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A Framework for Analyzing Business Model Innovation in Mobile Commerce

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ABSTRACT

The paper develops and tests a framework for evaluating mobile commerce business models and strategies. To study business model innovation in mobile commerce, we analyze the cost, revenue, and growth components of the business model. In addition, we also investigate whether the implementation of the new business model successfully capitalized on the key disruptive attributes of mobile commerce. An analytical framework is developed to guide the empirical study of the two leading mobile commerce companies in Taiwan. The empirical research indicates that the mobile commerce industry in Taiwan has been able to capitalize on many but not all of the value-adding mobile commerce disruptive attributes as well as the economic principles of the digital economy to provide mobile value. The development of mobile application services should be demand-driven and customer-focused, rather than merely supply-oriented. Mobile commerce service providers must understand the tacit consumer demand and be able to capture the full benefits of the disruptive technology and service innovation in order to achieve superior business performance.

INTRODUCTION

With the growing development of wireless communications and information technologies and the prevalence of hand-held mobile devices (e.g., cellular phones, personal digital assistants (PDAs), & tablet PCs), access to the Internet and other communications networks is no longer restricted to the traditional stationary desktop environment. Mobile commerce or m-commerce may be perceived as the buying and selling of goods and services through wireless handheld devices (Smith, 2006), or any transaction with a monetary value that is conducted via a mobile network (Ngai & Gunasekaran, 2007). Mobile application services constitute one of the most promising market segments that is set to become one of the most lucrative growth markets (Kim, Chan, & Gupta, 2007). In addition, m-commerce is also an emerging discipline involving many potential applications (Smith, 2006), especially in the era of 3G (third generation) wireless communications which provides more bandwidth and is much faster than the traditional 2G WAP (wireless application protocol) and 2.5G GPRS (general packet radio service). In this paper we define m-commerce as any transaction with a monetary value – either direct or indirect – that is conducted over a wireless telecommunications network (Ngai & Gunasekaran, 2007).

Mobile application services have been available for many years but it has not reached

mainstream status (Kim, Chan & Gupta, 2007). Although the popularity and growth of the mobile application services is not as strong as what experts and scholars had predicted earlier, there is plenty of room for further development. The mobile commerce opportunities exist and are huge, but building m-commerce applications presents huge challenges (Nohria & Leestma, 2001). Nevertheless, business organizations have been restlessly evaluating the revenue potential of the m-commerce market and developing business models to exploit the huge profit potential of this new market (Hsieh, Jones, & Lin, 2008). We argue that the key issue for the growth of mobile application services or mobile commerce depends on whether the service providers are able to develop and implement innovative business models that provide demand-driven and customer-focused services. The research questions of this study are:

- **Why has mobile commerce not achieved the mainstream status as promised?**
- **What are the unique and disruptive attributes of mobile commerce that differentiate it from the traditional business and electronic commerce?**
- **How do mobile service providers identify and capitalize on the disruptive attributes of m-commerce and mobile application service technologies in order to design and implement innovative business models?**
- **What are the key issues associated with the cost, revenue and growth components of a viable mobile commerce business model?**

We first discuss the applications and value chain of mobile application services and lay the foundation for developing an analytical model for evaluating m-commerce business models and strategies. Next, we develop an approach to identify the unique attributes of mobile commerce and discuss how those attributes have disrupted both traditional business and e-commerce. We then analyze the cost and revenue components of a viable mobile commerce business model. Several theoretical propositions are developed to guide an empirical case study of the two leading Taiwanese telecommunications companies that offer mobile application services. The empirical results and implications are discussed and a conclusion to our research is provided at the end.

MARKET POTENTIAL OF MOBILE APPLICATION SERVICES

M-commerce is coordinated by three basic components – end users, content (e.g., content providers & content aggregators), and device and service (e.g., mobile carriers, Internet services, & mobile applications service providers) (Barnes, 2002; Siau, Lim, & Shen, 2001). M-commerce is formally defined as the commercialization of the mobile application services technologies. The value of m-commerce is created through any electronic data interchange or the interchange of services and products by using mobile devices through wireless networks. Every organization's goal in entering the mobile market space is to leverage the mobile channels and networks to create value for customers (Kalakota & Robinson, 2001). Because of m-commerce's unique characteristics (e.g., mobility & reachability), firms are able to create customer value in a manner that is different from that which has been achieved in e-commerce and the traditional business applications (Han & Han, 2001).

Many scholars have contended that mobile applications have huge market potential due to the global penetration rate of mobile devices (May, 2001). Mobile devices and applications are being used in plants for industrial maintenance practices (Arnaiz, Emmanouilidis, Iung, & Jantuene, 2006; Campos, Jantunen, & Prakash, 2007). However, the consumer adoption rate of m-commerce in many countries is very low compared to that of desktop e-commerce (Kim, et al., 2007). Yeo and Wang (2003) indicate that there are many potential advantages of m-commerce; however, m-commerce does have its problems and issues which could inhibit the growth. For example, success of m-commerce hinges on the availability of methods of payment that are secure, ubiquitously available, globally accepted, and easy-to-use (Chen & Nath, 2008). Anckar and D’Incau argue that the popularity of m-commerce cannot be measured by the popularity of mobile devices because it goes far beyond mobile telephony. The high penetration rate of personal mobile wireless devices should be viewed as a prerequisite for m-commerce, rather than being seen as an obvious outcome of the high degree of adoption of m-commerce (Anckar & D’Incau, 2002).

Although mobile application services not only extend the benefits of the Internet and wireless networks, but also allow for unique services and additional value, the high rate of adoption of mobile devices has not translated into the increased popularity of m-commerce among consumers. Giving this situation, we need to identify the reasons for the lack of market penetration in m-commerce in the presence of highly popular hand held mobile devices. We also need to identify what is distinctive about the m-commerce and look where the mobile platform wins over the stationary Internet (May, 2001). In addition, we need to evaluate the m-commerce business models to see whether they are consistent with the economic principles of the digital economy.

