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REALIZING THE VALUE OF MOBILE SERVICES —THE VERIFICATION OF “LIMIT-TO-VALUE” FRAMEWORK

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Abstract

The development of mobile services has become a popular issue for companies in a mature internet environment. To successfully implement mobile services, companies must be adequately involved in the unprecedented innovation activities. However, for companies to buy into the service, it is essential for them to perceive the value of the service and actually achieve that level of value. With this in mind, this research aims to explore the value of mobile service investment and related value barriers. We use the limit-to-value framework to examine the valuation and conversion process for mobile services in the context of the exhibition industry and focus on exhibitors in particular. Pre-usage and post-usage data was collected through two-stage survey. This study can help us to understand the critical value-discounting factors and the valuation process for exhibitors as they consider adopting and using innovative mobile services in the exhibition industry.

Keywords: Mobile service, Value conversion, Exhibition industry, Valuation barriers.

1 INTRODUCTION

Advances in computing and wireless telecommunications networks have enabled anytime, anywhere access to mobile services on a grand scale through a multitude of mobile devices (e.g., cellular phones, hand-held or palm-sized computers, or vehicle-mounted interfaces) (Lyytinen & Yoo 2002; Wang et al. 2006). However, mobile services and mobile devices are not equally popular, just as the popularity of wired e-commerce cannot be assessed according to the popularity of computers, as has previously been proven (Anckar & D’Incau 2002). Gartner did a large-scale global survey of several thousand subscribers in 2007, asking what mobile services they used and the results show that fewer than 10 percent of people in Western Europe have used mobile services and that the number of people planning to try these services in the next year (2008) is only a few percent.

The low adoption rate reflects that users may not fully understand the value of mobile services. Brand-new mobile services have features such as ubiquity, personalization, flexibility, and dissemination, challenging people’s old habits, which are difficult to break (Jessup & Robey 2002). Thus, as use patterns change, new demands and expectations emerge that causes uncertainty about what people value and are willing to pay for (Tilson et al., 2004). In addition, value cannot be realized without mass adoption; even the best-designed mobile service business model will soon be defeated if it is not widely successful (Anckar & D’Incau 2002; Pedersen et al. 2002; Pedersen & Ling 2003). Therefore, understanding how the value of mobile service can be communicated and identifying the value-discounting factors that affect consumer intention to use mobile services are indeed pressing issues.

Past researchers have attempted to resolve similar issues in the field of IT in general. In 2000, Davern and Kauffman (2000) distinguished between two types of IT value, potential value and realized value, by analyzing decision support systems. Potential value represents the maximum value opportunity available to the investor if IT is implemented successfully, and realized value is the measurable value that can be identified after implementation. The model was extended by Chircu and Kauffman (2000) to show that each factor is subject to different influences that diminish the benefits of the investment. They have defined the “limit-to-value” framework as the valuation and conversion processes that are affected by a series of specific value-discounting factors called valuation barriers and conversion barriers. That is to say, there are a number of value flow barriers that affect the assessment of the potential value of IT and its conversion into realized value. This framework enables subsequent researchers to explain why not all value flows can be realized after the implementation of IT.

While the past literature on the performance of mobile services has focused on either adoption or post-adoption issues, few studies address the value flow through both stages, and therefore, the research that has been done has been unsuccessful in capturing the real value of the service. Although the limit-to-value framework provides a useful methodology for assessing value, there have been no empirical studies done so far. Therefore, our research goal is to use a limit-to-value framework to evaluate the value of mobile services before and after use. The framework will be further validated using an empirical study of an innovative mobile service in the Taiwanese exhibition industry. To be more specific, our research question focuses on the valuation barriers and conversion barriers that influence mobile service value before and after the introduction of such services.

2 LITERATURE REVIEW

To prevent incorrect estimates of IT investment value, Chircu and Kauffman (2000) have suggested that managers need to identify from the start the maximum value that they can obtain and what factors can diminish or erode that value. They propose the limit-to-value framework to explain how the general value flows to become realized value.

According to the Limit to Value Framework (Figure 1), for any type of IT investment, there are a number of sources of value that are general and can be applied to any company in any industry. IT value flows include all general value. Firms must realize that not all value can be captured and

identify what value barriers limit this realized value. Firms have to know the valuation barriers and conversion barriers to avoid losing expectation value. Valuation barriers emerge from the assessment of the potential benefits of the IT investment. After implementation, the firm must ascertain what factors make up conversion barriers that decrease the potential value to the realized value. There is a two-step process required to sort out how best to think about this problem. The two components involved are the valuation process and the conversion process.

