who register for the service Observability: • Consumers waiting in the long line ups and wasting a lot of time to pay bills are being observed by the potential users of the service.

Table 8: I-mode FeliCa (NTT DoCoMo, Japan)

Theory	Insights
Innovation	Type: • Combination of two platform technologies: NNT DoCoMo's mobile Internet service I-mode, and Sony's contactless IC chip FeliCa Drivers of technology advances: • Cell phones advancements and E-wallet (pre-deposit, credit/ debit card integration) drive the technological advancements. Drivers of market: • Consumers who wish to save time making payments at point of sale (POS) and mass transit tickets/passes and who wish to use mobile Internet shopping drive the mainstream market.
Business Models	Creation of new value chain: • Operator has created a new value chain by leveraging and integrating two large electronic payment cards networks: EDY (Euro, Dollar, Yen) which has 4.5million users and accepted at 9000 stores and Suica railways pass which has 9 million users used for mass transit. Control of value chain: • Operator controls the value chain and defines specifications for handset vendors and requires exclusivity and quality of content accessible through its portal. Revenue structures: • Operator established a joint venture company BitWallet Inc. with Sony which owns the electronic payment cards network EDY. • Operator offers win-win for content providers, vendors and portals.
Diffusion of Innovation	Advantage: • Relative to carrying multiple payment cards: high relative advantage due to multifunction use (mass transit pass, ticket, loyalty card and electronic payment card) and ability to check account balance on handset display. • Relative to point of sale (POS) payments: fast speed of transactions. Compatibility: • A large number of consumers were using electronic payment card EDY and electronic railway and mass transit card Suica already. Complexity: • Simple, pay with the wave of phone - no PIN or user ID required. Trialability: • Handsets are heavily subsidized by the operator. Observability: • 10 billion Yen fund has been established by the operator to help merchants avoid upfront costs of terminals and pay later.

Table 9: Zoop (LG Telecom, South Korea)

Theory	Insights
Innovation	Type • Combination of (i) new benefit to sustain mainstream cell phone market and (ii) new market for digital entertainment content. Drivers of technology advances: • Credit/debit card data stored in the memory of a phone and short range infrared communications drives technological advancements. Drivers of market: • Consumers who wish to save time making payments at attended and unattended point of sale (POS) and for mass transit tickets drive the market.
Business Models	Creation of new value chain: • Operator collaborates with credit card companies and banks to implement the wireless payments. Control of value chain: • Operator collaborates with the financial institutions and the city government to install point of sale (POS) terminals and toll gates. Revenue structures: • Operator charges commission from banks and credit card companies on transactions made through its wireless payments system.
Diffusion of Innovation	Advantage: • Relative to point of sale (POS): faster transaction completion. • Relative to cash: consumers can pay will cell phones at attended and unattended POS without having for loose change in their pockets. Compatibility: • A large number of consumers were using different electronic payment cards already. Complexity: • Requires personnel identification number (PIN) to release the data to POS terminals. Trialability: • Handsets are heavily subsidized by the operator. Observability • Cell phone is being used as another payment vehicle for credit/ debit card payments at point of sale and mass transit applications. Observability is high due to dense urban population centers and high use of mass transit.

Table 10: Sonera Shopper (TeliaSonera, Finland)

Theory	Insights
Innovation	Type • Combination of (i) way to sustain cell phone by increasing the number of access points used to complete credit/ debit card transactions and (ii) new market for premium digital content using the mobile Internet. Drivers of technology advances: • Cell phone innovations, interactive text messaging, and mobile Internet drive the technological advancements. Drivers of market: • Consumers who wish to pay using cell phone at attended and unattended POS and who wish to use mobile Internet services
Business Models	Creation of new value chain: • Operator did not establish a new value chain of content providers and handset manufacturers. Control of value chain: • No organization controls the value chain. Operator does not define the specifications to handset vendors who can differentiate and control prices of handsets. • Operator does not control content and the same content is available on other cellular networks. Revenue structures: • Operator charges commission to banks and credit card companies for electronic transactions through its wireless payment network.
Diffusion of Innovation	Advantage: • Relative to point of sale (POS): more access points to complete credit/ debit card transactions. • Merchant doesn't need any special POS terminals as the payment system works on interactive text messaging. Compatibility: • A large number of consumers were using SMS text messaging already. Complexity: • Requires messaging, user code and PIN. Trialability: • Available to all cell phone subscribers. Observability: • Existing payment systems extended to attended and unattended point of sale (POS) and taxi payments.

Table 11: Dexit (Dexit Inc., Canada)

Theory	Insights
Innovation	Type • New market for radio frequency identification (RFID) based wireless payments. Drivers of technology advances: • RFID based wireless payments are driving the technological advancements: The RFID tags can be attached key fobs or cell phone covers. Drivers of market: • Consumers who wish to pay quickly for low dollar value items at point of sale (POS) at coffee shops, fast food shops and convenience stores drive the market.
Business Models	New value chain: • Operator did not establish a new value chain to implement the wireless payments solution. Control of value chain: • Wireless payments service provider cooperates with cellular operator to install RFID tags to the cover plated of mobile phones. Revenue structures: • Payment service provider charges users a fee each time when they top up their accounts and reload the RFID card with money. The operator also charges commission to merchants for processing the payments.
Diffusion of Innovation	Advantage: • Relative to point of sale (POS): faster transaction completion Compatibility: • A large number of users were using the debit card and credit card for making payments at point of sale. Complexity: • The wireless payments system is easy and very simple to use. All a user need is the wave of Dexit RFID tag (key fob or cell phone) at the reader terminal. Trialability: • Dexit RFID tag is easily available at very low cost which gives rise to trialability. Observability • The payment service is available primarily in the down town area and underground market having a lot of pedestrian traffic all the day.

