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An examination of first-mover (dis)advantages of ICT-driven innovation in the service industry

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ABSTRACT
Information and Communication Technology (ICT) has been the key driver for the modern service industry to innovate and achieve competitive advantages. In this highly competitive industry, companies actively invest technology to launch innovative services expecting to attract customers or lower cost. Academic and empirical studies have examined first-mover advantages in general industries. However, with the accelerating pace of ICT and the intense competition of the service industry, those who take the lead of adopting advanced technologies for service innovation may result to huge difficulties. This research conducts a cross-case study on ten service industries regarding their adoption of advanced ICT for service innovation and the advantages and disadvantages of their first-mover strategies. The objectives are to verify previously proposed first-mover advantages and reveal special concerns for strengthening the effect and the duration of first-mover advantages in the fast-moving service industry.

Keywords
ICT-driven innovation, the service industry, first-mover.

INTRODUCTION
Over the last decades, the growth power of the world economy has been transformed from manufacturing to the service industry. According to the statistics of UNCTAD, the service industry accounted for 66 percent of world GDP and 39 percent of world employment in 2008, which makes it contribute a growing share to economy. Companies of the service industry create value through their provision and earn revenue (Edvardsson et al., 2005), which include retail, finance, logistics, transport, tourism, and food industry. While innovation is the only way to make services more profitable and survive in the intensively competitive market (Werner and Wolfgang, 2008), information and communication technology (ICT) has been the catalyst of business innovation (James et al., 2008).

From information-accessing devices, information-processing applications, infrastructure technologies to communication networking, the burgeoning ICTs provide powerful capabilities to enable innovative services to various kinds of customers. Giving a practical example, American Airline (AA) created a specific channel to its customers with the first Computer Reservations System (CRS) – SABRE and terminals in 1962s. Cooperating with several business strategies such as screen bias (i.e., more than 70% of bookings from first screen displayed increase market share) and hole effect (i.e., extra bookings gained by CRS), SABRE have become a successful innovation to increase market share and gain huge profit revenue (Pemberton et al., 2001; Stonehouse et al., 2001). Therefore, being the first-mover in adopting ICT for innovative services has been expected to bring the key competitive advantage in the service industry.

The term “first-mover” refers to a company who enters a market with sizeable investments in any activities of service processing and is able to achieve advantageous resource positions (Lieberman and Montgomery, 1988; Varadarajan et al., 2008). Taking a classical first-mover case of ICT-driven service innovation, Radio Frequency Identification (RFID) has become an important and potential technology over the past decade which through radio waves to transfer data by electronic tags. Known as the first enterprise-wide deployment of passive RFID in the retail industry, Wal-Mart (Nishtha et al., 2007; Hardgrave et al, 2008) mandated that their top 100 suppliers ship goods with RFID tags by 2005. As the first-mover in adopting RFID (Evans, 2004), Wal-Mart not only controlled its internal cost in real time but also achieved a leading standard effect of RFID usage. Nowadays, Wal-Mart is part of a RFID committee, which launched a formal initiative for suppliers and retailers to adopt.

Currently academic studies have indicated that pioneer new products, services, process, and technologies provide firms to gain competitive advantages. However, most of those studies focus on the manufacturing industry rather than the service
industry (Song et al., 1999). The first-mover advantage in the service industry may be alleviated since the difference service characteristics from the manufacturing industry. For example, service innovations are easily implanted and copied by others (Voss et al., 1992). The first modern Automatic Teller Machine (ATM) was installed by Barclays bank in 1967 with improved network transport and security. This ICT-driven service innovation has become the standard service in the banking industry and has been adopted by banks worldwide. The adoption of the ATM did not bring to Barclays the monopoly advantages of being the first-mover, it seems worthwhile to re-examine the first-mover theory with ICT-driven innovation in the service industry.

Suarez and Lanzolla further identified two factors that powerfully influence the fate of first-movers: the pace of new product diffusing at the market and the pace of new technology evolving (Suarez and Lanzolla, 2005). Accompany with the totally changing of the environment and the crucial dynamics of industry condition, the first-mover theory seems to be challenged (Suarez and Lanzolla, 2007). Besides, the advancement of ICT continuously changes value to business patterns (Porter, 2001). While ICT allows a range of innovation possibilities and specific applications, it doesn’t be well articulated and understood (Swanson and Ramiller, 1997). Given the rapid pace of change in technologies, ICT-driven innovations in the service industry not only take abundant expenditure and time but also contain significant risks, and consequently result in the totally different outcomes of being first-mover in such situation.