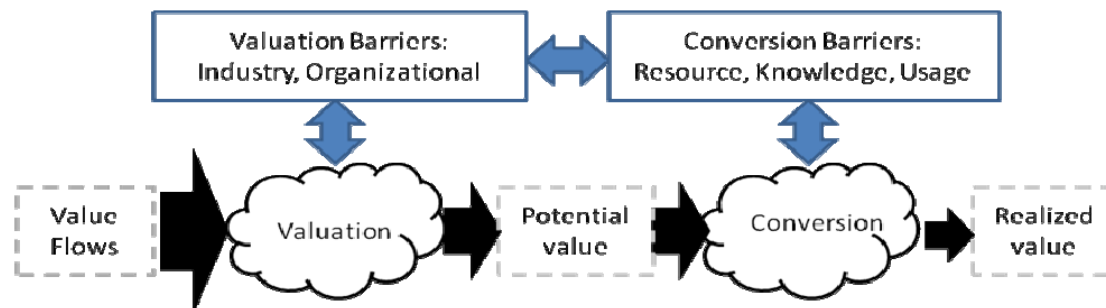


Figure 1. The Limits to Value for IT Investments Framework (Source: Chircu and Kauffman 2000)

2.1 Valuation Process

This is the process that the general value flow be applied by a specific industry and a specific organization to generate potential value. Potential value represents the maximum value opportunity available to the investor if IT is implemented successfully. During the IT valuation process, managers need to consider how specific organizational and industry characteristics generate barriers to altering the full general value potential. If firms ignore these features, as the following researchers have pointed out, the potential value might be narrow during the initial stage.

Numerous researchers have discussed organizational and industrial factors that affect firms' adoption of new technologies. Thong and Yap (1995) suggest that CEO and organizational characteristics are important factors affecting IT adoption in small businesses. Flanagan (2000) proposes that social pressures are significant in innovation adoption; organizational features and perceived benefits are reasonable predictors of adopters and non-adopters and effective predictors of the likelihood of adoption for non-adopters. Chwelos et al. (2001) point out three factors as determinants of the adoption of electronic data interchange (EDI): readiness, perceived benefits, and external pressure. Pae and Hyun (2002) find that compatibility, upgradability, and preannouncement affect network externalities and switching costs and thus have a significant effect on consumer adoption of new technologies. Patterson et al. (2003) stress that organizational and environmental factors, including organization size, decentralized organizational structure, organizational performance, supply chain strategy integration, inter-organizational factors, and environmental uncertainty, have a significant impact on the adoption of new supply chain technology. Zhu et al. (2003) believe that the TOE (technological context, organizational context, and environmental context) framework is appropriate for studying e-business adoption and technological innovations. The critical factors in their framework include technology competence, firm scope, firm size, consumer readiness, competitive pressure, and lack of trading partner readiness. Moreover, Zhu et al. (2006) develop a conceptual model and point out that open-standard inter-organizational systems (IOS) adoption will be positively influenced by network effects, expected benefits, and adoption costs; they find that network effects are a determinant of network adoption. Their paper also points out that adoption costs are the significant barrier to open-standard IOS adoption. Furthermore, Menor and Roth (2007) suggest that the adoption of a new service is affected by process focus, market acuity, strategy, culture, and information technology experience. Based on this past work on IT or e-business adoption, we conclude three types of industrial barriers: (1) network externalities, (2) industry characteristics of adopting new service innovation, and (3) competitive pressures; and three types of organizational barriers: (1) organization features (organization size and organization age), (2) organizational culture, and (3) business alignment.

2.2 Conversion Process

The conversion process parallels the implementation phase. This process changes potential value into realized value, which is defined as the measurable value that can be identified after implementation. The amount of value is often diminished during this process. Frequently, managers only give consideration to the potential value estimate for a system and ignore the difficulties of IT implementation that create conversion barriers (Chircu et al. 2001). Based on Chircu and Kauffman (2000), it would seem that resource barriers, knowledge barriers, and usage barriers are the major conversion barriers as discussed below.

Resource Barriers. Based on the resource-based theory, it emerges that resource barriers are generated by a lack of co-specialized resources such as human capital and new organizational processes. Chircu et al. (2001) also state that IT investments are often stalled by insufficient resources in areas like user training, system usability engineering, and organizational awareness of how to obtain value. Two IT-co-specialized resources are generally discussed in the past literature: IT operations, and IT objects. IT operations can be considered as the manifestation of technical knowledge and as the processes that utilize IT to accomplish a particular assignment (Spanos & Lioukas 2001; Molla & Licker 2005). IT objects represent computer-based hardware, software, and support personnel (Tippins and Sohi, 2003). They are equal to IT infrastructures, which are the shared information delivery base for firms and sustain IT-based innovation.