Lee and Vonortas argue that business model innovation in the digital economy must meet the two fundamental criteria associated with the characteristics of the digital economy (Lee & Vonortas, 2004). They are:

- **Does a firm’s business model follow the fundamental economic principles of the digital economy? What is the underlying economic logic that explains how organizations can create and deliver value to customers at an appropriate cost?**
- **Is a firm’s business model able to identify and capitalize on the “disruptive attributes” of the digital economy? That is, how can a firm capture the full benefits of the Internet innovation?**

Along the lines of these arguments, we view m-commerce as both technological and business model innovations that disrupt the traditional business models and applications. M-commerce is different from e-commerce in that online transactions are no longer restricted to stationary desktop computers. Some scholars view m-commerce as a subset of e-commerce (Coursaris & Hassanein, 2002). We argue that m-commerce is not a subset of e-commerce but has its own unique value-adding attributes that will fundamentally transform the business operations and supplier-customer relationships. To increase the market penetration or user adoption rate of m-commerce, a viable m-commerce business model must be able to capitalize on the value-adding

disruptive attributes to achieve higher perceived customer value. In addition, a viable m-commerce model must be able to exploit the economic principles of the digital economy.

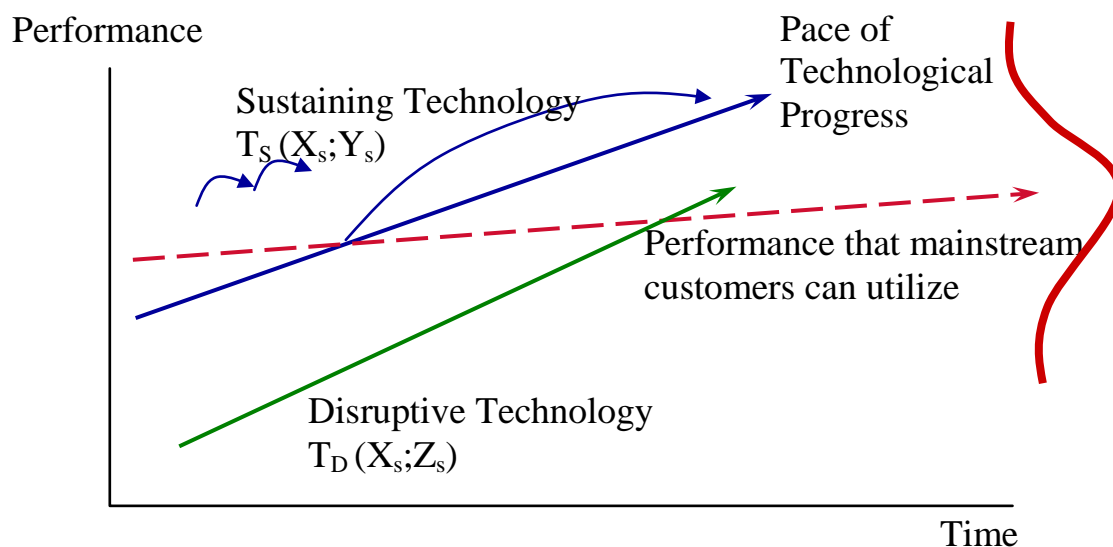
M-COMMERCE AS A DISRUPTIVE INNOVATION

M-commerce is an innovation in the digital economy, in that it is concerned with the use of new knowledge to offer products or services that customers want. It is disruptive in that the traditional organizations lack the necessary models of competitive architecture and organizational capabilities, and are therefore unable in critical ways to do what must be done (Miller & Morris, 1999). Companies need to identify disruptive attributes associated with m-commerce and acquire and exploit new knowledge and capabilities in order to design and implement a viable business model for growth and profit.

Disruptive innovation model

Christensen theorized the concept of disruptive technology or innovation (Christensen, 1997). A disruptive innovation typically presents a different package of performance attributes (Bower & Christensen, 1995). Figure 1 presents Christensen's disruptive technology model. The figure displays the pace of technological progress or the trajectories of disruptive technology (T_D) and sustaining technology (T_S). The progress in sustaining technology consists of radical innovations and many subsequent incremental innovations to sustain the overall technological trajectory. There are common or shared attributes (i.e., X_S) associated with both the sustaining and disruptive technologies. The common performance attributes that customers value improve at a faster rate in the case of disruptive technology. It is the trajectory of the T_D compared with that of the mainstream market demand that is significant (Bower & Christensen, 1995). In general, disruptive innovations create an entirely new market through the introduction of a new kind of product or service (Christensen & Overdorf, 2000). Instead of devoting efforts to improving the performance attributes uniquely associated with the sustaining technology (Y_S), firms can focus on likely adopters and growth segments to promote disruptive technology or innovation. New business models that capitalize on the disruptive performance attributes (Z_S) and incorporate them into customer value propositions are essential for success

Figure 1: Trajectories of Disruptive and Sustaining Technologies.



Disruptive attributes of M-commerce

The emergence and growth of e-commerce has fundamentally changed the traditional ways of doing business. E-commerce is a disruptive innovation that has transformed the rules of competition and created new value propositions and business models. Lee identifies and discusses several disruptive attributes of e-commerce to assist managers in formulating an Internet strategy (Lee, 2001). For example, through network connectivity and real-time interactivity, e.g., open computing platforms or architecture, customers can be involved in the firm's production process over the Internet (i.e., presumption (Tapscott, 1996)), building and utilizing customer databases (i.e., digital assets (Rayport & Sviokla, 1995)) for online marketing and mass product or service customization, new potential for exchanging and sharing content-rich information (Evans & Wurster, 1997), cost transparency (Sinha, 2000), infinite virtual capacity (Afuah & Tucci, 2003; 36), and the speed and frequency of technological and organizational change.

Just as the implementation of an e-commerce strategy is not merely the extension of traditional business online, the formulation and implementation of an m-commerce strategy is also not simply an extension of e-commerce practices. Instead, organizations must be able to identify and capitalize on the key attributes of m-commerce in order to create competitive advantages and sustain superior performance. To succeed in m-commerce businesses, organizations must design and implement business models that capitalize on the unique attributes of mobile Internet commerce, which comprise the two specific attributes of mobility and reachability (or broad reach), and five other value-added attributes, namely, ubiquity enhancement, personalization, localization of products and services, convenience, and instant connectivity (Turban, et al., 2004: 385-387). With m-commerce, users can initiate real-time contact with commercial and other systems wherever they happen to be. In addition, people can be reached at any time and anywhere and receive customized and location-specific services.

Table 1: Disruptive Attributes of M-Commerce (i.e., the “Z” attributes in Figure 1).

