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Description	一般講演要旨

Identifying Innovation in Korean Mobile Business Solution Services

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Abstract— The Korean mobile operators now provide not only communication networks but also business solutions to enterprises in various industries such as manufacturing, transportation, and education. This paper examines the characteristics of the innovative Mobile Biz Solution services provided by closely looking at 236 service products. Then, we identify the key characteristics of those services, and find out which service characteristics lead to innovations and what type of service innovations pervade the whole Mobile Biz Solutions. The result shows that service characteristics of broadcasting and advertising bring radical innovation by creating a new channel for the purpose of information delivery, marketing and promotion. The existing service characteristics such as mobility, informative and wired network create IP-phone, web fax (communication-enhanced), mobile office (ordinary business task support), and cloud service, which are incrementally innovative services. In general, radical innovation is less likely to be introduced than incremental innovation, but it often leads to the core business of a firm.

Index Terms— Service innovation, Mobile service, Mobile business solution, Korea

1. INTRODUCTION

In the saturated domestic mobile market, Korean mobile operators have started pursuing earnings' opportunities by continuously bringing out new mobile services and by creating a new segmentation in both domestic and international market. They are transforming from network providers to providers of high-value mobile solutions for individuals and enterprises.

As smartphone usage increases and demand for new types of mobile solutions from enterprises grows, mobile operators put more and more efforts in expanding B2B business. Now they offer industry-wide business solutions (e.g. machine-to-machine (M2M) communications, Geographic Information System (GIS) solution for advanced business analysis, and Building Energy Management System (BEMS) service) to many companies in different industries such as manufacturing, wholesale, and transportation. They also provide specialized solutions such as health control in humans, and education solution for higher education and distance education institutions.

This paper focuses on mobile solution services for enterprises, i.e. Mobile Biz Solutions, which is a most promising business area for mobile operators. The objective of this paper is to identify which service

characteristics create innovations, and find out what type of service innovations pervade the mobile business solution services.

The paper is comprised of six sections. Section 2 examines earlier studies on service innovation and service characteristics. Section 3 introduces a paradigm change in the Korean mobile telecommunication market. Section 4 describes the research methodology. Section 5 summarizes the research results and section 6 discusses theoretical and empirical implications, and directions for future studies.

2. THEORETICAL BACKGROUND

2.1. Innovation in services

Innovation in services especially has become of great importance in recent years [1]. Unlike products, service characteristics include inseparability (simultaneous production and consumption), heterogeneity (the requirement for human effort and interaction), and perishability (the inability to be kept in stock) [2][3]. These inherent features pose more challenges to innovation than in the case of physical goods.

The studies of service innovation have applied Schumpeter's original innovation concept to services [4][5][6], encompassing the introduction of a new good (radical innovation) or a new quality of a good (incremental innovation). Gallouj (2002) distinguished innovation in services into a wide range of different forms, taking Lancaster's work [7], in which a product is defined as a set of characteristics. The term 'radical innovation' denotes the creation of a totally new product, i.e., the introduction of a new bundle of service characteristics, which is unconnected with those of an old product. Ameliorative innovation, by contrast, simply increases the quality of certain service characteristics. Incremental innovation involves the addition (or elimination) of one or a few of the existing characteristics [8].

2.2. Service Characteristics and Innovation

Lancaster (1966) observed that products can be described as a bundle of 'service characteristics' [7]. Lancaster's insight is that consumers do not desire a product in itself but rather the particular bundle of service characteristics that it offers.

In accordance with the Lancasterian perspective, Gallouj (2002) argues that service characteristics are

considered from a user's point of view, and innovation can be defined as any change affecting one or more terms of these characteristics [8]. It is furthermore supported by prior studies studying the mobile service sector in that phone characteristics and services characteristics influenced the diffusion and innovation of mobile services [9][10].

In this paper, we define service characteristics as 'the characteristics associated with the Mobile Biz Solution services, which are perceived by service users. This notion is further developed by distinguishing the new and enhanced service characteristics. All the introductions of a bundle of new service characteristics can be seen as a radical service innovation, whereas any increase in the value or quality of certain service characteristics can create incremental innovation.

3. PARADIGM SHIFT IN THE KOREAN MOBILE TELECOMMUNICATION MARKET

A significant change occurred in the Korean mobile telecommunication market during 2009-2010 in the regulation, technology and market aspects.