This research endeavors to seek patterns regarding the first-mover advantages and risks associated with ICT-driven service innovations. The findings should help service providers to launch ICT-driven innovation in appropriate situations and thus to sustain competition.

THEORICAL BACKGROUND

Over the past three decades, pioneering products, services, and process technologies have resulted in sustainable competitive advantages and have been extensively studied in the manufacturing industry (Lieberman and Montgomery, 1988; Song et al., 1999; Suarez and Lanzolla, 2007; Varadarajan et al., 2008). While the environment is rapidly changing, the extent of first-mover with ICT-driven innovation in the service industry is important but has been far less discussed. This chapter will give a brief review of the characteristics of ICT-driven innovation in the service industry and explore the extant literature on the issue of first-mover.

ICT-driven Innovation in the service industry

Although services play a predominant role while regarding to the GDP and employment of the advanced country, the knowledge about service operation and management is still developing. Services are intangible, inseparable, perishable, variable, inconsistency, and heterogeneous (Kerin et al., 2008; Kotler and Keller, 2006; Pride and Ferrell, 2003; Solomon and Stuart, 2003; Lovelock and Gummesson, 2004; Spring and Araujo, 2009). While services establish the direct contact and intimate relationships with customers to create value, all of the characteristics make the service industry hard to manage its performance and quality (Edvardssona and Olsson, 1996; Sundbo, 1997). While the innovations make service more profitable (Werner and Wolfgang, 2008), scholars further found that the problem service providers had long suffered from haphazard approaches to innovate can be resolved by implementing the new technologies (Thomke, 2003).

Bringing the greater efficiency, effectiveness, performance, quality, and customer relationships, ICT has been claimed as a source of competitive advantage in late 1980s (Ross et al., 1996) and regards as the catalyst of business innovation nowadays (James et al., 2008). To examine the factors played by knowledge-intensive business services (KIBS) in innovation, Hertog (2000) provides a framework that includes four dimensions of service innovation: service concept, service delivery systems, client interface, and technology option. Referring to the taking action with new technology, the dimension of “technology option” identifies that technologies are not only the center but also the necessary factor of service innovation (Henning et al., 2009; Glazer, 1985). As Howells (2006) mentioned, service innovation contains four stages (i.e., technology, assimilation, demarcation, and synthesis) and technological innovation is the first of these stages.

However, given the high elimination rate of ICT and the short life cycle of innovation, the ICT-driven innovations take extreme investments of time, money, and human resources. At the same time, ICT-driven innovations in the service industry have become more quickly suffer the imitation (Voss et al., 1992). For example, a company’s service innovation via the Internet may be easily copied by the competitors (i.e., the later-movers) if this innovation can’t be protected with other complementary resources. The particular characteristics of ICT-driven innovations mentioned above realize the so-called “innovator’s dilemma” (Christensen, 1997); in which situation, the managers are blind to decide the order-of-entry of ICT adoption. By focusing on the practical cases of service industry, we argue the existing of the first-mover theory within the ICT-driven innovation.
First-mover

The issue of “first-mover” is derived from the barrier-to-entry theory (Bain, 1956) and the order-of-entry-effects theory (Urban et al., 1979). Some literature may refer to it as “first brand” (Schmalensee, 1982; Bond and Lean, 1979), “pioneer” (Robinson and Fornell, 1985; Urban et al. 1986), or “early entrant” (Grewal et al., 2003). Summarizing prior findings, there is a strong relationship between order of entry and market share. After the sizeable investment of innovation, R&D, or patents in products/services/process technologies, first-movers can obtain not only higher market share but also greater profit earning (Schmalensee, 1982; Robinson and Fornell, 1985; Urban et al. 1986; Lieberman and Montgomery, 1988; Varadarajan et al., 2008).