Knowledge Barriers. Awareness is one of the knowledge barriers that may affect the decision to adopt or reject innovations in firms. Awareness refers to an organization's perception, comprehension, and projection of the benefits and risks of IT, and it affects both initial adoption and subsequent level-of-utilization decisions (Mirchandani & Motwani 2001; Molla & Licker 2005). Likewise, organizational learning also related to knowledge barriers (Tippins & Sohi 2003). An IT investment requires employees to learn and develop know-how regarding new skills and new organizational routines as part of organizational learning. Some scholars propose that knowledge barriers can be addressed by absorptive capacity that the senior leadership teams own because they can recognize valuable IT information, developing and applying learning as they guide IT innovation activities at their firm (Cohen & Levinthal 1990). In 2002, Zahra and George summarize the work of organizational learning and absorptive capacity and reconceptualize absorptive capacity as a construct related to a firm's acquisition, assimilation, transformation, and exploitation learning capabilities. Similarly, Ulrich (2009) also suggests that absorptive capacity involves exploratory, transformative, and exploitative learning capabilities, resolving knowledge barriers from external environment.

Usage Barriers. Even if an organization can conquer resource barriers and knowledge barriers in IT implementation, the overall success of its investment is still highly dependent on how well IT is embraced by potential adaptors (Chircu & Kauffman 2000). Chircu et al. (2001) suggest that usage barriers are due to the usefulness and the usability of the system and the responsibilities associated with its use, which may result in hesitation on the part of users regarding the adoption of IT. Similarly, Devaraj and Kohli (2003) argue that the driver of IT impact is not the investment in the technology but instead the actual usage of that technology. Zhu and Kraemer (2005) also consider actual usage as a critical stage in the value creation process and define actual usage as the extent to which e-business is being used to conduct value chain activities measured by the breadth of its use for different value chain activities and the depth of use percentage for each activity that has been transferred to the internet platform.

3 RESEARCH MODEL AND HYPOTHESIS

New and improved computing and telecom technology enables anytime, anywhere access to mobile services on a grand scale through a multitude of mobile devices (Mallat et al. 2008). However, there are many value discounting factors related to mobile service, such as the relative novelty of mobile commerce, the complexity of mobile transactions, the perceived lack of security, a lack of user-friendly mobile portals, and the different perceptions of mobile service value held by different

demand sides. Therefore, it is difficult to estimate how people act to a new mobile service. Due to the variety of obstacles between new mobile service and people adopting behaviors, outcomes for mobile services often do not meet expectations. Thus, it is indeed important to understand value propositions and related value barriers in the context of mobile service. As a result, our research aims to explore the various aspects of value barriers for mobile service. According to the previous research, our research framework is developed from the limit-to-value framework and works to dissect the valuation process for mobile services and the barriers that can diminish value realization, as Figure 2 shows. The details of this framework are described below.