Disruptive Attribute	Definition	Focal Points
Mobility	Users can initiate real-time contact with commercial and other systems wherever they happen to be.	<ol style="list-style-type: none"> 1. Market penetration of user adoption rate of mobile devices 2. Perceived customer benefits 3. Be able to maintain connection while making transactions anywhere 4. Time required for product and service delivery to the m-commerce users
Reachability	People can be reached at any time. Information can be requested and delivered to users anytime and anywhere	<ol style="list-style-type: none"> 1. Promote a firm's product and service offerings to end users 2. Allow users to block certain hours or messages for privacy concerns
Ubiquity	Being available at any location at any given time. A ubiquity-related service aims to satisfy users' instant needs or wants for making commercial transactions anytime and anywhere.	<ol style="list-style-type: none"> 1. Coverage and quality of the wireless signals 2. Easy information access in a real-time environment 3. Understand the usage patterns of

Disruptive Attribute	Definition	Focal Points
		mobile devices
Localization	Combined with a global positioning system (GPS), the precise location of each user can be known. M-commerce vendors are able to provide users with instant and location-specific information and/or transaction. In addition, users can also search for information according to the location they are at.	<ol style="list-style-type: none"> 1. Offer location-specific products and services 2. Provide timely and relevant location-specific information 3. Be able to combine localization and product and service personalization
Personalization	A mobile device may have different usage according to different users; therefore products or services should be provided according to each user's needs and preferences.	<ol style="list-style-type: none"> 1. Offer customized interfaces for individual customers 2. Build customer database to gather personal profiles, track purchase patterns, and identify behavior and preferences 3. Deliver customized and location-specific information and transaction capability
Connectivity	M-commerce enables users to connect easily and quickly to the Internet and other commercial systems.	<ol style="list-style-type: none"> 1. Fast connection time for accessing m-commerce portal 2. Maintain the "always-on" connection capability
Convenience	It is convenient for users to operate in the wireless environment. The portable and mobile advantages of wireless devices enable consumers to access information and perform market transaction activities whenever and wherever they want.	<ol style="list-style-type: none"> 1. Easiness of operating mobile devices 2. Easier and faster to access and deliver information 3. Easy to make transactions in a secure environment

Table 1 depicts m-commerce's disruptive attributes and the focal points of managerial decision-making and actions. We define m-commerce business model innovation as the use of new knowledge (both technological & market knowledge) that capitalizes on the disruptive attributes of the Internet to design and implement an innovative way of offering products or services that customers want. To understand the disruptive nature of an innovation or technology, managers must identify what are the attributes that make it disruptive to the traditional organizations or established markets. Given the vital role that the value-adding disruptive attributes play in the adoption and growth of m-commerce, the first proposition is formulated as follows:

P1: To succeed in the m-commerce business environment, companies must be able to design and implement a viable business model that capitalizes on the disruptive attributes of m-commerce to offer customers higher perceived benefits.

EVALUATION OF MOBILE APPLICATION SERVICES BUSINESS MODELS

In addition to capitalizing on the disruptive attributes discussed above, a viable mobile application services or m-commerce business model must be able to exploit the basic economic

principles of the digital economy. We apply the analytical framework developed by Lee to evaluate m-commerce business models and strategies (Lee, 2001). The framework is based on several fundamental economic principles and evaluates business models and strategies from both demand- and supply-side perspectives.

Economies of scale

In the online business environment, economies of scale must come from both the demand and supply sides of the operations (Lee, 2001). The Internet has redefined the concepts of economies of scale by allowing small companies to achieve low unit costs for products and services in markets dominated by big companies (Rayport & Sviokla, 1995). On the other hand, a product exhibits demand-side economies of scale if the more people that use it, the more valuable the product becomes to its users, i.e., as a function of network externalities. Since m-commerce is a network-based service application, a marketing strategy designed to influence consumer expectations is crucial in network markets to build a critical mass of users (Shapiro & Varian, 1999: 181). Mobile telecommunications carriers can facilitate the adoption and growth of m-commerce users and lower the unit cost of operations by cultivating their existing installed base of customers. In addition, m-commerce managers need to understand that demand- and supply-side economies of scale reinforce each other in a virtuous circle. The growth on the demand side reduces the unit cost on the supply side and makes the product or service even more appealing to users and potential adopters. Therefore, we can suggest the following:

P2: To build a critical mass of installed customer base and to lower the unit cost of operations, m-commerce companies must be able to exploit network effects by designing and implementing strategies that influence both customer expectations and their perceived value of product and service offerings.

Economies of scope

Economies of scope are cost-saving externalities between product lines or distribution channels. Economies of scope exist when the production of Good A reduces the production cost of Good B (Tirole, 1998: 16). On the demand side, companies can redefine economies of scope by drawing on a single set of “digital assets” (i.e., a customer database) to provide value across many different and disparate markets (Rayport & Sviokla, 1995). In both e-commerce and m-commerce environments, the combination of demand- and supply-side scope and scale economies reinforces network effects. Maintaining a critical mass of installed base of users (the scale effect) is important because growth on the scale side increases the number of potential customers for cross-selling (the scope effect), which in turn will enable the company to build an even larger customer base (Lee & Vonortas, 2004). Overall, m-commerce companies need to offer a range of complementary products or services to attract new customers that will in turn lower the total costs of operations through the effects of scale and scope economies. From the above discussion, we offer the third proposition as follows:

P3: To maintain a critical mass of installed base of customers, m-commerce service providers need to exploit the demand-side economies of scope by drawing on digital assets to provide value across many different and disparate markets. In

doing so, m-commerce companies can also benefit from lowering the total costs through supply-side economies of scale and scope.

Switching costs

Switching costs are a case of idiosyncratic investment or investment in multiple complementary assets specific to a particular technology or system (Tirole, 1988: 21). Total switching costs are the sum of the costs borne by the supplier to serve new customers (e.g., R&D & marketing costs), and those costs borne by the consumer to switch suppliers (e.g., investment in specific assets &/or the inconvenience of switching vendors) (Shapiro & Varian, 1999: 112). Strategies to increase the m-commerce customer's switching costs include using proprietary technologies or standards (e.g., a removable SIM (subscriber identity module) card used to identify a subscriber on mobile telephony devices), applying fixed term service subscription contracts or agreements, providing personalized content and services, capitalizing network effects to maintain a large user community, and offering complementary, location-based, and time-specific services to increase perceived customer value. We therefore propose the following to underline the strategic role of switching costs in the highly competitive m-commerce business environment:

P4: The provision of highly value-added m-commerce services to increase the customer's perceived benefits and investment in multiple complementary assets and marketing are essential to attract new customers and increase the current user's costs of switching to other service providers.