Although the first-mover strategy may accompany with several disadvantages (Lieberman and Montgomery, 1988; Boulding and Christen, 2001), it still be approved by empirical researches (Robinson and Fornell, 1985; Lambkin, 1988; Franco et al., 2009) and be pursued by the most business managers. Some scholars further outlined the other factors influence the fate of first-movers, such as the richness of first-movers’ resources and capabilities (Lieberman and Montgomery, 1998; Suarez and Lanzolla, 2007), the dynamic of market and technology evolution (Suarez and Lanzolla, 2005, 2007). The first-mover theory seems to have generated strong interest in both academic and empirical efforts, but the extant researches are associated with specific industry (Short and Payne, 2008; Varadarajan et al., 2008). To fill the research gap of the first-mover’s theory in the service industry, we apply studies from previous literatures (Lieberman and Montgomery, 1988; Suarez and Lanzolla, 2007; Varadarajan et al., 2008) and conduct an analysis framework with five first-mover advantages and four disadvantages. The following sections elaborate those first-mover (dis)advantages.

First-mover advantages: technological leadership

First-movers always lead its competitors in the R&D and patent race. As an advanced leader of technology development, the first-mover might create a new product/service, might save on the cost of the product/service-making process, or might increase the product/service quality and quantity. The technological leader gains the advantage of scale economies with the accumulated learning and experience (Lieberman and Montgomery, 1988; Lieberman and Montgomery, 1998; Suarez and Lanzolla, 2007). Furthermore, first-mover with the Intellectual property (IP) will achieve powerful protection from later-movers (Lambkin, 1988).

First-mover advantages: preemption of scare resources

While a company enters a new market, it might accumulate its scarce resources within the monopoly period. Scare resources can be physical assets or virtual resources. Such physical assets may include the natural deposits and geographic resources (Lieberman and Montgomery, 1988), while the virtual resources include the brand penetration and the customer loyalty (Robinson and Fornell, 1985; Eaten and Ware, 1987). In the manufacturing industry, the geographic resources are especially important, such as plant location, market area, channel distribution. (Varadarajan et al., 2008; Suarez and Lanzolla, 2007)

First-mover advantages: network externalities

Network externalities come from the inter-weaved relationships by both the sizable customers and key suppliers (Lambkin, 1988). With such an installed base (i.e., size of the network), first-movers may easily co-construct and lead the standards with whole industry (Varadarajan et al., 2008). Finally, it will increase its value to its current and potential customers.

First-mover advantages: switching cost

Switching costs can be of several types, such as initial transactions costs, installation costs (including the resources the buyer must provide in adapting to the seller's product), supplier-specific learning by the buyer, and contractual costs (Lambkin, 1988; Varadarajan et al., 2008). With switching costs, later-mover must invest extra resources to attract current customers away from the first-mover (Lieberman and Montgomery, 1988).

However, the emerging technologies made the first-mover advantages equivocal. While Porter (2001) argued that the Internet have lowered switching costs and weakened the network effects (via lower transaction cost, lower search efforts, and higher information transparency), there are more cases show the first-mover can obtain advantages by offering the unique and value-added services. For example, as one of the biggest online stores, Amazon provides the personalized service based on the consumers’ data they have held.

First-mover advantages: brand reputation

According to Schmalensee (1982), customers always deal with imperfect information regarding product quality. Under the conditions of information and consumption-experience asymmetry (Varadarajan et al., 2008), customers tend to rationally
Shang & Wu  

*First-mover (dis)advantages of ICT-driven innovation in the service industry*

stick with first-mover that they have encountered. Several related studies found that, in some sorts of consumer goods (i.e., low-price and high-frequency goods), the brand image and loyalty to a first-mover may remain remarkably durable (Porter, 1976; Wernerfelt, 1987).

**First-mover disadvantages: free-rider effects**

While a first-mover has invested huge resources and expenditure in new market, such as educating customers and expanding distribution, a later-mover may utilize the free-rider effect to transfer the first-mover advantages to itself (Kerin et al., 1992; Lambkin, 1988; Lieberman and Montgomery, 1988; Lilien and Yoon, 1990). In this paper, the free-rider effect particularly means the shifting risk of the market, leaving shifting of technology.

Customers’ needs are complex and heterogeneous, which means that most markets can be divided into smaller market segments. Therefore, later-movers might easily transfer product/service characteristics to fulfill different customers’ needs.

**First-mover disadvantages: uncertainty of technology**

Every new technology/product/service needs a large amount of resources and capital investment, at the same time, they brings the risk of failure. The first-mover advantages are accompanied by risks because of the uncertainty and expenditures in the emerging technologies. Lambkin (1988) pointed that the uncertainty of new technology is hard to be resolved.