Table 12: Octopus (Octopus Cards Limited, Hong Kong-China)

Theory	Insights
Innovation	Type: • It is not based on cell phones but is a low cost innovation- i.e. a stored value smart card which is primarily used for mass transit ticket and pass. Drivers of technology advances: • Contactless smart card using infrared communication is driving the technological advancements. Drivers of market: • Transportation ticketing applications on mass transit, busses, ferries and trains drive the main stream market. • Low value payments at point of sale (POS) for small purchases, vending machines, car parks, fast food outlets, cake shops, bakeries, supermarkets and convenience stores drive the new market. Start: • Started with simple electronic tickets and passes at mass transit.
Business Models	New value chain: • A new value chain has been created by forming a joint venture of all the five major public transport companies. Control of value chain: • Operator offers win-win for all participating companies and controls the value chain by coordinating the incentives and activities of all players. • It's not used by the operators as a product differentiator, but is being used as a common service for all customers. Revenue structures: • The operator charges a commission from all the public transport companies and merchants for processing the payments.
Diffusion of Innovation	Advantage: • Relative advantage for making payments at mass transit tickets and passes is high as compared to paying the fare with exact amount of coins. Compatibility: • A large number of passengers were using different magnetic strip cards to pay fares at mass transit already. Complexity: • It is a simple and easy to use as the payments are made with the wave of card and no contact or PIN is required. Trialability: • Every body can get Octopus card, cost of card is very low. Observability: • 11 million users, 8.7 million transactions per day, 95% of residents (age 16-65) posses Octopus cards and accepted all over Hong Kong at above 300 organizations and chains.

Table 13: Vodafone Live (Vodafone, Europe)

Theory	Insights
Innovation	Type • Combination of (i) new benefits to sustain mainstream cell phone market and (ii) new market for mobile Internet. Drivers of technology advances: • Cell phone innovations, mobile Internet and 3G multimedia applications (music, video, MMS, and 3D games) drive technology. Drivers of market: • Fun and entertainment loving young users and gamers drive the market. Start: • Started with non user friendly applications on WAP and upgraded to 3G multimedia applications.
Business Models	New value chain: • Operator established a new value chain of content and game providers. Control of value chain: • Operator defines specifications and requires exclusivity of content from leading entertainment brands. Revenue structures: • Operator copied the NTT DoCoMo's revenue sharing model with WAP offering but gets 40% instead of 9% from the content charges. Seeding of start-ups: • Operator has less openness policies towards new start-ups for provision of content and did not seed a large number of start-ups.
Diffusion of Innovation	Advantage • Relative to sophisticated devices such as Pocket PC, smart phones, personnel digital assistants (PDAs) and Blackberry is low. • Relative to PC: ability to send and receive emails and other information anywhere and anytime and to pay online without using a PC. Compatibility: • A large number of consumers were using SMS text messaging already. Complexity: • Initial WAP offerings on 2G circuit switching networks were very complex. Trialability: • There is no subsidization by the operator on the costly handsets. • Entertainment content is too expensive for young users (e.g. music downloads @1.5 pound per track which is double than Apple's iTunes) Observability: • As of March 2005, 13 million Vodafone-live users out of 147 million total mobile subscribers in 21 European countries.

Table 14: Moneta (SK Telecom, South Korea)

Theory	Insights
Innovation	Type • Contactless IC chip installed in mobile phones for making payments at attended and unattended point of sale (POS) terminals using infrared wireless communications. Drivers of technology advances: • Near field infrared communications and E-wallet (pre-deposit, credit/ debit card integration) drive the technological advancements. Drivers of market: • Users who want to save time making payments at POS and mass transit tickets/passes and mobile Internet shopping drive market.
Business Models	New value chain: • Operator cooperated with leading banks and credit card companies and created a new value chain. All the three operators have recently agreed on standards and formed a joint venture for installation of compatible POS terminals. Control of value chain: • Operator defines specifications to the handset vendors and offers win-win for all the participants. Revenue structures: • Operator invested heavily in upfront costs of multimedia content creation and enhanced its share from 10% to 30%.
Diffusion of Innovation	Advantage: • Relative to carrying multiple payment cards: multifunction use (e.g., handset can be used as transit ticket, loyalty cards and payment vehicle). • Relative to point of sale (POS): fast speed of transaction. Compatibility: • A large number of users were using SMS and other data services already. Complexity: • It is very simple and easy to use (i.e. pay with the wave of phone). Trialability: • Handsets are heavily subsidized by the operator and operator has a subsidiary company making mobile phones. Observability: • 470,000 terminals (dongles) installed which covers 80% of all POS.

Table 15: Vivo Wap (Vivo, Brazil)

Theory	Insights
Innovation	Type • Combination of (i) new benefits to sustain mainstream cell phone market and (ii) new market for mobile Internet. Drivers of technology advances: • Mobile phone innovations, mobile Internet and 3G multimedia applications based on BREW drive the technological advancements. Drivers of market: • Consumers who want to access mobile Internet for 3G multimedia applications (games, music, video, information and MMS) drive market. Start: • Started with WAP applications on 2G network and upgraded to 3G multimedia applications.
Business Models	New value chain: • Operator didn't establish a new value chain of content providers. Control of value: • Operator did not control the value chain. Handset manufacturers can differentiate their products and charge users high prices for various handsets. Revenue structures: • Operator collaborates with content providers for provision of exclusive content on its portal and charges a commission to content providers. Seeding start-ups: • Operator did not seed a large number of startups (content providers).
Diffusion of Innovation	Advantage: • Relative to PC: users can send and receive information anywhere and anytime. • Relative to doing nothing while waiting: entertain, shop on the Internet, pay bills, and access information etc. Compatibility: • Text messaging service (SMS) was started in 2003 so not a very large number of users were familiar with text messaging and data applications. Complexity: • Keeping in view the literacy rate of the country, the mobile Internet service is complex for average users. Trialability • There is no subsidization of costly handsets by the operator. • 80% users are prepaid who use cell phone just for voice communication. Observability • Only 4.5% revenue comes from non-voice services including SMS. Observability is low as there are not mass transits or large urban centers.