Firstly, government's telecom policy moved towards 'openness'. Korea's regulatory requirements had once discouraged foreign-produced smartphones from entering the domestic market. The Korean government in 2005 made it mandatory for all mobile-phone makers and content providers to use a software standard for Internet access, called WIPI (Wireless Internet Platform for Interoperability). However, the world's handset market was rapidly changing from a closed platform to an open mobile operating system. In order to keep pace with the trend, the regulation of mandatory use of WIPI was abolished as of April 2009.

Secondly, as a result of the policy of openness, iPhone was launched in Korea in November 2009, and Motorola 'MOTOROI', the first Android-based phone, was introduced in February 2010. Smartphone allowed great possibilities for creating new market and business opportunities. In addition, rapid spread of smart devices such as smartphone, smart pad, and tablet PC accelerated demand for high speed networks. Mobile operators focused their efforts on offering a high-speed wireless data communication services over Long Term Evolution (LTE) network, which enables improved services for video calls, multi-player games, navigation and cloud services.

Thirdly, since the end of 2009, mobile operators have expanded their operations to wired/wireless convergence business such as integrated services combining mobile phone, fixed-line phone, broadband Internet, VoIP (Voice over Internet Protocol) and IP TV services. KT and LG U+ merged their wired and wireless communication business into a single brand at the end of 2009 and in 2010, respectively. SK Telecom also has expanded its business beyond the scope of the existing mobile

network business by strengthening alliance with subsidiary companies (e.g. SK broadband, SK telink).

In addition, the mobile operators are now becoming platform players. They are in the business of building service platforms for a broad range of fields spanning content delivery, location-based services, commerce, advertising, and media. Most of the service platforms were launched during 2009-2010.

Thus, a paradigm shift in the Korean mobile telecommunication market during 2009-2010 largely changed the characteristics of mobile telecom service. Through smartphone and other mobile devices, various mobile convergence services were provided including mobile office service, industry-specific service such as mobile financial service, and other services that facilitate corporate communication. This change led to a variety of radical or incrementally new service products.

4. METHODOLOGY

For precise analysis of service characteristics, the number of categories constituting it was simplified, and service products were summarized as several groups according to the categorized service characteristics. Data analyses were performed using Excel (Microsoft, 2007) and IBM SPSS Statistics 19.

4.1. Factor analysis: Categorization of service characteristics

We examined 236 Mobile Biz Solution service products (excluding service packages and price plans) in the web pages of SK Telecom (<http://www.bizworld.co.kr/>), KT (<http://biz.olleh.com/>) and LG U+ (<http://biz.uplus.co.kr/>). Then, we detected keywords that describe each of the 26 sub-characteristics to find out which service characteristics a certain service product has.

The characteristics of each service product were converted into a set of 26 dummy variables (1=having a given characteristic, 0=not having it). As a result, a 236X26 matrix of dummy variables was constructed.

A factor analysis was then conducted using principal component analysis with varimax rotation. It reduces a large number of observed variables to a smaller number of factors.

4.2. Cluster analysis: Service classification

The objective of cluster analysis is to group service products into groups such that each group is as homogeneous as possible with respect to service characteristics.

From factor analysis, factor scores were calculated. In the next step, a hierarchical cluster analysis was performed on the factor scores derived from sub-characteristics to classify 236 service products into proper categories. The results were further analyzed with

a one-way ANOVA (Analysis Of Variance) as post-hoc test to determine the statistic differences between each groups.

5. RESULTS

5.1. Result of factor analysis: Characteristics of Mobile Biz Solution services

In order to identify the service characteristics of Mobile Biz Solutions, we scrutinized 236 Mobile Biz Solution service brands of Korea's three big mobile operators: SK Telecom, KT, and LG U+. The service characteristics break down into 26 sub-characteristics (see Table 1).

Among 26 sub-characteristics, 13 are considered as new service characteristics: mobilization (X5), entrance security (X10), equipment security (X11), interoperability (X12), information storage (X15), information analysis (X16), consulting (X17), advertising (X20), broadcasting (X21), remote control (X22), auto-monitoring (X23), emergency care/safety precaution (X25), and billing system (X26).

13 remaining sub-characteristics are considered as incrementally new or changed service characteristics: communication (X1), mobility (X2), wireless network (X3), wired network (X4), infra maintenance (X6), rental/lease (X7), real-time (X8), data security (X9), information sharing (X13), information search (X14), e-task (X18), location-based (X19), and education (X24).