**First-mover disadvantages: shifts in technology**

Competitors may develop a different function or position by shifting in technology (Carpenter and Nakamoto, 1989; Kerin et al., 1992; Lambkin, 1988). Although patents provide protection for most new technologies, later-movers still can “invent around” those patents as technology advances (von Hippel, 1982). Furthermore, imitation costs are generally lower than innovation costs in most industries and markets, and if duplication is relatively easy, first-movers’ advantages will decrease over time.

**First-mover disadvantages: incumbent inertia**

Most first-movers cannot maintain advancement after initial success with new products or services. There are several rational/non-rational reasons (Lieberman and Montgomery, 1988). At the beginning, the first-mover may be locked into a specific standard of fixed assets. The firm will keep the same profile set or product lines to lower its original cost. Gradually, the first-mover will become organizationally inflexible and unable to respond adequately to environmental change or competitive threats (Lambkin, 1988; James et al., 2008).

The above advantages and disadvantages are extracted from the extant literatures and will be quoted by this paper.

**RESEARCH DESIGN**

To identify the first-mover advantages and disadvantages achieving by who takes the advanced technology for innovative services, we picked up a few emerging technologies of different stage over the decades. The adopted technologies include: the computer reservations system (CRS) in Airline industry, the ATM in Banking industry, the transaction management systems (TMS) in Pharmaceutical distribution, the point-of-sales (POS) system in Fast food services, the online tracking system (OTS) in Logistic, the Location-based services (LBS) in Mobile Advertising, the smartcard system (SCS) in Public Transportation, the Multi-media kiosks (MMK) in Convenience Store services, RFID in Retails, Near field communication (NFC) for Ticketing. Then, ten selected cases (shown in table 1) are the first-mover in the industry for adopting the particular ICT to provide customers innovative services.

<table>
<thead>
<tr>
<th>ICT</th>
<th>Industry</th>
<th>First-mover (Adopting year)</th>
<th>Later-mover</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATM</td>
<td>Banking</td>
<td>Barclays (1967)</td>
<td>HSBC, RBS, Natwest</td>
</tr>
<tr>
<td>TMS</td>
<td>Pharmaceutical distribution</td>
<td>McKesson (1975)</td>
<td>Cardinal Health, AmerisourceBergen</td>
</tr>
<tr>
<td>POS</td>
<td>Fast food restaurant</td>
<td>McDonald's (1991)</td>
<td>KFC, Burger King, etc.</td>
</tr>
<tr>
<td>OTS</td>
<td>Logistic</td>
<td>FedEX (1994)</td>
<td>UPS, DHL</td>
</tr>
<tr>
<td>LBS</td>
<td>Mobile advertising</td>
<td>DoCoMo (2001)</td>
<td>KDDI, Softbank Mobile</td>
</tr>
<tr>
<td>SCS</td>
<td>Public transport</td>
<td>EasyCard (2002)</td>
<td>Taiwan Money Card, Taiwan Easy Go</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ICT Type</th>
<th>Service Type</th>
<th>First-Mover (Year)</th>
<th>Competitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFID</td>
<td>Retail</td>
<td>Wal-Mart (2005)</td>
<td>Costco, Target, etc.</td>
</tr>
<tr>
<td>NFC</td>
<td>Ticketing</td>
<td>Mobilkom Austria (2007)</td>
<td>T-Mobile, Orange, etc.</td>
</tr>
</tbody>
</table>

Table 1. Brief background of ten cases

Data of the ten cases were collected from publically available resources including: academic papers, annual reports of the first-mover and competitors, business reviews, analysis researches, and industry articles. We examined the first-mover (dis)advantages in ten cases by nine research items, i.e., technological leadership (TL), preemption of scarce resources (PSR), network externalities (NE), switching cost (SC), brand reputation (BR), free-rider effects (FRE), uncertainty of technology (UT), shifts in technology (ST), incumbent inertia (II). Following this stage, we organized expert panels to discuss in detail findings about the first-mover strategies. Those experts consisted of domain managers, academic professor, and industry researcher. Then a cross-case analysis was conducted to find patterns of the first-mover with ICT-driven service innovations.