6 DISCUSSION OF INSIGHTS

During the course of this research, seventeen cases of mobile Internet and wireless payments were studied. It has been observed that although all the mobile Internet services are being provided by the mobile operators but wireless payments services are being provided by mobile operators as well as by independent payment service providers.

The mobile Internet service was observed to be a disruptive innovation. According to Christensen (2003), disruptive innovations improve some aspects of performance while reducing others, thus causing a new set of customers to be the first users. The mobile Internet is a disruptive technology when compared to the PC Internet. Mobile phones have higher portability but inferior displays, keyboards, and processing and memory capability than the PCs. This makes the mobile Internet most appropriate for those users who value portability over display, processing and memory capability.

Wireless payments service was observed to be a sustaining innovation by mobile operators. Most of the mobile operators are cooperating with financial institutions and credit card companies to integrate the debit card or credit card functionality into the mobile phones to sustain the existing mainstream cellular market.

This research has examines nine cases of mobile Internet services, four cases of wireless payments by mobile operators and four cases of wireless payments by independent payment service providers as detailed in Table 16.

Table 16: Summary of mobile Internet and wireless payments services

No	Operator, country	Mobile Internet service	Wireless payments service	Niche Market
	Mobile Operator	**Disruptive innovation**	**Sustaining innovation**	
1	NTT DoCoMo Japan	I-mode	I-mode FeliCa	
2	KDDI Japan	EZweb		
3	Vodafone Japan	Vodafone live (former J-sky)		
4	SK Telecom South Korea	Nate	Moneta	
5	Korea Telecom Freetel South Korea	Magic-N		
6	LG Telecom South Korea	EZi	Zoop	
7	Vodafone Group Europe	Vodafone Live		
8	AT&T Wireless United States	M-mode		
9	Vivo Brazil	Vivo Wap		
10	TeliaSonera Finland		Sonera Shopper	
	Independent Payment Service Provider			
11	Octopus Cards Ltd. China (Hong Kong)		Octopus	
12	Mobipay International Spain		Mobipay	
13	Smartpay China			Smartpay
14	Dexit Inc. Canada		Dexit	
	Total cases	**9**	**7**	**1**

6.1 Comparison of mobile Internet services

The mobile Internet services were observed to be disruptive innovations. Although the successful is very subjective term, we take number of users of mobile Internet service out of total mobile subscribers as the proxy measure for this measurement. Characteristics of different mobile Internet services are described in the following table.

Table 17: Mobile Internet- theory of disruptive innovations

Mobile Internet service	Targeted new users with disruptive innovation	Started with simple applications	Mobile Internet service users (M)*	Total mobile users (M)*	Result
I-mode DoCoMo, Japan	Yes	Yes	43.51	48.34	Successful
EZweb KDDI, Japan	Yes	Yes	17.85	22.70	Successful
Vodafone live Vodafone, Japan	Yes	Yes	12.91	15.10	Successful
Nate SK Telecom, South Korea	Yes	Yes	17.52	18.93	Successful
Magic-N KTF, South Korea	Yes	Yes	10.80	11.95	Successful
EZi LG Telecom, South Korea	Yes	Yes	5.35	6.04	Successful
Vodafone Live Vodafone, Europe	No	No	16	133	Less successful
M-mode AT&T Wireless United States	No	No	**	21.7	Un-successful
Vivo Wap Vivo, Brazil	No	No	0.3	25	Un-successful

*(M): Million

**: M-mode has reached early adopters stage- according to AT&T Wireless press release.

Insight 1

Targeting new customers with disruptive innovation

The operators in Japan and South Korea targeted new markets consisting of young and teenager users with the mobile Internet service. The first interaction between products and users in these markets was between young people and entertainment. The high mobility and ample free time of young people lead to their high use of the mobile Internet.

Theory

The theory of disruptive innovations (Christensen et al., 2004) argues that new market disruptive innovations lack the raw functionality of the products but bring new benefits such as convenience, customization, or low prices. The attribute bundle means that the product will only find success if it takes root among new customers or in a new context of use. Demanding customers who are already consuming a potentially competing product will reject the innovation because of its performance limitations. Competing against non-consumption entails a lower acceptance hurdle. The mobile Internet is disruptive technology when compared to the PC Internet. Mobile phones have higher portability but inferior displays, keyboard, processing and memory capabilities. Young people are more mobile and have less access to office and home as they spend most of their time outside. Due to their less emphasis on complex business applications and their higher propensity of trying new things, they are more willing to put up with smaller displays, keyboards and processing capability of mobile phones as compared to older people. Young people are major consumers of games and horoscopes and their

downloading of ringing tones and screen savers to personalize their phones is similar to their emphasis on personalizing clothing, hair, makeup, and handbags.