Transaction Costs

Transaction costs are all costs associated with making a market transaction possible (Coase, 1937: 386-405; Williamson, 1975, 1985). From the buyer's perspective, transaction costs include information, searching, bargaining, contracting, monitoring, and enforcement costs. M-commerce service providers that offer a good user interface and higher usability portal (Pearrow, 2007) will be able to reduce customers' transaction costs (i.e., the costs of doing business with the supplier). On the other hand, the advent of the Internet and other information and communication technologies has dramatically reduced the costs of many kinds of market transactions. It may even be possible to negotiate a separate deal at each step of the value chain (Tapscott, et al., 2000: 9). The practice of vertical integration to mitigate market transaction risk has been replaced by the virtual integration approach of independent alliance or network partners working together to create value jointly. The disaggregation of the value chain has created a new business ecosystem in the m-commerce environment. M-commerce service providers need to take advantage of the reconfiguration of the value chain to radically transform their value propositions for the benefit of the end-users. The foregoing discussion suggests the following proposition:

P5: M-commerce service providers can reduce customer's transaction costs by offering a high usability and secure Web portal. In addition, m-commerce vendors need to exploit the disaggregation and reconfiguration of the value chain to radically transform their value propositions to benefit customers.

Table 2 presents m-commerce cost models and the key issues and strategies for building a viable business model and creating and sustaining competitive advantages in a highly competitive business environment.

Table 2: M-commerce cost model and strategy.

Economies of scale	Demand-side	Supply-side
	A product exhibits demand-side economies of scale if the more people that use the product, the more valuable it is to its users – a function of network externalities	Reductions in unit costs resulting from increased size of operations
	Major issues and strategies	
	<ol style="list-style-type: none"> How do you build a large installed base of users? How do you reach a critical mass of users to sustain the growth of the business? <p><u>Key strategies:</u></p> <ol style="list-style-type: none"> Offer superior products or services to increase the customer’s perceived value Manage customer expectations through marketing and competitive product pre-announcements Establish an ecosystem of partners through strategic alliances and networks 	<ol style="list-style-type: none"> How do you lower the unit cost of production, i.e., how do you spread the fixed cost of capital investment by expanding output? <p><u>Key strategies:</u></p> <ol style="list-style-type: none"> Increase scale through volume-driven strategy Spread fixed cost of capital investment over a large customer base and product lines
Economies of scope	Demand-side	Supply-side
	A single set of digital assets can provide value across many different and disparate markets	Cost-saving externalities between product lines. Economies of scope are realized when total costs are reduced by producing or distributing two or more products jointly
	Major issues and strategies	
	<ol style="list-style-type: none"> How do you leverage a single set of digital assets to provide customized solutions to meet individual customers’ needs? <p><u>Key strategy:</u></p> <ol style="list-style-type: none"> Re-invent customer relationships by identifying individual needs and being able to offer a total solution to satisfy their latent demands 	<ol style="list-style-type: none"> How do you supply a bundle of products or services at a lower total cost than some combination of two or more single product or service providers? <p><u>Key strategy:</u></p> <ol style="list-style-type: none"> Identify and take advantage of economies of scope in production and distribution
Switching costs	Demand-side	Supply-side
	Demand-side switching costs are measured by the monetary value of switching suppliers by consumers	Companies need to estimate their costs (e.g., R&D and marketing costs) and revenue stream from a potential

		customer to figure out how much to spend to acquire that customer
	Major issues and strategies	
	<p>1. How do you increase the customer's costs of using your company's products or service?</p> <p><u>Key strategies:</u></p> <ol style="list-style-type: none"> 1. Offer superior (core and complementary) products or services to increase customer's perceived value 2. Implement a customer relationship management (CRM) system and develop a strong trust relationship with end users 	<p>1. How do you maximize the value of an installed base of customers by selling complementary products and services?</p> <p><u>Key strategies:</u></p> <ol style="list-style-type: none"> 1. Evaluate switching costs relative to the future stream of revenue on a per-customer basis 2. Build and sustain Web 2.0 type online communities
Transaction costs	Demand-side	Supply-side
	Demand-side transaction costs include customer search, information, negotiation, contracting, monitoring, and contract enforcement costs	Supply-side transaction costs involve the optimal boundary of an organization. Firm tends to expand precisely to the point where the costs of organizing an extra transaction with the firm becomes equal to the costs of carrying out the same transaction by means of an exchange on the open market
	Major issues and strategies	
	<p>1. How do you reduce your customer's (transaction) costs of doing business with you?</p> <p><u>Key strategies:</u></p> <ol style="list-style-type: none"> 1. Capitalize on m-commerce's disruptive attributes to make it easy for customers to access information and obtain personalized and location-specific services 2. Identify customer's decision process (pre-purchase, during purchase, and post-purchase) and be able to provide timely assistance 	<p>1. How do you transform the value proposition and organizational structure to enhance value creation?</p> <p><u>Key strategies:</u></p> <ol style="list-style-type: none"> 1. Low transaction costs in the digital economy enable companies to restructure and reconfigure the entire value creation network 2. Lower transaction costs in the digital economy allows virtual integration of independent companies to jointly create innovative m-commerce services

Source: Adapted from Lee and Vornortas, 2004.

Revenue and growth models

M-commerce offers companies new opportunities for increasing revenues and growth. To achieve higher potential for growth, companies need to understand the change in consumer purchasing behavior due to the presence of a new set of disruptive attributes (e.g., the changing nature of time & space) associated with m-commerce (Balasubramanian et al., 2002). Table 3 illustrates the major issues and key strategies associated with the revenue and growth of m-

commerce. Many key issues and strategies are similar to the e-commerce business environment, for example, monitoring online behavior and building and exploiting “digital assets” or a customer database to identify new sources of revenue and to create higher perceived customer benefits; implementing a dynamic pricing strategy to profit from the fluctuations in market conditions and competitors’ behavior (Baker et al., 2001); and building brand equity and enhancing customer loyalty. In addition, m-commerce managers also need to collect and utilize location-specific data, gauge consumer activities and buying preferences, and implement a viable business model in order to provide innovative, location-based, and time-sensitive mobile applications services.