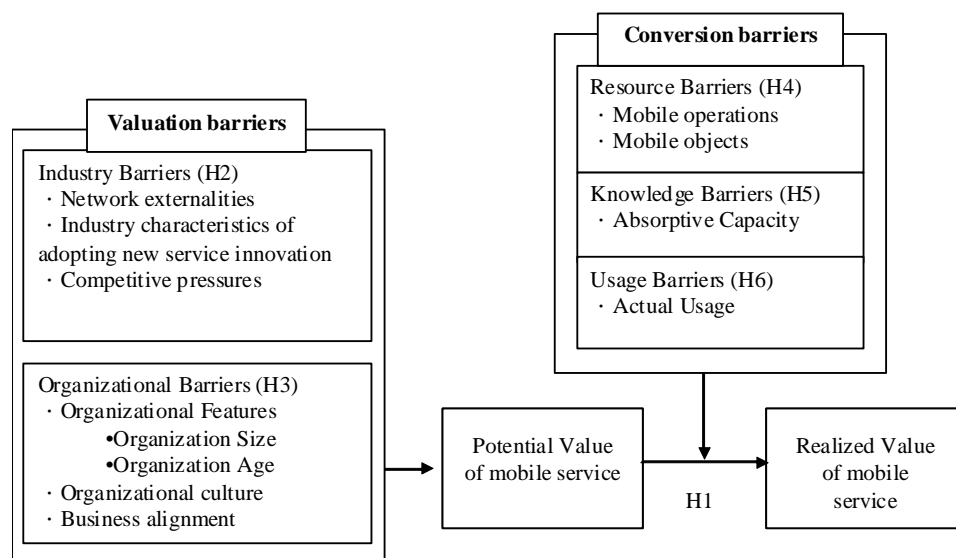


Figure 2. Research Framework

3.1 Value of Mobile Services

We define the potential value of mobile services as the expected value opportunity available to the investor if the implementation process is one hundred percent successful. Numerous studies recognize the potential value of mobile service. For example, Siau et al. (2001) argue that mobile service can provide elements of value such as ubiquity, personalization, flexibility, and dissemination. Wang et al. (2006) also consider the potential of mobile service to deliver value-added, interactive, and location-based services to customers. However, not all of the mobile services can proceed smoothly without a hitch. Barriers may arise after implementation and thus reduce the degree of implementation success. Some scholars mention that without mass use, mobile services will quickly fail, even under the best-designed business model (cf. Anckar and D’Incau 2002; Pedersen et al. 2002; Pedersen & Ling 2003). Wang et al. (2006) argue that firms should take crucial barriers into consideration during the operation of mobile services, such as consumer acceptance. Based on the above literature, the value of mobile services that can ultimately be realized by the firm may be different from the expected value because of the barriers that arise after mobile service has been implemented. The realized value of mobile services has significant implications for a firm to truly understand the mobile service they feel and perceive. Therefore, we define the realized value of mobile services as the real value that can be identified after mobile service implementation. According to Chircu and Kauffman (2000), this will be the result of a conversion process in which the transformation of potential value occurs.

Based on both values and the mobile service literature, we argue that high potential value means high expected value in combination with a high level of intention to use mobile services. The firms have features that facilitate the adoption of new mobile technologies and believe that such services can provide them with benefits. With a high level of support and a strong belief in mobile services, it is expected that conversion barriers will be proactively eliminated, thus leading to high levels of realized value. We develop the hypothesis H1 on this basis:

H1: Potential value is positively related to the realized value of a mobile service.

3.2 Valuation Barriers with Mobile Services

3.2.1 Industry barriers

Based on the literature review in Section 2, three industrial barriers are discussed in this study: network externalities, industry characteristics of adopting new service innovation and competitive pressures.

As Katz and Shapiro (1986) have argued, network externalities are based on the assumption that the perceived benefits often depend on the number of other consumers who purchase identical or compatible items. In the mobile market, Wang et al. (2008) consider network externalities as well-verified concepts that can significantly explain the acceptance of new technologies; they confirm the effectiveness of network externalities in bolstering the acceptance of multimedia messaging services (MMS), an innovation in the field of mobile telecommunications. Hence, we argue that network externalities affect potential users' acceptance of new mobile service innovations before they actually use them. Once the number of other adopters who have used such mobile services on the market grows up, the potential adopters will expect a high level of value from the service. Therefore, we develop hypothesis H2a:

H2a: A lack of network externality has a negative effect on the potential value of mobile services.

At the same time, having positive attitudes toward adopting new service innovations is necessary to keep a firm growing. Datamonitor (2009) provides an analysis of the global mobile industry, and this report shows that the global mobile phone market, which consists of all analog and digital handsets used associated with mobile telephones, generated total revenues of \$101 billion in 2008, representing a compound annual growth rate (CAGR) of 12.2% for the period spanning 2004-2008. The global mobile phone market has been growing at a healthy rate over the past five years and will continue to do so during the forecast period (Datamonitor, 2009). Therefore, it seems that the widespread mobile market around the world will sustain mobile investment very well. Firms should take these innovative trends into account and work to create more powerful mobile services to facilitate market growth. Because the industry generally expects a bright future for new mobile services, such positive attitudes will help a specific firm to preserve a similar attitude and thus create high potential value for mobile services. Thus, we develop hypothesis H2b:

H2b: A lack of industrial positive attitude toward adopting new service innovation has a negative effect on the potential value of mobile services.

Moreover, competitive pressure has a significant influence on mobile service. Many firms mention that they will consider investing in mobile applications when their competitors and strategic partners, the source of competitive pressure, begin to experiment with new service practices (Wang & Cheung 2004). Thus, competitive pressure can drive firms to seek the benefits of new mobile services. In other words, a lack of competitive pressure causes firms not to be able to see the value of mobile services and keeps them from moving into the realm of mobile business. Thus, we developed hypothesis H2c:

H2c: A lack of competitive pressure has a negative effect on the potential value of mobile services.

3.2.2 Organizational Barriers

Based on the discussions in Section 2, three different kinds of organizational barriers are considered: organizational features (including organization size and organization age), organizational culture, and business alignment.