Table 18: Mobile Internet- Roger's theory of diffusion of innovation

Mobile Internet Service	Relative advantage	Trial-ability	Compa-tibility	Comp-lexity	Observ-ability	Result
I-mode NTT DoCoMo, Japan	High	Yes	Yes	No	High	Successful
EZweb KDDI, Japan	High	Yes	Yes	No	High	Successful
Vodafone live Vodafone, Japan	High	Yes	Yes	No	High	Successful
Nate SK Telecom, South Korea	High	Yes	Yes	No	High	Successful
Magic-N KTF, South Korea	High	Yes	Yes	No	High	Successful
EZi LG Telecom, South Korea	High	Yes	Yes	No	High	Successful
Vodafone Live Vodafone, Europe	Low	No	Yes	Yes	Some	Less successful
M-mode AT&T Wireless United States	Low	No	No	Yes	Low	Un-successful
Vivo Wap Vivo, Brazil	Low	No	No	Yes	Low	Un-successful

Insight 2

Relative advantage of mobile Internet for young users

The relative advantage of mobile Internet for teenagers and young users is high as compared to older people or business users. The mobile Internet service has high relative

advantage to young users who want to kill their free time or utilize the small free chunks of time to play games, chat with friends, send/ receive picture and video messaging and e-mails, and download music. Moreover, young people place less emphasis on the richness of the content than older people do, due to the fact that they have less experience and thus lower specialization.

Theory

According to Roger's theory of diffusion of innovations, relative advantage is a key factor in the diffusion of innovation. Relative advantage is the degree to which an innovation is perceived as better than the product/ service it supersedes. The degree of relative advantage may be measured in economic terms, but social prestige, convenience, and satisfaction are also important factors. It does not matter so much if an innovation has a great deal of objective advantage. What does matter is whether an individual perceives the innovation as advantageous. The greater the perceived relative advantage of an innovation, the more rapid its rate of adoption will be.

Examples

Mobile Internet services in Japan and South Korea are successful as they targeted the young users. M-mode is less successful as it targeted business users who have less relative advantage as compared to pocket PC, Blackberry, Palm and other high end handheld devices.

Insight 3

Compatibility with existing needs and past experience of young users

Mobile Internet service has more fit and compatibility with the needs of young users. Young users are more mobile so they put more emphasis on portability. They are the major users of entertainment content, messaging, e-mail, games and music downloads.

Theory

According to Roger's theory of innovation diffusion, compatibility is the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters. An idea that is incompatible with the values and norms of a social system will not be adopted as rapidly as an innovation that is compatible.

Examples

Mobile Internet services in Japan and South Korea are more successful as they target the young users who were already familiar with SMS text messaging. M-mode is less successful as they didn't target the young users and SMS adoption in the US was low. Vodafone Live in Europe is picking up as users were familiar with SMS.

Insight 4

Observability of mobile Internet usage

The adoption of mobile Internet services in Japan and South Korea has turned these nations into a complete mobile environment. Due to higher population density, people

use mass transit and other public transport excessively to commute from one place to other.

Theory

According to Roger's, observability is the degree to which the results of an innovation are visible to others. The easier it is for individuals to see the results of an innovation, the more likely they are to adopt it.

Examples

Mobile Internet services in Japan and South Korea are more successful due to higher observability in big urban centers and at the mass transit. M-mode is less successful as the urban centers in US are more scattered. For most of the large cities, mass transit is underground having no cellular communication.

Insight 5

Affordable prices for handsets and services

Affordable prices for handsets and services helped to attract a large number of young users.

Theory

According to Rogers' theory for the diffusion of innovation, trialabilty contributes to the fast adoption. Trialability is the degree to which an innovation may be experimented with

on a limited basis. An innovation that is trialable represents less uncertainty to the individual who is considering it for adoption, who can learn by doing.

Examples

In Japan and South Korea, the handsets are heavily subsidized by the operators to encourage the young people to adopt the mobile Internet services. Moreover, the monthly subscription and usage charges are very low and simple which contributed to the success of the mobile Internet services. M-mode in the US is less successful due to costly handsets and high usage charges. Vodafone Live 3G is getting some success in Europe due to reduced packet charges and introduction of flat rates for the service.

Insight 6

Simple initial applications and appropriate services

The successful mobile Internet services were started with very simple applications like ringing tones, screen savers, animated characters and horoscopes on low data transmission speeds (9.6 kbps). User learning has played a key role in success of these services. With the advancements in technology, the content has evolved from simple to more rich, graphic, and video and the handsets have evolved from simple to larger and colored displays, more processing power, more memory and more battery life.

Theory

The theory of disruptive innovations entails that the disruptive innovations usually bring very simple and easy to use products/ services to a new market. According to Roger's,

complexity of a product or service hinders its adoption. Complexity is the degree to which an innovation is perceived as difficult to understand and use. Some innovations are readily understood by most members of a social system; others are more complicated and will be adopted more slowly. New innovations that are simpler to understand are adopted more rapidly than innovations that require the adopter to develop new skills and understandings.

Examples

Mobile Internet services in Japan and South Korea are more successful as the service providers initially started with simple and interesting applications and focused on the initially appropriate and simple content. M-mode is less successful as they started with complex and demanding applications.