CASE ANALYSIS

To make the assessment more objectively, we tried to prepare a detailed criterion for the nine research item. Then, every item is described by several illustrations. During the discussion of expert panel, experts assess each item of each case by the same criterion. For example, if the service company owned the patent of this ICT-driven innovation, the degree of “technological leadership” is higher. If there have several competitors owned the similar ICT-driven innovation, the company may encounter “shifts in technology” by later-movers.

Furthermore, we continue tracked the adoption year of ICT-driven service innovation by the second-mover. The interval between first-mover and followers can help us to understand the duration of the first-mover advantages and to decide on its effects on consequent performance.

FINDING

To explore the first-mover effect of the ICT-driven service innovation, we tracked the advantages, disadvantages, durations, competing strategies and the consequents of selected cases.

According to the case analysis, first-movers of the ICT-driven service innovation experienced the similar advantages as those in the manufacturing industry. The similar advantages are the preemption of scarce resources, switching cost, and brand reputation. There are two first-mover advantages relatively weak. One is the technological leadership, which means retaining the leading position by achieving outstanding technologies or establishing intellectual property. This may possibly due to that most service companies outsource the development of ICT-driven innovative process and focus only on coordinating and reorganizing internal and external resources for new services. Another one is the network externalities, which refers to the standards co-constructed by the company and its suppliers and customers. Sundbo (1997) indicated the service innovations are easy to be imitated by competitors and which weaken the effect of external externalities.

Second, nearly every first-mover encounters the disadvantage of free-rider effect. It is a common pattern with the first-movers. Later-adopters took advantage of stable technology, lower costs and mature customers. It seems that the long-lasting winners coordinated other resources and continuously reinventing the services. For example, the first MMK in the CVS industry of Taiwan was developed by Hi-Life – the third-large of CVS in Taiwan. As a convenient and successful machine, High Life provides payment services for overnight delivery, banks, parking fees, event tickets, etc. (Shang and Chen, 2010). This innovative service dramatically changed customer behavior and drew attentions from all competitors. However, by retaining hundreds of MMK related patents, the followers were unable to imitate the services for more than two years.

Finally, those first-movers in the service industry also suffer the disadvantages as those in the manufacturing industry (i.e., uncertainty of technology and shifts in technology) except “incumbent inertia”. This is probably due to that most service industries are intensively competitive than the manufacturing industries, service providers involve in a non-stop cycle of continuous innovation to attract and retain customers. In addition, the development of service innovations tend to take less time and resources than the establishment of manufacturing capacity for innovative products or processes, the whole organizational resources in service providing firms tend to engaged less than those in manufacturing industries.

CONCLUSION

With the dynamics of ICT development and industry environment, should service company endeavor to be the first-mover? This paper tries to examine the first-movers’ performances in the service industry, especially with the ICT-driven innovation.
The finding reveals that first-movers with the ICT-driven service innovation may not have the same (dis)advantages as those in the manufacturing industry. It indirectly proves the previous researches about the first-mover theory and its moderating factors (Lieberman and Montgomery, 1988; Suarez and Lanzolla, 2007; Varadarajan et al., 2008). With different industry and different pace of technology and market evolvement, the first-mover effects may vary.

The further implication of this finding appears that service providers are in an intensively competitive environment where they experience shorter period of the advantages and doesn’t have the leisure of being stabilized. Multiple investments in service innovations should always in progress.

Furthermore, it's worth to note the importance of the strategy about organizing the complementary resources for service innovation. Although ICT is the best way to facilitate service innovation (Sambamurthy et al, 2003), it evolve rapidly, continuously and can be duplicated easier. Using the advanced ICT to lock customer may in vain, because competitors can catch up soon or invent around in another value-adds. Therefore, first-movers need to invest in building the complementary resources such as external linkages (Keen, 1991) which involve the unique position strategy, the trust-based supply network, and the long-term intimate relationship with customers. Those complementary resources play a crucial role (Stieglitz and Heine, 2007) and will help first-movers to establish a service infrastructure difficult to imitate. For examples, the business strategies of screen bias to AA in combination on its Sabre system, the patents of MMK of Hi-Life to restrict the free riders, the industrial standard building by Wal-Mart. Those strategies of building complementary resources to hold the position in either in the market or with suppliers can be a key consideration for sustaining the first-mover advantages with ICT-driven service innovation.

This research is still going on and more recent cases will be adopted in the future research. Other research methodologies will be used to resolve the limitation of multi-case study (Eisenhardt, 1989).

REFERENCES