Wang and Cheung (2004) have argued that firm size has an interaction effect on the use of mobile technologies in daily firm business and that larger firms demonstrate a significantly stronger intention to adopt e-business than do smaller firms. We can derive that large firms expect that mobile

innovations can preserve organizational growth, attract more customers, and increase exposure rates. Thus, hypothesis H3a is as follows:

H3a: Organization size has a positive effect on the potential value of mobile services.

The past literature has indicated that organization age is negatively related to the adoption of innovations (Flanagin et al. 2000). Newer organizations are born into an environment saturated with advanced communication and information technologies, and thus, they naturally rely on technologies to achieve competitive advantage (Porter 1981). Because mobile services are often perceived as a new technological trend, a new channel, and a new opportunity to gain competitive advantage in the specific industry to which a particular firm belongs, we argue that the newer organizations may be more inclined to use mobile services, and they may expect higher value from those mobile services than older organizations.

H3b: Organization age has a negative effect on the potential value of mobile services.

Organizational culture is also a key factor that affects a firm's decision to invest in an innovation. Today, the new innovative market tendency is toward mobility and service orientation. Additionally, if senior managers in an organization such as the CEO recognize these market trends, they are more likely to adopt mobile services and perceive that the benefits of the service outweigh the risks. Then, the firm will be more likely to adopt the mobile service. Consequently, our hypothesis here is as follows:

H3c: Organizational culture has a positive effect on the potential value of a mobile service.

IT-business alignment can aid stakeholders in developing a clearer understanding of the goals and objectives of the project at the outset and can maximize the potential return on IT investment (Huang & Hu 2007). Particularly now, in the information explosion age, firms take customer service seriously. If they aim to increase the productivity and efficiency of customer service representatives and enhance customer service value, the firms that want to gain competitive advantage will recognize the value of new IT innovations such as mobile service technology. Thus, hypothesis H3d is as follows:

H3d: A lack of business alignment has a negative effect on the potential value of a mobile service.

3.3 Conversion Barriers with Mobile Service

3.3.1 Resource Barriers

Based on the literature review in Section 2, we derive two co-specialized resources related to mobile services: mobile operations and mobile objects.

Mobile operations are defined as organizational methods or processes that are required to complete a mobile task. Slilva and Gray (2008) argue that the current business requires supportive organizational structure and processes to push mobility forward. The increasing mobility of the workforce pose new challenges for organizations as they seek to effectively manage working environment and develop more flexible modes of communication, collaboration, and information-sharing. Without efficient business processes to support mobility, companies can not realize the value of mobile services. Hence, we develop hypothesis H4b:

H4a: A lack of mobile operations has a negative moderating effect on the relationship between the potential and realized value of mobile services.

Mobile objects are made up of important IT objects that facilitate and support mobile applications, including mobile technological infrastructure, mobile handheld devices, and mobile technical support for human resources. Mobile technological infrastructure (e.g., Wireless Application Protocol (WAP), Bluetooth, 3G, and General Packet Radio Service (GPRS)) provides connectivity in the mobile world (Perry et al. 2001; Nah et al. 2005). Mobile handheld devices such as mobile phones and personal digital assistants (PDAs) have increased the sophistication and popularity of mobile technology and drive organizations to change the way they support mobile and remote workers. Besides, mobile

services cannot succeed without the mobile technical support for human resources. Therefore, even if companies expect a high level of value from mobile services, they will not be able to realize that level of value if they lack essential mobile objects. Thus, hypothesis H4c is as follows:

H4b: A lack of mobile objects has a negative moderating effect on the relationship between the potential and realized value of mobile services.

3.3.2 Knowledge Barriers

If a firm possesses absorptive capacity and learning capability in this mobile era, it can decrease the knowledge barriers based on the absorption of external knowledge, making organizational resources more accessible, shareable and valuable through new mobile innovations. On the other hand, a firm without the above capabilities will encounter knowledge barriers that inhibit the realization of a higher value of mobile service after use. Therefore, we develop hypothesis H5:

H5: Knowledge barriers negatively moderate the relationship between the potential and realized value of mobile services.

3.3.3 Usage Barriers

Vrechoupoulos et al. (2003) suggest that complicated use affects the realization of mobile service value. Sinisalo and Karjaluoto (2009) also assert that the degree of mobile service usage is related to mobile phone capabilities including SMS, WAP, MMS, XHTML and HTML. Moreover, smartphone users exhibit more actual usage of mobile data communication. With this in mind, we argue that firms may not realize the value of mobile services if they do not appropriately use the services. Thus, we develop hypothesis H6:

H6: A lack of actual usage has a negative moderating effect on the relationship between the potential and realized value of mobile services.