6.2 Mobile Internet services- capturing value with business models

According to Chesbrough (2002), a successful business model creates a heuristic logic that connects technical potential with the realization of economic value and unlocks latent value from the technology. The functions of a business model include:

- Identification of a market segment
- Articulation of the value proposition.
- Creation of value chain required to create and distribute the offering.
- Creation of business models, and cost and profit structures.
- Position of the firm within the value network

Table 19: I-mode (NTT DoCoMo, Japan); EZweb (KDDI, Japan); and Vodafone-Live (Vodafone, Japan)

Business model parameters	Insights
Identified market segment	• Operator targeted new users (teenagers) and young users who want to kill time playing games while on mass transit or away from home.
Clear value proposition	• Mobile Internet access, information, entertainment, music, multimedia messaging (MMS), e-mail, picture and video email.
Elements of value chain	• Mobile operator created new value chain of content providers, handset manufacturers, portals and services.
Defined cost and profit	• Operator offered revenue sharing model with content providers taking only 9% commission from content charges and also earns revenue from increased data traffic.
Position in the value network	• Central role of operator in value chain to coordinate the incentives of all players in the value chain. • Operator controls quality of content and defines specifications for handset manufacturers. • Operator has more open policy for content providers.

Table 20: Nate (SK Telecom, South Korea); Magic-N (KTF, South Korea); and EZi (LG Telecom, South Korea)

Business model parameters	Insights
Identified market segment	• Targeted new users (teenagers) and students. • Users who want to kill time playing games and accessing mobile Internet while on mass transit or away from home.
Clear value proposition	• Mobile Internet access, information, entertainment, music, multimedia messaging (MMS), e-mail, and streaming video.
Elements of value chain	• Mobile operator, content providers, and handset manufacturers are important elements of new value chain.
Defined cost and profit	• Operator offers revenue sharing with content providers taking a commission of 9% to 15% from content charges. • Operator invested heavily in content creation for multimedia services and established partnerships with content providers.
Position in the value network	• Operator created a new value chain of handset manufactures, content providers and technology providers. • Operator controls and defines specifications to other handset manufacturers and plays a central role in the value chain. • Operator established subsidiary firms manufacturing handsets.

Table 21: Vodafone Live (Vodafone, Europe)

Business model parameters	Insights
Identified market segment	• Young users and people who want to kill time playing games or accessing Internet while on mass transit or away from home/ office.
Clear value proposition	• Mobile Internet access, information, entertainment, music, multimedia messaging (MMS), e-mail
Elements of value chain	• Mobile operator, content providers, handset manufacturers, and technology providers are important elements of value chain.
Defined cost and profit	• Operator has revenue sharing model with content providers. • Operator increased its share to 40 percent from the content charges due to its sheer size.
Position in the value network	• Operator controls quality of content and defines specifications to handset manufacturers.

Table 22: M-mode (AT&T Wireless, United States)

Business model parameters	Insights
Identified market segment	• Operator offers high end data applications and market segmentation by different service packages for businessmen and professionals.
Clear value proposition	• Value proposition includes mobile Internet access, information, e-mail, and MMS.
Elements of value chain	• Operator did not create new value chain or strong relationships with content providers and handset manufacturers.
Defined cost and profit	• Operator has established contracts for proving content with large content providers (e.g. CNN, Disney etc.). • Operator gets revenue from increased data traffic.
Position in the value network	• No central role of operator in the value chain. • Operator has less openness to new start-ups (content providers).

Table 23: Vivo Wap (Vivo, Brazil)

Business model parameters	Insights
Identified market segment	• Operator has targeted both post-paid and pre-paid users
Clear value proposition	• Value proposition includes mobile Internet access, information, e-mail, and MMS.
Elements of value chain	• Operator did not create a new value chain of content providers and handset manufacturers.
Defined cost and profit	• Operator has exclusive content arrangements with foreign content providers. • Operator gets revenue from increased data traffic
Position in the value network	• No central role of operator in the value chain. • Operator did not seed a large number of local start-up companies to generate innovative content.

Insight 7

Capturing value from innovation with business model

The role of business model is very vital in capturing the value from a new innovation. I-mode created a rationale business model which is based on revenue sharing with the content providers. NTT DoCoMo created a revenue sharing model with content providers at a ratio of 91:9, i.e. 91% of the revenue goes to content providers and 9% to NTT DoCoMo as service fee. NTT DoCoMo solved the pay-for-content problem by implementing a micro-payment system which takes care of the billing for the content purchases and the charges are simply shown on the user's phone bill.

Theory

According to Chesbrough, a successful business model creates heuristic logic that connects technical potential with the realization of economic value. The business model provides a coherent framework that takes technological characteristics and potentials as input and converts them through customers and markets into economic outputs. The business model is thus conceived as a focusing device that mediates between technology development and economic value creation.

Examples

I-mode is very successful due to its business model. The other operators in Japan and South Korea emulated the same business model, while using different underlying technologies. M-mode is not that successful as it could not attract a large number of content providers. Vodafone Live in Europe is less successful as it is less generous in sharing the revenue with content providers i.e. 60:40 ratios.

Insight 8

Creating and dominating the value chain

The operator created and dominated the value chain of mobile Internet services, content providers, handsets, and portals. The operator plays a central and vital role to coordinate the incentives of all the players in the value chain.

Examples

The carriers in Japan and South Korea dominate the mobile Internet value chain. They vertically integrate, by acting as wireless Internet service providers, access providers,

mobile phone providers, retailers and content aggregators. For activities such as phone manufacturing and content provision, the carriers have established a very close relationship with the phone manufacturers for cooperative research and development, and with content providers, through exclusive sourcing agreements. This strategy has allowed them to assure supply of mobile phones and wireless Internet content; to influence the technology produced and to adapt the network, mobile phones and content to each other.