P6: The continuous progress of mobile communications and information technologies will broaden m-commerce business opportunities and growth. To capture the benefits of potential high-revenue and growth opportunities, companies need to understand the changing nature of the m-commerce environment, utilize technologies to track mobile customers’ behavior and buying preferences, practice a dynamic pricing strategy, and design and implement a viable business model that capitalizes on the disruptive attributes of m-commerce.

Table 3: M-commerce revenue and growth issues and strategies.

Revenue and growth	<p><u>Key issues:</u></p> <ol style="list-style-type: none"> 1. How does m-commerce change consumer behavior in terms of time, space, and willingness to pay for new products and services? 2. How are new sources of revenue identified, in addition to traditional product and service sales? 3. How are prices and segmented markets tested, and adjustments made to changes in supply and demand in real time? 4. How is the customer’s willingness to pay for location-based and time sensitive personalized services identified? 5. How is the synergy effect achieved through one-stop shopping or cross-selling opportunities? 6. How is m-commerce brand equity built up and the loyalty effect enhanced? <p><u>Strategies:</u></p> <ol style="list-style-type: none"> 1. Build and utilize “digital assets” to create new markets and generate new sources of revenues for growth 2. Collect and exploit location-specific data and experiment with new ways of (dynamic) pricing 3. Use third-party hosting services to gauge consumer activities to design innovative pricing models for m-commerce services 4. Identify additional sources of revenue, such as advertising, referrals, subscriptions, transactions, and consulting services 5. Increase customer perceived benefits through consumer marketing, branding, and reputation to increase their willingness to pay for the m-commerce services 6. Develop new markets and innovative product/service lines for growth 7. Establish strategic alliances and networks and co-evolve with other business partners in the m-commerce business ecosystem
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TAIWAN'S MOBILE APPLICATION SERVICES INDUSTRY: A CASE STUDY

We apply the analytical framework developed above to guide the empirical study of two Taiwanese communications companies that entered the m-commerce business environment in 1997. The purposes of the empirical study are to investigate why the market penetration rate of m-commerce is low in the presence of a high adoption rate of mobile communications devices in Taiwan; and how m-commerce service providers design and implement a viable business model. The theoretical framework will assist us in examining whether the case companies are able to implement a viable business model to capture the full benefit of innovations in m-commerce.

Research design

Yin argues that research method can be decided in terms of “the type of research question posed,” “the extent of control an investigator has over actual behavioral events,” and “the degree of focus on contemporary as opposed to historical phenomena (Yin, 2003).” Case study research is better when it comes to answering the research questions involving “how” and “why.” In addition, the focus is on contemporary events and there is no need for the control of behavioral events. We choose to apply the case study research methodology because: (a) Our primary research questions are as follows: Why has m-commerce not reached the mainstream status given the high adoption rate of mobile communications devices; and how do m-commerce service providers design and implement a viable business model that is able to capitalize on the disruptive attributes of m-commerce and exploit the economic principles of the digital economy. (b) Our study seeks to answer the research questions of “why” and “how” and identify the managerial insights of managing successful m-commerce business operations. Therefore, we do not have to control a specific event and there will be no need to use controllable variables in case study research. (c) Our research focuses on contemporary m-commerce market phenomena, rather than historical events.

Siggelkow (2007) also argues that there are at least three important uses for case research: (a) cases are often a great way to motivate a research question, (b) it can inspire new ideas and sharpen existing theory, and (c) a case study can get closer to theoretical constructs and is able to illustrate causal relationships more directly. Consequently, we rigorously follow the case study research methodology (discussed in Yin (2003)) beginning from the research design to data collection, analysis, as well as discussing the implications for business executives. In addition, rather than applying the approach of building new theories from case study research (Eisenhardt, 1989; Eisenhardt & Graebner, 2007), we develop an analytical framework and several theoretical propositions to guide the case study process. We follow Yin's approach in that the initial step in designing the case study must consist of the development of theory and then show that case selection and the definition of specific measures are important steps in the data collection process (Yin, 2003: 49-50).

Data collection for a multiple-case study

We have adopted the multiple-case study approach because the evidence from multiple cases is often considered to be more compelling, and the overall study is regarded as being more robust (Herriott & Firestone, 1983). In doing so, we need to follow the “replication” logic, rather than

the “sampling” logic, when selecting the cases. If similar results are obtained from all selected cases, replication is said to have taken place (Yin, 2003: 48). Therefore, Yin argues that each case must be carefully selected so that it either predicts similar results (i.e., a literal replication) or produces contrasting results but for predictable reasons (i.e., a theoretical replication) (Yin, 2003).

We have selected two cases from Taiwan’s mobile telecommunications industry to study business model innovation in m-commerce. Case data are collected from documentation, archival records (e.g., a company’s annual reports, industry reports, & the official company Websites & other credible sources published on the Internet), and interviews. We conduct face-to-face interviews with upper-level business executives who are responsible for managing m-commerce business. We strictly follow the three principles of data collection suggested by Yin (2003: 97-106): (a) use multiple sources of evidence, (b) create a case study database, and (c) maintain a chain of evidence to ensure the credibility and reliability of the data.

The case companies

We have selected two leading Taiwanese telecommunications companies – Far EasTone Telecommunications Company (Far EasTone) and Chunghwa Telecommunications Company (Chunghwa Telecom) as the cases to investigate and evaluate the m-commerce business models and strategies. We are interested in studying how these two firms which have completely different historical backgrounds, technological standards, and approaches launched their m-commerce business. Table 4 shows the general profiles of these two companies. Chunghwa Telecom is one of the three mobile phone service providers in Taiwan. Before it became a private company in August 2005, Chunghwa Telecom was a state-owned enterprise. However, Taiwan’s Ministry of Transportation and Communications is the largest shareholder and has complete authority over appointing the board of directors to oversee the company’s operations.