After conducting factor analysis, 10 characteristics variables whose eigenvalues were greater than 1 were extracted from 26 sub-characteristics:

- Informative (X14, X16, X19)
- Real-time/automation (X8, X23)
- Seamless working condition (X2, X5, X18)
- Cloud computing (X1, X4, X9, X15)
- Security for tangible asset (X10, X11)
- Consulting/remote control (X17, X22)
- Broadcasting/advertising (X20, X21)
- Wireless work environment (X3, X6, X7)
- Information-sharing platform(X12, X13, X24, X26)
- Emergency care/safety precaution (X25)

5.2. Result of cluster analysis: Service types of Mobile Biz Solution

Table 2 shows the result of cluster analysis and post-hoc test. Mobile Biz Solution service products were classified into seven groups that have different service characteristics. The seven service groups are:

- *Data-centric informative service*
- *Ordinary task support service*
- *IT Governance service*
- *Cloud service*
- *Other mobile solution service*
- *Multi-channel communication service*
- *Security support service*

(a) Data-centric informative service

This service group has most strong 'informative' characteristic among other service groups but shows weak tendencies in other characteristics except 'informative'.

TABLE 1
DEFINITION OF SERVICE CHARACTERISTICS

Service characteristics			Description
X1	Communication	E	Communication with co-workers, customers, partners
X2	Mobility	E	Access to internet or intranet to manage a task anytime anywhere
X3	Wireless network	E	Environment for a large-volume high-speed mobile access
X4	Wired network	E	Environment for a dedicated line for transmission of large-volume data at high speed
X5	Mobilization	N	Converting the existing web-based groupware and system into mobile groupware or m-system
X6	Infra maintenance	E	Maintenance, repair of all IT infra in a firm
X7	Rental/lease	E	Rental or lease of network and equipments, License of S/W
X8	Real-time	E	Real-time customer response, real-time email check (push mail)
X9	Data security	E	Security of application, data, and network
X10	Entrance security	N	Control the entrance of building/facility using RFID entrance card or FMC CCTV service
X11	Equipment security	N	Security of devices. In case of loss or theft, Lock&Wipe function, M2M control using camera/WiFi
X12	Interoperability	N	Enable diverse systems and applications to work together under different devices and server
X13	Info sharing	E	Sharing information in and between groups, organization
X14	Info search	E	Collecting and delivering information on market data, sales, finance, stocks, HR data, cash flow
X15	Info storage	N	Storing a large volume of DB and information
X16	Info analysis	N	Analyzing data and information. Creating a report.
X17	Consulting	N	IT consulting
X18	e-task	E	Supporting ordinary task and business. Converting manually created admin. task to "e-task"
X19	Location-based	E	Obtaining logistics info, tracking transportation
X20	Advertising	N	New advertising and promotion channel: SMS, MMS, call-waiting tones, video advertising
X21	Broadcasting	N	Customized broadcasting channel for the purpose of info. delivery, or marketing
X22	Remote control	N	Remote control system for equipment, facility, and device
X23	Auto-monitoring	N	Automatic monitoring of H/W, S/W, OS, Middle Ware
X24	Education	E	Providing education solution, including employee training
X25	Emergency care/safety precaution	N	Security of human being
X26	Billing system	N	ARS credit cards payment, e-payment, wireless billing device

N: New service characteristics, E: Enhanced quality of existing service characteristics

TABLE 2
CLUSTER ANALYSIS

Service characteristics	Service classification							One-way ANOVA	
	1(n=128)	2(n=9)	3(n=18)	4(n=63)	5(n=4)	6(n=9)	7(n=5)	F value	Sig.
Informative	0.303	-0.043	-0.344	-0.407	1.111	-0.795	-0.768	7.338	.000*
Real-time/automation	-0.241	-0.001	0.762	0.119	-0.067	0.833	0.477	4.786	.000*
Seamless working condition	-0.071	4.035	-0.184	-0.317	0.101	-0.485	-0.015	4.786	.000*
Cloud computing	-0.459	-0.126	-0.434	1.130	-0.357	-0.219	-0.004	34.692	.000*
Security for tangible asset	-0.097	-0.311	-0.071	-0.223	0.380	0.044	5.722	99.029	.000*
Consulting/remote control	-0.188	-0.168	2.670	-0.240	-0.996	-0.515	0.246	59.735	.000*
Broadcasting/advertising	-0.075	-0.130	-0.324	-0.322	0.547	3.919	-0.100	65.895	.000*
Wireless work environment	-0.181	-0.091	-0.124	0.287	3.049	-0.365	-0.163	9.868	.000*
Information-sharing platform	-0.143	0.496	0.218	0.041	0.042	0.835	-0.076	2.070	.058
Emergency care/safety precaution	-0.220	0.473	0.577	-0.065	5.688	-0.355	-0.400	62.365	.000
Name of service groups	(a)Data-centric informative	(b)Ordinary task support	(c)IT Governance	(d)Cloud	(e)Other mobile solution	(f)Multi-channel communication	(g)Security support		
Innovation type	Incremental	Mix	Radical	Mix	Mix	Radical	Radical		