Insight 9

Seeding a large number of start-ups as content providers

Mobile Internet is just not a service but a complete new network industry for which the positive feedbacks among different items is crucial for its success. The critical items in mobile Internet include users, content providers, handset manufacturers and portals/ search engines. The interaction among these items is critical for the success and a lack of just one item can seriously slow the diffusion of mobile Internet. A critical mass of users and content providers is needed to initially create a positive feedback in the system.

Examples

The success of mobile Internet services in Japan and South Korea is also due to the fact that the operators seeded a large number of start-up firm and encouraged them with generous revenue sharing business models to create useful and interesting initial content and applications. M-mode is less successful as it could not attract a large number of content providers. Vodafone Live in Europe is less successful due to its less openness policies towards content providers.

6.3 Comparison of wireless payments services

During the course of this research, it has been observed that wireless payments services have been launched by mobile operators to sustain the mainstream cellular market. The characteristics of different wireless payments services are described as followings:

Table 24: Wireless payments: leveraging large captive networks

Wireless payment system	Mass transit network users	Point of sale (POS) payments	Credit card account linkage
FeliCa NTT DoCoMo, Japan	9 million (Suica) mass transit network users	Compatible with EDY electronic payment card network (4.5 million users)	Yes
Moneta SK Telecom, South Korea	10.1 million mass transit users	470,000 POS terminal	Yes
Zoop LG Telecom, South Korea	10.1 million mass transit users	80,000 POS terminal	Yes
Mobipay Mobipay, Spain	Extended to 10,000 taxis	4,000 POS terminal Message based application	Yes
Sonera Shopper TeliaSonera, Finland	Used for bus tickets only	800 vending machines and city parking meters	Yes
Octopus Octopus Cards Limited Hong Kong- China	11 million mass transit users	30,000 POS terminals at more than 300 organizations	No
Dexit Dexit Inc., Canada	No	350 POS terminals	No
Smartpay Smartpay, China	No	No	No

Wireless payments have been introduced by the mobile operators as a sustaining innovation to provide their users with added value of making payments at mass transit and point of sale. Wireless payments systems are used to make small amount purchases at such convenience stores POS terminals where the speed of transaction is main concern to increase the customer turn out.

Insight 1

Wireless payments as a sustaining innovation

Currently, cash is primarily used in small transactions. Most of the wireless payment systems replace the small amount cash payments which are usually not feasible for debit or credit cards due to relatively high transaction costs. There is no visible disruption by the wireless payments to the financial institutions or credit card companies. The wireless payments service providers collaborate with credit card companies and banks to integrate the credit/ debit payments into the mobile payments.

Insight 2

Solving chicken or egg problem in wireless payments

The main challenge for wireless payments is solving the network effects or chicken and egg problem. This is the main reason why the Payment Service Providers have leveraged the captive markets of mass transit ticket payment applications. In case of using wireless payments for transportation tickets, there are large firms who can single handedly install the readers in their train stations or busses. Convenience stores are moving the fastest to introduce wireless payments in Asia, specially Hong Kong and South Korea as they have

national networks to solve the network problem. For the successful wireless payments systems, the operators have invested heavily to install reader terminals at point of sale for the small businesses and shops (NTT DoCoMo established a 10 billion Yen fund and SK Telecom spent 100 million dollars).

Table 25: Wireless payments: Roger's theory of diffusion of innovation

S. No	Wireless Payment System	Relative advantage (Speed of transaction)	Compl -exity	Compa-tibility	Trial-ability	Obser-vability	Status
1	FeliCa DoCoMo, Japan	High	Low	Yes	Yes	Yes	3 million FeliCa phones sold since July 04
2	Moneta SK Telecom, South Korea	High	Low	Yes	Yes	Yes	470000 POS terminals; mass transit ticketing
3	Zoop LG Telecom, South Korea	High	Low	Yes	Yes	Yes	80,000 POS terminals; mass transit ticketing
4	Mobipay Mobipay, Spain	Low	High	Less	No	Less	4000 POS terminals; 10000 taxis
5	Sonera Shopper TeliaSonera, Finland	Low	High	Less	No	Less	800 vending machines; City parking meters
6	Octopus Octopus cards Ltd. Hong Kong- China	High	Low	Yes	Yes	Yes	11 million users; 30,000 POS terminal
7	Dexit Dexit Inc., Canada	High	Low	Less	Yes	Less	350 POS terminals
8	Smartpay Smartpay, China	High	Low	Less	Yes	Less	100,000 users

Roger's theory of diffusion of innovation can be used to differentiate between success and failure of wireless payments. The successful wireless payments systems have high relative advantage of speed of transaction and low complexity. For mass transit ticketing application, the speed of transaction and ease of use or simplicity are the main contributing factors. Similarly the high compatibility, trialability and observability lead to the fast adoption of the service.

Insight 3

Relative advantage

Mobile wallet phones (IC chip is installed in the cellular phone to store financial information) have more relative advantage on the following attributes. Speed of transaction, convenience, viewer function (balance can be viewed on the display of mobile phone), adding money (anywhere, any time), security (requires PIN, or fingerprint for activation), and multifunction use

Theory

According to Roger's theory of innovation diffusion, relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes. The degree of relative advantage may be measured in economic terms, but social prestige, convenience, and satisfaction are also important factors. It does not matter so much if an innovation has a great deal of objective advantage. What does matter is whether an individual perceives the innovation as advantageous. The greater the perceived relative advantage of an innovation, the more rapid its rate of adoption will be.

Examples

FeliCa, Moneta and Zoop are the examples of wallet phones having IC card functionality and are successful wireless payment services. Mobipay and Sonera Shopper don't have the IC card functionality and require interactive messages between merchant and user. Octopus is a smart card used to make wireless payments at mass transit and POS terminals.