4 RESEARCH METHODOLOGY

4.1 Industry and Case Background: Orbi Service

More and more companies in the MICE (Meetings, incentives, Conventions and Exhibitions) industry use mobile services to create higher levels of business value and benefits. This research aims to determine the valuation process for a mobile service in the MICS industry, named Orbi. Orbi is an integrated service platform that aims to offer delicate service and an intimate experience for the three participants in the MICE industry: organizers, exhibitors, and buyers. This service was developed by the Service Science Research Center at National Chengchi University and sponsored by the Taiwan External Trade Development Council (TAITRA) and the Sayling Wen Education Foundation. In our study, we identify the value components that exhibitors expect to gain from Orbi and the facilitators/barriers that may affect the value realization process. Exhibitors' purpose is to join a specific exhibition, build relationships with new customers, maintain relationships with old customers, collect the latest industry and competitor information, introduce new products, build brand awareness and firm image, and so on. The services required to fulfill exhibitor demands as provided by Orbi are summarized in Table 1.

Condition	The description of Orbi service
Before the exhibition	The Orbi platform enables exhibitors to upload information regarding marketing, including enterprise logos, introduction of exhibitors, new products, booth activities, mobile advertisements (e.g., banners, e-DM) and product introduction videos.
During the exhibition	The Orbi service automatically sends out messages regarding products and

	services to increase exposure to new production and business brands. The service provider lends visitors the exhibition service intelligence device, Orbi. Accordingly, when visitors use the Orbi device during the exhibition, they can directly identify the location of a specific booth either using the electrical map or by clicking on the enterprise logo in Orbi to get information on exhibitors, products, and activities.
After the exhibition	Exhibitors can choose to gain daily reports on exhibitions that include daily buyer analysis during the exhibition and get a comprehensive report of exhibition analysis after the exhibition.

Table 1. The Orbi Service

4.2 Measurements

The operationalization of the independent, moderating and dependent variables is shown in Table 2.

Independent Variables		
Components	Items	Measures of Industry Barriers
Network Externalities (Adapted from Pae and Hyun 2002)	NE1	The number of companies adopt Orbi services will increase the value of the service.
	NE2	The number of participants (ex: buyers, mass media, VIP) adopt Orbi services will increase the value of the service.
Industry Characteristics of Adopting New Service Innovation (Adapted from Patterson 2003)	IC1	Buyers in our industry are generally quick to adopt new service innovation (Ex: Orbi service).
	IC2	Suppliers in our industry are generally quick to adopt new service innovation (Ex: Orbi service).
	IC3	Competitors in our industry are generally quick to adopt new service innovation (Ex: Orbi service)
Competitive Pressures (Adapted from Flanagan 2000 and Zhu 2006)	CP1	The willing to adopt Orbi service is highly affected by competitors.
	CP2	Within our highly competitive industry, any customer's service innovation (Ex: Orbi service) is noticed by competitors.
Components	Items	Measures of Organizational Barriers
Organizational Features (Patterson et al. 2003)	Size	The number of employees in the company.
	Age	The age of the company.
Organizational Culture (Adapter from Ruppel 2001)	OC1	Using Orbi service to maintain the customer relationship in exhibition corresponds with our company's faith that encourages and emphasizes customer innovation.
	OC2	Our company believes customer's service innovation (Ex: Orbi service) is beneficial to sales growth.
Business Alignment (Adapted from Thong and Yap 1995 and Reinartz 2004)	BA1	Using new service innovation (Ex: Exhibition Analysis Report of Orbi service) to help transforming the enormous information to reliable, relevant and accurate customers' information is important for our company.
	BA2	It is important for our company to access customer's information fast whenever we need the customer's information.
Moderating Variables		
Components	Items	Measures of Resource Barriers
Mobile Operations (Adapted from Tippins and Sohi 2003)	MOP1	Our company normally sends the relevant product information to existing customers via mobile devices.
	MOP2	Our company normally sends the relevant product information to potential customers via mobile devices.