By contrast, Far EasTone is a private enterprise that belongs to the Far Eastern Group – a conglomerate consisting of over 180 affiliated companies with a business scope spanning ten major industries, including textiles & synthetic fibers, petrochemicals, financial services, retail and department stores, transportation, hotels, and construction. Far EasTone was established as a joint venture between the Far Eastern Group and AT&T of the United States in 1997. It is the first Taiwanese company whose core business is mobile communications services. Far EasTone is currently partnering with NTT DoCoMo of Japan to provide *i-mode* mobile application services in Taiwan.

Table 4: Comparison of Far EasTone and Chunghwa Telecom.

	Far EasTone	Chunghwa Telecom
Date founded	April 1997	July 1996
Capital	NT\$ 32.6 billion (~ US\$ 1 billion)	NT\$ 96.4 billion (~ US\$ 3 billion)
Business items	Mobile communications service, The sales and repair service of mobile phones and parts	Fixed line communications, Mobile communications, Internet and data communications and network services
Number of mobile phone	6.25 million (30.6%)	8.82 million (38.5%)

subscribers in August 2008 (Market share)		
M-commerce service	14 service categories and over 200 content providers	11 service categories and more than 300 content providers
3G subscribers	N/A	2.3 million
2007 Sales	NT\$ 46.2 billion (~ US\$ 1.4 billion)	NT\$ 197.4 billion (~ US\$ 6.1 billion)
2007 profit	NT\$ 11.6 billion (~ US\$.36 billion)	NT\$ 48.7 billion (~ US\$ 1.5 billion)
Employees	3,600	24,000
Internet Service	<i>i-mode</i> , Far EasTone mobile net, 3G/3.5G + Wi-fi wireless services	<i>emome</i> : 3G and GSM system, Internet service provider (HiNet), Broadband access (ADSL and FTTX)

Sources: Far EasTone 2007 Annual Report, fareastone.com.tw, and Chunghwa Telecom 2007 Annual Report and official website.

Mobile communications market and technological standards in Taiwan

The market penetration or adoption rate of mobile phones in Taiwan had reached 84 percent by the end of 2007. As of December 2007, the total number of 3G subscribers in Taiwan had reached 6.91 million (accounting for 30 percent of total mobile phone services in Taiwan) (Far EasTone, 2007). Chunghwa Telecom has adopted WAP (Wireless Application Protocol) as the standard for its mobile phone services. Both *i-mode* and WAP are wireless Internet communication standards. Table 5 compares the differences between *i-mode* and WAP services. Far EasTone first adopted PDC (Personal Digital Cellular) as the communication standard for its *i-mode* 2G service. PDC is a second-generation technology used in digital cellular telephone communications with the first systems introduced by Japan's NTT DoCoMo in 1991 as a replacement for the earlier analog networks. Chunghwa Telecom uses the same GSM (Global System for Mobile communications) TDMA standard for its WAP 2G mobile phone service. Both the *i-mode* and WAP 3G services apply the CDMA 2000/WCDMA mobile communications network standard but use different web languages. Far EasTone's *i-mode* is only popular in Japan. By contrast, WAP is an open international mobile communications standard. Currently, there are 2.6 million more subscribers for Chunghwa Telecom's WAP service than for Far EasTone's *i-mode* service. Both *i-mode* and WAP deliver only those services that are specifically converted for the service through their gateways. It is different from other mobile devices that use Web browser software and apply a flat pricing structure for data. For example, Apple's iPhone and iPad come with a Web (HTML) browser making it possible to view practically any Web pages on the Internet. Nevertheless, Apple is also serving as the gatekeeper of their mobile application services by controlling most of the digital content and applications sold through apps at the iTunes App Store by taking a 30 percent cut on any sale (Kane & Adams, 2011).

Table 5: Comparison of mobile internet service in 2G, 3G and 3.5G systems.

	<i>i-mode</i> service			WAP service	
	2G	3G	3.5G	2G	3G
Standard of Mobile Communication Network	PDC (Personal Digital Cellular)	CDMA2000/WCDMA	HSDPA/WCDMA	GSM/TDMA	CDMA2000/WCDMA

Data Transmission	Packet	GPRS system: Packet	GPRS system: Packet	GSM system: Circuit or SMS GPRS system: Packet	GPRS system: Packet
Network Connection	Always Connected	GPRS system: Always Connected	GPRS/EDGE/3G/HSDPA: Always Connected	GSM system: Connect and Reconnect GPRS system: Always Connected	GPRS system: Always Connected
Web language	C-HTML based on HTML			WML(WAP 1.X) XHTML(WAP 2.0)	
Data Transmission speed (bps)	9.6K	384Kbps	3.6Mbps	9.6-14.4Kbps	384Kbps

Sources: Far EastTone (<http://www.fetnet.net/>); Taiwan Institute for Information Industry, 2008; and Mobile Internet Industry Yearbook, 2002.

Data analysis and results

We examined the evidence obtained from the multiple-case study to address the initial theoretical propositions developed earlier. The analytical technique we applied for the data analysis was the “pattern matching” strategy, which compares an empirically-based pattern with a theoretically-predicted pattern to validate or strengthen the causal relationships (Yin, 2003: 116).

Proposition 1

We found that both Far EasTone and Chunghwa Telecom were able to identify and capitalize some (but not all) of the disruptive attributes in m-commerce. For mobility, reachability and ubiquity, both companies were able to penetrate the mobile phone market and reached an 84% adoption rate of the mobile phone, providing a high quality network of signal coverage. However, mobile consumers in Taiwan have not yet fully adopted or perceived the benefits of m-commerce. The increasing numbers of 3G subscribers and content providers may significantly improve the adoption of m-commerce in the near future. Both companies are able to offer a fast connection time for accessing m-commerce portals and maintain “always-on” connection capability. Nevertheless, both companies are still unable to fully incorporate some of the key value-adding attributes into their business models. Due to legal restrictions (e.g., privacy law), both companies are unable to offer location-based service. Personalization is another area that needs to be improved. Far EasTone’s *i-mode* allows users to customize user interface to access a variety of information but they do not provide personalized products or services through their m-commerce gateway, and they require subscribers use proprietary *i-mode* handsets. Chunghwa Telecom’s WAP standard allows users to purchase handsets from a range of vendors but the product specifications vary from vendor to vendor. Overall, both companies are planning to offer more personalized services in the near future.