Insight 4

Compatibility

Users in Japan and South Korea are familiar with making payments at POS or paying transit tickets with electronic cards so the wallet phone is compatible with their needs.

Theory

According to Roger's theory of innovation diffusion, compatibility is the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters. An idea that is incompatible with the values and norms of a social system will not be adopted as rapidly as an innovation that is compatible.

Examples

Moneta, FeliCa and Zoop are mainly used for mass transit tickets and for making payments for small purchases at POS. Octopus is used for mass transit tickets and small purchases at convenience stores near mass transit stations.

Insight 5

Simplicity and ease of use

The mobile payment systems which are very simple and easy to use have more adoption.

Theory

According to Roger's innovation diffusion theory, complexity is the degree to which an innovation is perceived as difficult to understand and use. Some innovations are readily understood by most members of a social system; others are more complicated and will be adopted more slowly. New ideas that are simpler to understand are adopted more rapidly than innovations that require the adopter to develop new skills and understandings.

Examples

FeliCa, Moneta, Zoop and Octopus are very simple and easy to use i.e. just by waving the phones or smart card near the terminal so their adoption is high. Mobipay and Sonera Shopper are not easy to use. User has to initiate or respond to an interactive messaging session and key in his PIN, so these systems are less successful in the environment requiring speed of transaction at POS or mass transit tickets.

Insight 6

Trialability

Low cost is an important factor in the adoption of mobile payments. If the cost of handset and service is low, more users will use it on trial basis and then stay with the service.

Theory

According to Roger's, trialability is the degree to which an innovation may be experimented with on a limited basis. An innovation that is trialable represents less uncertainty to the individual who is considering it for adoption, who can learn by doing.

Examples

FeliCa, Moneta and Zoop are more successful as the handsets are heavily subsidized by the operators. Octopus card costs no money to the user so it is very successful. Mobipay and Sonera Shopper are less successful as handsets are costly and are not subsidized.

Insight 7

Observability

Wireless payments systems having high observability are more successful.

Theory

According to Roger's, observability is the degree to which the results of an innovation are visible to others. The easier it is for individuals to see the results of an innovation, the more likely they are to adopt it.

Examples

FeliCa, Moneta, Zoop and Octopus are used at mass transit and POS in highly dense population centers giving rise to observability. Mobipay and Sonera Shopper are not frequently used at mass transit or POS so their observability is low.

6.4 Variable for predicting the outcomes of similar situations

From the research on adoption of mobile Internet and wireless payments, we have arrived at the following dimensions generated by different theories, which can be used to estimate the addressable market size or potential market for any future deployment of such services.

(i) Christensen's' disruptive innovations

(ii) Rogers' theory of diffusion of innovation

- Number of users 12-19 years old.
- Number of users 20-29 years old.
- Number of users 30-39 years old.
- Number of high school students
- Number of college students
- Number of professionals (lawyers, doctors, engineers, IT persons, white collar workers, govt. servants etc)

(iii) Rogers' theory of diffusion of innovation

Trialability

- Price of handsets
- Price of service or usage charges
- Number of users who can afford the service

Observability

- Number of commuters using subways/ railways and buses.

Compatibility

- Number of existing SMS users
- Number of point of sale terminals
- Number of credit card holders

Complexity

- Number of simple applications
- Literacy rate

(iv) Chesbrough's business models

- Number of content providers on the exclusive arrangements.
- Relationships with handset manufacturers
- Availability of complementary products and services
- Role of mobile operators for the alignment of the interests of all critical players in value chain

6.5 Propositions

One immediate objective of this research is to formulate propositions from exploration of multiple cases of mobile Internet and wireless payments that can be used to predict the outcomes in similar future cases. A proposition is defined as a statement about concepts that may be judged true or false if it refers to observable phenomena.

The rationale for the formulation of propositions lies in the data analysis by multiple investigators and a number of iterations between data and theoretical perspectives for within-case and cross-case comparison of patterns. In the research community, it is believed that humans are very poor processors of information and they may leap to premature or even false conclusions as a result of different information processing biases. The key to good cross case comparison is by looking at the data in many divergent ways with the help of multiple investigators.

From the study of the cases of mobile Internet and wireless payments and examining these cases through the lenses of various theoretical perspectives, we have formulated a number of propositions that can be used in the future research on the adoption of mobile Internet and wireless payments services.

Proposition 1

The higher the number of young initial target users, the higher the number of users and the rate of adoption of mobile Internet service.

Proposition 2

The higher the number of professionals or business initial target users, the lower the number of users and the rate of adoption of mobile Internet service.

Proposition 3

The higher the number of high school or college students users, the higher the number of users and the rate of adoption of mobile Internet service.

Proposition 4

The lower the prices of handsets, the higher the number of young users and higher the rate of adoption of mobile Internet service.

Proposition 5

The lower the service usage charges for the mobile Internet service, the higher the number of young users and the rate of adoption of the mobile Internet service.

Proposition 6

The higher the usefulness of the content, the higher the number of users and the rate of adoption of the mobile Internet service.

Proposition 7

The higher the number of content providers, the more innovative will be the content and the higher the number of users and the rate of adoption of mobile Internet service.

Proposition 8

The higher the number of simple content applications like ring tones, wall-papers, logos, melodies, songs and games, the higher the number of users and the rate of adoption of mobile Internet.

Proposition 9

The higher the number of users of existing data services like SMS, the higher the number of users and the rate of adoption of mobile Internet.

Proposition 10

The higher the availability of the complementary products and services, the higher the number of users and the rate of adoption of mobile Internet.