Mobile Objects (Adapted from Tippins and Sohi 2003)	MOB1	Using mobile device (ex: cell phone or PDA) to conduct the marketing activities (such as sending SMS and mobile advertising, etc.) is not strange for our exhibition staff.
	MOB2	Our company has sufficient staff in the exhibition to support mobile marketing (i.e. using mobile device for marketing activities).
Components	Items	Measures of Knowledge Barriers
Absorptive Capacity (Adapted from Tippins and Sohi 2003 and Ulrich 2009)	AC1	Our company usually has the action of collecting industry information.
	AC2	Our company usually has the action of collecting buyer demand.
	AC3	Our company has the ability to quickly respond to and deal with the requirements of buyers.
	AC4	Our company has the ability to quickly respond to market changes.
	AC5	Our company is good at applying customer information in develop new service and products.
Components	Items	Measures of Usage Barriers
Actual Usage	AU1	Our company has extensively used Orbi services in the exhibition.
	AU2	Our company has the willingness to continue using Orbi service in the follow-up exhibition.
Dependent Variables		
Components	Items	Measures of Potential and Realized Value
Potential Value	PV 1-8	The value perceived by the companies before the implementation of Orbi service
Realized Value	RV 1-8	The value perceived by the companies after the implementation of Orbi service

Table 2. Measurements

4.3 Data Collection

To determine how exhibitors determine the value of Orbi services before and after use, we distribute the survey using a two-step process. Our sample source was the exhibitors who were taking part in the Taipei International Sporting Goods Show (TaiSPO 2010) at the Nangang Exhibition Hall from April 29 to May 2, 2010. TaiSPO 2010 had 385 exhibitors, 1,715 booths, and 1,865 foreign buyers. It was comprised of exhibitions of 8 categories of products, and the main focus was fitness equipment, including sporting goods such as skating and skiing equipment, sports balls and rackets, golfing products, sports apparel, and more. Orbi service has never been used in Nangang Exhibition Hall before, and thus both exhibitors and buyers have no experience with the services.

The first stage of questionnaire was sent out two weeks before the exhibition starts. We aimed to determine the exhibitors' expectations toward the Orbi service prior to the users' (including both exhibitors' and buyers') exposure to the actual service. We used a web questionnaire to distribute our questions and sent out 297 questionnaires, ultimately collecting 124 valid questionnaires. In the second stage, we focus on how exhibitors realize the value after the usage, and thus we distributed the survey one month after the exhibition. We sent out the questionnaire to the 124 exhibitors that have completed the first-stage survey and collected 113 valid responses. Since the 113 respondents have completed two stages of surveys, we use them to analyze our model, for a response rate 38%.

We use partial least squares (PLS) to analyze the measurement model. The loadings for all of the items were higher than 0.709 (Hulland 1999). The convergent validity is examined using Cronbach's

alpha, composite reliability, and average variance extracted (AVE). The result shows that the model has good measurement properties.

5 RESULTS AND DISCUSSION

5.1 Structure Model Analysis

We first assess the loadings and t-values of the valuation barriers, which includes industry and organizational barriers as independent variables and potential value as a dependent variable. The results are shown in Table 3. We find that the R^2 of independent variables and dependent variable is 0.447. The loadings of IC and BA are significant at the $p < 0.01$ level, supporting H2b and H3d. NE, CP, and OC are found to be insignificant, thereby leading us to reject H2a, H2c, and H3c. Size and Age (H3a and H3b) are found to be significant at the opposite direction.

We then calculate the R^2 value for the basic model (Model 1), which includes the potential value (PV) and realized value (RV) (Table 4). The path coefficient is found to be significant, thus suggesting support for H1. Then we follow Chin et al. (2003) PLS product-indicator approach as we seek to detect the moderating effects at play. We obtain the R^2 of the moderating effect models by including the independent variable (PV), moderators (MOP, MOB, AC and AU), interaction terms (PV x MOP, PV x MOB, PV x AC and PV x AU), and the dependent variable (RV) in the model. Then we compare the R^2 of the moderating effect models with the R^2 of Model 1 to derive the f^2 statistics and the pseudo-F statistics. The differenced R^2 are all significant in Model 2, Model 3, Model 4, and Model 5, supporting H4a, H4b, H5 and H6.

Valuation Barriers' Items, Loadings and t-value Analysis (Pre-usage data; n=113)				
Independent Variables		Items	Loadings	t-value
Industry Barriers	Network Externality (NE)	NE1	0.879	0.896
		NE2	0.846	
	Industry Characteristic of Adopting New Service Innovation (IC)	IC1	0.866	2.451***
		IC2	0.927	
		IC3	0.870	
	Competitive Pressures (CP)	CP1	0.915	0.722
CP2		0.942		
Organizational Barriers	Organizational Features	SIZE	1.000	-1.907**
		AGE	1.000	-2.328***
	Organizational Culture (OC)	OC1	0.927	0.932
		OC2	0.913	
	Business Alignment (BA)	BA1	0.927	2.582***
		BA2	0.929	
Dependent Variables		R ²		
Potential Value (PV)		0.447		
Note: *p<0.1; **p<0.05; ***p<0.01				