Proposition 2

Although each company has more than a thirty percent market share in the mobile phone service market, neither of them is able to exploit the network effects to reach a critical mass of installed base of users in m-commerce. One of the reasons may be attributed to the limited varieties of *i-mode* handset available to users. Far EasTone's strategy is to target middle- and high-income users for their *i-mode* services but the progress is still slow. By contrast, Chunghwa Telecom's marketing strategy aims at younger generations by offering many free recreation and entertainment services (e.g., gaming & sports) to attract new customers in order to achieve critical mass. As regards the supply-side economies of scale, neither Chunghwa Telecom nor Far EasTone's m-commerce divisions need to share the mobile telecommunications infrastructure costs as part of the operational expenses. Therefore, they can concentrate their efforts on the marketing of their m-commerce services.

Proposition 3

Far EasTone offers 14 categories of services (e.g., news & weather, banking & financial services, shopping, gaming, music, career & learning, astrology, health, sports, & adult entertainment), and has over 200 content providers to support their *i-mode* services. Far EasTone believes that offering a scope of complementary and high value-added services is the key to attracting and maintaining customers. In addition, the process of collaboration between Far EasTone and its content providers is based on an open and transparent framework, which allows vendors to add or modify services according to changing market demands. Far EasTone is also in the process of building "digital assets" to exploit the demand-side economies of scope.

Although Chunghwa Telecom has more than 300 content providers offering m-commerce services through its WAP gateway, it only offers 11 categories of service and the quality (or richness) of the scope of offerings in general is not very appealing to customers. Based on the popularity of the service categories, Chunghwa Telecom has adopted the competitive strategy of allowing more than one vendor to provide similar services. Overall, Chunghwa Telecom needs to exploit its large user fixed and mobile user databases to offer a larger range of complementary products and services to increase the customer's perceived value of m-commerce.

Proposition 4

Far EasTone's strategy to increase customer loyalty (or the customer's costs of switching to other vendors) for its *i-mode* service include (a) allowing users to customize their own interfaces to access content, (b) adopting a proprietary standard and a closed network system, (c) implementing a personalized charge and billing system, (d) offering complementary value-adding m-commerce services, and (e) giving incentives for current subscribers to extend their contracts and charging high penalty fees for switching vendors before the end of the contract. Far EasTone needs to invest in multiple complementary assets and upgrade its services by pushing personalized messages and offering customized m-commerce services.

Due to the fact that WAP is an open communications standard, it places tremendous pressure on Chunghwa Telecom to increase the user's costs of switching to other suppliers. To increase the

consumers' switching costs, Chunghwa Telecom bundles a discount package of both voice and m-commerce services to lure new consumers. In addition, Chunghwa Telecom embraces the concept and practice of one-to-one marketing by making additional investments in technologies and systems that push personalized messages to individual customers according to their web browsing habits and purchase patterns.

Proposition 5

Far EasTone's *i-mode* offers a user-friendly interface and a portal with higher usability to reduce the customer's costs of searching and receiving m-commerce services. Chunghwa Telecom's approach to reducing the customer's transaction costs includes adding features such as "my favorites" and a search engine to its *emome* m-commerce portal. From the supply-side perspective, both companies are able to exploit the disaggregation and reconfiguration of the value chain in the mobile telecommunications industry by transforming the traditional vertical integration model into the current virtual integration of independent content providers and mobile device equipment suppliers. Far EasTone also maintains good relationships with its content providers through long-term contracts to increase trust and to reduce information asymmetry and opportunistic behavior. Chunghwa Telecom also partners with major content providers through a complicated idiosyncratic contracting system to enhance the trust relationship. Overall, both companies need to further develop the m-commerce business ecosystem and co-evolve with their alliance and network partners.

Proposition 6

More than 95 percent of the revenues in both companies were obtained from operating mobile phone services. Far EasTone's major revenue sources for its *i-mode* service come from its monthly subscription fees, content service fees (15-85 split with the content providers), and data transmission fees. Far EasTone adopts a premium pricing strategy due to the high status and popularity of its brand name. However, Far EasTone needs to identify additional sources of revenue (e.g., charge fees for content search), exploit the potential of a dynamic pricing strategy, work with manufacturers to offer more varieties of *i-mode* handsets, and leverage its brand equity and its close partnership with Japan's NTT DoCoMo to expand worldwide service.

Younger generations are the main target market segments for Chunghwa Telecom's m-commerce services. It is no surprise that instant text messaging is the largest source of revenue for Chunghwa Telecom's mobile services. Other revenues generated from m-commerce services include content, subscription, and data transmission fees. Chunghwa Telecom splits the content revenues with content providers in a range of between 10% and 30%. As a former state-owned enterprise, Chunghwa Telecom must adopt a more customer-focused and market-oriented strategy to offer consumers a broad range of mobile value in order to sustain revenue and growth.

DISCUSSION AND MANAGERIAL IMPLICATIONS

Yin contends that a multiple-case study is an analytical generalization approach, as opposed to the statistical generalization based on large and random samples (Yin, 2003: 31-32). We adopted this approach in which a previously developed theory is used as a template with which to

compare the empirical results of the case study. Replication may be claimed if two or more cases are shown to support the same theory. Table 6 summarizes the empirical results of our multiple-case study in Taiwan's m-commerce market. It describes how the findings from each of the two case studies support or do not support the theoretical propositions developed in the analytical framework. The high degree of literal and theoretical replication shown in Table 6, and the extent of "pattern matching" across the two cases where they encountered the same phenomenon provide high degrees of reliability (i.e., the same procedures can be repeated with the same results) and external validity (i.e., the study's findings can be generalized) to the theoretical framework.

Table 6: Support of key elements of analytical framework found in the multiple-case study.