Proposition 11

The higher the revenue share given by the mobile operators to the content providers, the more seeding of start-up firms (content providers) and higher the rate of adoption of mobile Internet.

Proposition 12

The higher the number of commuters using mass transit, the higher the number of users and the rate of adoption of mobile Internet and wireless payments services.

Proposition 13

The higher the number of compatible readers at point of sale and mass transit, the higher the number of users and rate of adoption of wireless payments service.

Proposition 14

The higher the number of credit card holders, the higher the number of users and the rate of adoption of wireless payments service.

Proposition 15

The greater the money spent by the operators to install POS terminals to seed the market, the higher the number of users and higher the rate of adoption of wireless payments service.

Proposition 16

The greater the leveraging of large POS payments and mass transit ticketing networks, the higher the number of users and higher the rate of adoption of wireless payments service.

7 CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

7.1 Conclusions

The objective of this research was to use the constructs identified by three theoretical perspectives to generate insights from examining 17 cases of the adoption of the mobile Internet and wireless payments services. The insights were generated in collaboration with an industry partner in environments were abundant data were not available.

The main benefits of using multiple theoretical perspectives were two. First, the theoretical perspectives helped academic and industrial researchers to identify the information that really matters and to make sense of what seemed to be a limited amount of data. Without suitable theoretical perspectives and the appropriate research method, it is very hard to decide what information really matters and to make sense of the scant information that is available. Without theoretical perspectives, discussions may be anchored around industry nuances that are pushed by the analysts with private agendas. The second benefit of using constructs from multiple theoretical perspectives was that the results seemed to be more complete when compared to the results obtained using a single theoretical perspective.

The method used in this research generated insights on why mobile Internet and wireless payments services are very successful in Japan and South Korea while the rest of the world is still struggling to catch up. The method used in this research can also be used to examine service adoption in other domains.

The method used in this research challenged the researcher to operationalize the constructs of three different perspectives in a way that it was acceptable to both academics and industry partners. This was not an easy task. Discussing the implications of theoretical perspectives at a high level of abstraction was easier than discussing implications at a level of detail that industry participants found useful.

The method also resulted in the identification of patterns for the factors of success. For example, it was discovered that operators that established and controlled value chains used to deliver the services were more successful than those that did not.

7.2 Limitations

While the two theories, disruptive innovations and business models provided valuable insights, they were not easy to apply in this situation for two reasons. First, the models and their theories lack formality. The constructs needed to be detailed before they could be applied. Second, the data about successful cases is not abundant in the English language. Most of the data on successful cases have been published in Japanese and Korean.

This study has three limitations. First, the "goodness" of the insights was not validated with expert personnel. This was simply not possible to accomplish given the cost that this would have entailed. The second limitation is that Christensen's model of disruptive innovations works well for a single product scenario. Christensen's disruptive innovation model is limited for situations in which competition is anchored around a service

portfolio that has a number of competitors and complementers. For example, according to Christensen, firms need to establish a separate organization or unit at an arms length to launch a successful disruptive innovation growth business. While it was true for the case of I-mode where NTT DoCoMo established a separate organization to launch the service, but it was not true for the other five mobile operators who also launched very successful services. The third limitation is due to the fact that an adequate theoretical perspective that handles multiple firms and their responses to a new market disruptive innovation has not matured yet, especially for the services. Developing such a perspective was outside the scope of this research.

7.3 Suggestions for future research

There are three suggestions for future research. First, to formalize the disruptive technology perspective so that it is easier to apply and incorporates more of the factors that may help explain the phenomena.

The second suggestion is to undertake empirical research seeking to validate the relationships and dynamics of mobile Internet and wireless payments service providers with the suppliers of complementary products and services implied by the disruptive innovation perspective.

The third suggestion is to use the variables and propositions generated from this research for empirical testing of the adoption of mobile Internet

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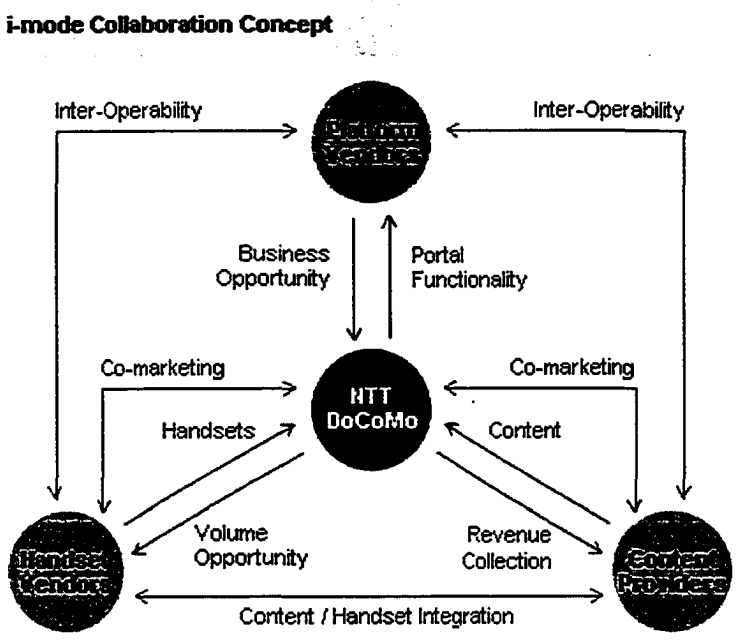
APPENDICES

Appendix 1: I-mode collaboration concept



This total value chain management is made possible by a well-balanced mobile multimedia ecosystem of partners in which the operator plays a central coordination role.

(Source: NTT DoCoMo)