Table 3. Valuation Barriers' Items, loadings and t-value Analysis

Conversion Barriers' Items, Loadings and t-value Analysis (Post-usage data; n=113)					
Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Potential Value (PV)	0.309***	0.292***	0.266***	0.269***	0.234***
Mobile Operations (MOP)		0.237***			
Mobile Objects (MOB)			0.301***		
Absorptive Capacity (AC)				0.477***	
Actual Usage (AU)					0.568***
PV x MOP		0.114*			
PV x MOB			0.195***		

PV x AC				0.211***	
PV x AU					0.112*
Realized Value (RV) R ²	0.096	0.171	0.233	0.433	0.447
Differenced R ²		0.075	0.137	0.337	0.351
f ²		0.091	0.179	0.594	0.541
Pseudo F-value		10.227	20.182	67.167	61.110

Table 4. Conversion Barriers' Items, loadings and t-value Analysis

5.2 Findings

1. *High potential value can lead to relatively high realized value for a mobile service.* As we argued before, the potential value of a mobile service is the expected value available to the investor if the implementation process is completely successful. However, the true value of the Orbi service that these exhibitors ultimately experienced was different from the expected value because of the barriers that arose after the mobile service had been implemented. In this case, we can see that the exhibitors who had high expectations and intentions surrounding their use of the Orbi service proactively eliminated the conversion barriers and achieved high levels of realized value at the exhibition.
2. *The number of participants adopting Orbi services does not increase the value of mobile services.* It is interesting to note that network effects do not apply to the Orbi service as introduced at this exhibition. The Orbi service is a brand-new service in Taiwan. Even though many exhibitors have expressed their interest in this service, almost none of them have used the service before. In addition, Orbi users do not have a channel through which to share their opinions about Orbi. Thus, most respondents doubt that this service can be widely accepted by the marketplace. Network externality thus becomes not a factor at this exhibition.
3. *Competitive pressure does not have a significant effect on the potential value of mobile services.* One possible reason may be that most of the exhibitors who participated in this exhibition are small and medium-size exhibitors. Most of them focus on a niche market, and their product categories seldom overlap. The competitive pressure to adopt the Orbi service was thus relatively small. It is also very possible that exhibitors do not see the Orbi service as a competitive weapon.
4. *Organization size has a negative effect on the potential value of a mobile service.* One potential reason for this unexpected result might be that smaller companies are more active and flexible in adopting new services. Because they are under pressure to grow to enhance competitive advantage, the motivation to accept a new market and new technologies such as the Orbi service and thus to maintain an innovative work environment will be more intensive. Moreover, large companies often suffer from slowness, ponderousness, bureaucracy, and poorly motivated employees.
5. *Organization age has a positive effect on the potential value of a mobile service.* Some researchers argue that newer organizations have been born into an environment saturated with advanced communication and information technologies, and therefore they naturally rely on technologies to achieve competitive advantage (Porter 1981). Our data analysis shows the opposite result. One reason may be that older companies might be more experienced in adopting new technologies. The older companies generally possess complete, experienced investment teams ready to face the constantly changing market, and they tend to have employee training systems and rich resources, including appropriate mechanisms for adopting whatever new technologies the market demands.
6. *Organizational culture does not have a significant effect on the potential value of a mobile service.* Past studies have found that organizational culture is a key factor in whether a firm decides to invest in an innovation or not. Our data analysis yields inconsistent results. It shows that organizational culture becomes insignificant while the service is perceived as an industrial trend and is pretty aligned with business goals.

7. *Companies encounter resource barriers, knowledge barriers, and usage barrier while transforming potential value to realized value.* Our result shows that, even if exhibitors expect high value from the Orbi service, they will not be able to achieve that level of value without the support of business processes and technology infrastructure, the capability to learn how to gain value from the service, and actual usage of the service in enterprise.

6 CONCLUSION

Applying the limits-to-value framework proposed by Chircu and Kauffman (2000), we have aimed to study the related valuation barriers of mobile services in the exhibition industry. We validated the model using a two-step survey to investigate how the exhibitors evaluated the value of the new mobile service “before” and “after” the implementation. The results show that the factors “industry characteristics of adopting new service innovation” and “business alignment” appear to be effective in determining the potential value of mobile services. They also verify that resource barriers, knowledge barriers, and usage barriers have significant influence on the value conversion process in which the potential value of mobile services transforms to realized value. There are several contributions of this study. First, the proposed framework assists practitioners and researchers in realizing the key value barriers of a mobile service. In addition, we use the framework in the context of real business practice (in the Taiwanese exhibition industry), considering an innovative mobile service, the Orbi service. This enables us to validate the “limit-to-value” model in the context of mobile services.

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