Proposition	Far EasTone	Chunghwa Telecom
<i>Proposition 1:</i> Business model that capitalized on the disruptive attributes of m-commerce to increase customer perceived value	L,T	L,T
<i>Proposition 2:</i> Exploit network effects to build and sustain a critical mass of installed base of users in order to lower the unit operation costs	T	T
<i>Proposition 3:</i> Draw on a single set of digital assets to offer a scope of complementary products and services across many different and disparate markets	L	T
<i>Proposition 4:</i> Offer highly value-added services and invest in multiple complementary assets to increase customer's costs of switching to other vendors	L,T	L
<i>Proposition 5:</i> Make it easy for customer to do business with service providers and be able to reconfigure the value chain and transform value propositions to offer higher perceived customer benefits	L	L
<i>Proposition 6:</i> Capture the benefits of potential high-revenue and growth opportunities by implementing a viable business model, utilizing technology to track customers' preferences, and practicing a dynamic pricing strategy		

Note: The replication logic of a multiple-case study: **L** indicates literal replication (i.e., predict similar results). It indicates that this component was a clear, explicit element in the firm's mobile commerce business model; **T** indicates theoretical replication (i.e., predict contrasting results but for predictable reasons). Both **L** and **T** are entered in the Table when the firm implemented a series of strategies and dealt with some of them differently than they did with others. Where no **L** or **T** is shown, that theoretical proposition was not a clear or important part of the firm's mobile application service strategy or practice.

Both Far EasTone and Chunghwa Telecom are able to capitalize some but not all of the m-commerce disruptive attributes to offer value-added services. However, both companies are still unable to fully incorporate the personalization, localization, and ubiquity attributes into their m-commerce business models. The findings of Proposition 2 show both companies are still unable to take advantage of the network effects to achieve demand-side economies of scale. The m-commerce departments in both companies share little or none of the total fixed costs of operations. In principle, the mobile application services departments should shoulder their fair

share of the fixed costs of investments in building and maintaining the communications infrastructure. Since they are not under pressure to spread the fixed costs, it is rather easy for them to achieve a better business performance. The main responsibility of the mobile application services department in both Far EasTone and Chunghwa Telecom is to build and maintain an installed base of loyal customers in order to reap demand-side economies of scale through consumer marketing and value-added services.

The findings of Proposition 3 demonstrate that both companies are able to provide a scope of offerings to their m-commerce customers. However, Chunghwa Telecom lacks the capability to effectively manage its mobile content providers to ensure the quality of the m-commerce services. In addition, Chunghwa Telecom is unable to collect information (e.g., customer profiles and buying behavior) from mobile customers or to exploit its large existing customer database to offer a variety of customized products or services.

The results of evaluating Proposition 4 indicate that Far EasTone is unable to exploit its proprietary mobile handset specifications to lock in customers or increase their costs of switching vendors. Far EasTone needs to aggressively promote its *i-mode* services and strengthen its competitive advantage by enhancing the functions and features of its proprietary handsets. Finally, the evaluation of Proposition 6 indicates that both companies are overwhelmingly generating revenues from offering mobile phone voice and text messaging services. In order to expand the m-commerce business, both companies need to design and execute a viable business (revenue) model that utilizes technologies to track their customers' profiles and mobile buying behavior, and implement a dynamic pricing strategy to exploit the customer's willingness to pay for higher mobile value.

Our findings have some important managerial implications: First, the supply-side of m-commerce relates to its technology infrastructure and cost structures, whereas the demand-side of m-commerce has to do with the consumer's demand and search for value (Keen and MacKintosh, 2001; Kim, et al., 2007). Building and maintaining technology networks and systems is necessary for companies to provide quality and reliable mobile communications services. However, to increase market penetration or the adoption of m-commerce services, companies need to understand and be able to provide mobile value to meet or exceed customer demands. In addition, the acceptance of m-commerce is also related to the factors of perceived usefulness, perceived ease of use, social influences, wireless trust environment, and facilitating conditions (Lu, et al., 2005). Second, to increase perceived customer value, marketing attempts to identify the customer's latent demand for m-commerce services. Although mobile communications devices are very popular in Taiwan, the majority of consumers still use mobile phones for voice communications and text messaging. Mobile application services providers need to "educate" potential adopters of the benefits of their services through aggressive marketing campaigns. In addition, the cultural characteristics of users have a profound impact on how a new information technology, such as mobile Internet services, is initially adopted and later used (Lee, et al., 2007). Based on the results of their empirical study of mobile Internet user adoption in three Asian countries (Korea, Hong Kong, & Taiwan), Lee, et al., (2007) suggest that mobile service providers could devise differentiation strategies for some target user groups to provide them with culturally specific mobile Internet services.

Third, mobile telephony market is very competitive. M-commerce service providers need to expand the scope and contents of their offerings. One way to accomplish this goal is to establish strategic alliances with content aggregators and media companies. The entry of *i-mode* and Vodafone Live! Into Greece caused an increase in the number of such alliances (Stoili & Economides, 2007). Fourth, companies need to identify the discriminating attributes and understand why these attributes differentiate m-commerce from or disrupt both the traditional commerce and other forms of e-commerce. It is in regard to those attributes that consumers place higher values on the adoption of new technologies or innovations. For example, consumers may not want to purchase ring tones or manage their retirement accounts on the go. However, when customers need to find a gas station or reserve a restaurant table in an unfamiliar location, they are unable to receive location-based and time-specific information. Therefore, a viable m-commerce business model must be able to capitalize on the disruptive attributes for which customers place high values. Finally, understanding and being able to exploit the economic logic in the digital economy are essential for m-commerce to be successful. Managers must realize that achieving economies of scale and scope, increasing the customer's switching costs of switching vendors, as well as reducing transaction costs must come from both the demand and supply sides of the operations.

CONCLUSION

The conceptual arguments in the analytical framework that we have developed are plausible and, most importantly, we use a multiple-case study as additional justification for our arguments. The analytical framework serves as a valuable tool for business executives in assessing the extent to which a proposed service is likely to offer customer value and to determine the features and add-on services needed to support the provision of value to m-commerce consumers (Anckar & D'Incau, 2002). Since m-commerce customers are searching for higher perceived value, getting to know what consumers really want (i.e., their latent demands) is crucial for mobile application service providers.

Both Far EasTone and Chunghwa Telecom have generated almost all of their revenues from mobile phone services. The 3G mobile service applications have been available for some time but the market penetration rate for m-commerce is still very low in Taiwan. Our research demonstrates that the main challenge facing m-commerce service providers is to design and implement a viable business model which understands that the demand side of m-commerce is a search for value, exploits the economic principles in the digital economy (i.e., the principles of scale & scope economies, switching costs, & transaction costs, from both demand- & supply-side perspectives) to create new markets, and capitalizes on the disruptive value-adding attributes of m-commerce in order to generate revenues from a variety of sources through dynamic pricing strategies and sustain the growth of the company.

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