* P<0.001

This type of service is commonly used in any departments of the firm. It helps to collect all necessary data on market information, sales, cash flow, goods in stock, and personnel. In addition, it analyzes the collected data and produce report on market analysis, finance and accounting, quality control, and human resources. It also deals with collection and analysis of location-based information such as parcel tracking and vehicle tracking.

(b) Ordinary task support service

This service group shows very strong ‘seamless working condition’ characteristic. It changes the existing business system and alters the entire working environment. For example, the existing web-based system is transformed into a mobile-based system, which converts the existing web-based groupware or system into mobile groupware or m-system such as mSFA (Sales Force Automation), mCRM (Customer Relationship Management), and mERP (Enterprise Resource Planning). Previous paper-based task is converted to task management software and online platform (e.g. e-task, e-approval, e-finance).

It also allows remote access to corporate intranets, file systems or web-based applications so workers can carry out tasks via mobile devices outside office or on overseas business trip.

(c) IT Governance service

This service group shows strong tendencies on ‘real-time/automation’ and ‘consulting/remote control’. It focuses particularly on information technology systems, their performance and risk management. It includes a remote control of IT facility, network, hardware, software and operating system, and supports real-time automatic monitoring of breakdown, defect, virus and abnormal traffic.

An enterprise often consults with a mobile operator about IT management before adopting this type of service.

(d) Cloud service

The main characteristic of this service group is ‘cloud computing’. This type of service delivers a computing platform and operates application software. It offers

infrastructure such as virtual machines, servers, storage, and network, too.

It can deliver computing and storage capacity to enterprises so they do not need to manage the cloud infrastructure and platform on which the application is running. The cloud computing-based service is often followed by data security solutions.

(e) Other mobile solution service

This service group benefit from various mobile solutions through either wireless network or specialized mobile device.

For example, the service can enable ‘wireless work environment’. It provides a mobile access network service such as a wireless LAN (Local Area Network), which enables a high-speed, large-volume data transmission in a limited area such as computer laboratory or office building. It also offers a maintenance solution for local network and helps companies operate more efficiently.

The service sometimes focuses specially on service characteristic of ‘emergency care/ safety precaution’. It offers multi-purpose mobile terminal equipped with an automated external defibrillator to building and apartment. It also supports transportation firms with a specialized mobile device which has an emergency button on it

(f) Multi-channel communication service

This service group strongly focuses on ‘broadcasting/ advertising’ characteristics. It provides a new advertising or promotion channel to an enterprise such as MMS (Multimedia Message Service), call-waiting tones, and video advertising. In addition, an enterprise can develop its own media contents and broadcast a customized channel for the purpose of internal information delivery, or marketing its product to customers.

(g) Security support service

This service group deals with ‘security for tangible asset’. For example, it controls the entrance of buildings and facilities by serving RFID (Radio-Frequency Identification) entrance card or FMC (Fixed Mobile Convergence) CCTV service.

It also enhances the security of devices. In case of loss

or theft, it activates 'lock and wipe' function to protect sensitive data inside them.

5.3. Innovation in Mobile Biz Solution service

26 sub-characteristics of Mobile Biz Solution service were identified as (1) 'new' service characteristics and (2) 'incrementally new or changed' service characteristics in the section 5.1. According to these original service characteristics, 10 categorized service characteristics (as a result of factor analysis) were also classified into 'new' and 'incrementally new' characteristics.

We compared portions of 'new' and 'incrementally new' sub-characteristics constituting each of 10 service characteristics. As a result, 'security for tangible asset', 'consulting/remote control', 'broadcasting/advertising' and 'emergency care/rescue' were regarded as radically new, indicating that those service characteristics are mainly composed of 'new' sub-characteristics.

On the other hand, 'informative', 'real-time/automation', 'seamless working condition', 'cloud computing' and 'wireless work environment' were regarded as incrementally new because they consist of 'incrementally new' sub-characteristics.

5.3.1. Incremental service innovation

128 service products (54%) are identified as incremental service innovation.

'Informative' has been one of the principle characteristics in mobile telecom service since the emergence of a wireless internet.

But (a) *Data-centric informative service* becomes much stronger than the primary stage of data service. This type of service is an incrementally innovative service. The quality of data and information delivered via a mobile network has been significantly improved. Data collection and information search become more accurate and analytic. The service benefits firms in all industries.

5.3.2. Radical service innovation

Three service groups whose characteristics consist of a new set of 'security for tangible asset', 'consulting/remote control', 'broadcasting/advertising' or 'emergency care/rescue' can be referred to as 'radical service innovation', i.e. (c) *IT Governance service*, (f) *Multi-channel communication service* and (g) *Security support service*. Thus, among the total 236 service products, we found that 32 Mobile Biz Solution service products (14%) belong to radical service innovation.

A new set of service characteristics creates a totally new service product, i.e. radical service innovation.

Firstly, in case of IT Governance service, IT consulting and auto-monitoring system are radically new service characteristics. M2M (Machine-to-Machine) technology makes it possible to automatically monitor every aspect of firm's IT resources, from the condition of hardware, software and middleware to the performance of them on networks.

Secondly, the characteristic of 'broadcasting/advertising' newly designed multi-channel marketing that has changed the entire marketing system.

Thirdly, a security support service helps to protect firm's tangible asset such as IT facilities and devices. This is also a new service which has emerged by developing high-speed mobile network.

5.3.3. Semi-radical service innovation

The service groups of (b) *Ordinary task support service*, (d) *Cloud service* and (e) *Other mobile solution service* belong to semi-radical innovation because it enhanced the existing service function but also have radically new characteristics to some extent. 76 service products (32%) are identified as semi-radical service innovation.

Firstly, performing simple tasks via a mobile phone such as personal scheduling and memo were possible before 2009-2010, too. However, (b) *Ordinary task support service* makes it possible to conduct more advanced tasks, covering the whole range of business, with high efficiency at the similar level as a desk-based work condition. On the other hand, it radically changes the traditional work style performed during the regular working hour. It creates a flexible mobile workplace so that workers can carry out routine work anytime anywhere.

Secondly, the data security function of a mobile solution has been enhanced. A Mobile Biz Solution service protects firm's data, application and network and maintains the security level of IDC (Internet Data Center) through a data backup service, document conversion server, SSL (Secure Sockets Layer), MDM (Mobile Device Management) system. In addition to enhanced security, a cloud service adds a radically new characteristic, which is extremely large-volume data storage. The Cloud service let enterprise users access a broad range of business software and data, which is stored on servers at a remote location, through a web browser or mobile application. Therefore it allows enterprises to lighten burden on routine storage operations so IT teams can focus on more strategic technology initiatives.

Lastly, a variety of mobile solution services can be seen as semi-radical service innovations. They utilize the existing wireless network and mobile infrastructure, but this type of service very often creates a radically new service such as emergency care or safety precaution services.

6. CONCLUSIONS

This paper linked the characteristics of Mobile Biz Solution services with service innovation and identified the type of service innovations in the whole Mobile Biz Solution.

Firstly, the finding of the paper shows that collecting

data and securing it are the mainstream service of Mobile Biz Solution. Data-centric informative service occupies 54% of the whole Mobile Biz Solution services. Cloud service makes up the second largest portion, at 27%, followed by IT Governance service at 8%.

Secondly, the sub-characteristic of 'Information-sharing platform' shows no difference between service groups. This is caused by the characteristic of a 'platform'. Now a variety of mobile service platforms are pervasive in all types of Mobile Biz Solution, enabling diverse applications to work together under different devices and servers. Particularly, a mobile education platform is often packaged with other mobile services. Most of the mobile office services are equipped with the mobile education platform as a basic function.

Thirdly, a half of Mobile Biz Solutions are data-centric informative services, which is incremental service innovation. This means that information search and analysis is primary function for business solutions, and it is based on incremental innovation. In Mobile Biz Solution service, incremental service innovation is more likely to be introduced than radical service innovation. Incremental service innovation plays a very important role in business. Incremental innovations can lead to a significant improvement in price or functionality [11]. Moreover, incremental innovation can influence the industry change in a more significant way and be more beneficial to companies than radical innovation [12].

However, Mobile Biz Solution services have a big potential of radical service innovation, too. With the technological development of network and mobile device, there are still many rooms to develop new services and various applications that will help enterprises take the next step toward a truly paperless or buildingless office.

Innovation in mobile business solution services benefits not only enterprises but also their customers. Thus, more new service development is expected in the mobile telecommunication service.

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