IT-based evolution of service business model:
Case of education service

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Abstract. According to advances in technology and changes in business environment, business model (BM) have been modifying and improving constantly over time. In particular, service BMs show more diverse and rapid evolutionary pattern compared to manufacturing sector. Notably in education service, it is evident that information technology (IT) has exerted substantial impact on BM. To reveal the IT-based evolution of education service BM, this study examines variations of BM components with core BM patents in education service which are representative data source of technical BMs.

Keywords: Service business model, Business model evolution, Information technology, Education service

1. Introduction

All firms have business models (BMs) and they continuously modify their BMs to adjust to dynamic environment. Especially, there are three main external drivers of a change in BMs: dynamics of technology, market and regulatory [1]. Among others, information technology (IT) guides the most strongly dynamics of a business model in early development phase of a new business. For a successful BM, firms should take technological characteristics and potentials as inputs, and convert them through customers and markets into economic value [2]. And emergence of a new component drives innovation of a suitable structure and architecture. In other words, alteration of the BM components is the foundation of innovation and evolution of the industry. Therefore it is important to analyze the change of the BM components and explore its pattern continuously, because we can find industry-wide evolutionary pattern through component level analysis.

As the importance of the service sector in economic activity increases, more effort needs to be made on service business innovation and evolution. Highly developed IT not only creates new product but also provokes various new services and leads IT-based service BM evolution. Especially, the evolution of education service BM has been accelerated by a number of technological advances.

In spite of the importance of service BM innovation and evolution as a critical element for continuous growth, activities to improve existing services, to explore trends depend solely on the intuition of analysts or the discussion of experts. In this aspect, this research identifies patterns of service BM evolution by analyzing BM patents.

BM patents have high value as a qualitative database, containing detailed BMs both in manufacturing and the service field. In particular, most BM patents deal with IT-based new BMs and most applications of new BMs are closely related to the service field, rather than manufacturing, such as financial services, health care, e-commerce, education, entertainment, and so on.

In light of this, we will extract practical and useful information from a BM patent database for analyzing service BM evolutions. Firstly, investigating BM component of the core patents which are extracted based on citation index, number of family patents and claims, and frequency of service keywords, and then through the change aspect of the BM components, we can explore the IT-based evolution of service BM.

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2. Literature review

2.1. Business model (BM)

The BM is the method of doing business by which a company can sustain itself – that is, generate revenue. It spells-out how a company makes money by specifying where it is positioned in the value chain [3]. Within today's business environment, the BM should also be enjoying dynamicity in order to cope successfully with the continuous changes. Characterizing the BM as dynamic [4, 5] is essential mainly because many industries nowadays. Unlike the traditional world of business, the world of digital business is complex, dynamic and has high levels of uncertainty and competition. Hence, in the more complex and sometimes unique digital business, the BM needs to be explicit and more flexible [6]. In line with this thinking, the function of a BM is an interface or an intermediate theoretical layer between the business strategy and the business processes.

Organizations and firms need to design and adopt suitable BMs in order to survive and succeed in a world of increasing environmental complexity. Since, enhancing their competitive positions by improving their ability to respond quickly to rapid environmental changes with high quality business decisions can be supported by adopting suitable BMs for the new world of digital business [6].

2.2. BM patent

A BM patent is defined as a method of administering, managing, or operating an enterprise or organization, and is a technique used in conducting business [7]. Most BM patents are intended to protect the business model within legal boundaries. However, they also describe the real world business and business models of manufacturing and the service field in electronic environments, and these documents are the only sources of information that can explain the business process or method thoroughly.

Basically, a BM patent encompasses processes and methods of general business, but its main application area is the service field. Despite the considerable contribution that BM patents can bring to business, especially the service world, there has been little research conducted on them. Furthermore, most of that research has focused on analyzing the need to apply patents and conduct patenting activity, rather than the content of the BM patent itself [8, 9]. Therefore, in this research we deal with the contents of BM patents, analyzing them to identify pattern of service BM evolution based on IT.

3. Research framework

The research procedure is as follows. First, from a patent database, registered BM patents of a target service industry are gathered. Second, some information obtained from gathered data with data parsing and text mining techniques. Third, according to the information from the second step, core patents of the service industry are extracted. Fourth, by analyzing BM components of the core patents, fifth, IT-based evolution pattern of service BM can be found. Fig. 1 depicts the overall process of this study. More detailed explanations for each step are provided with case of education service.
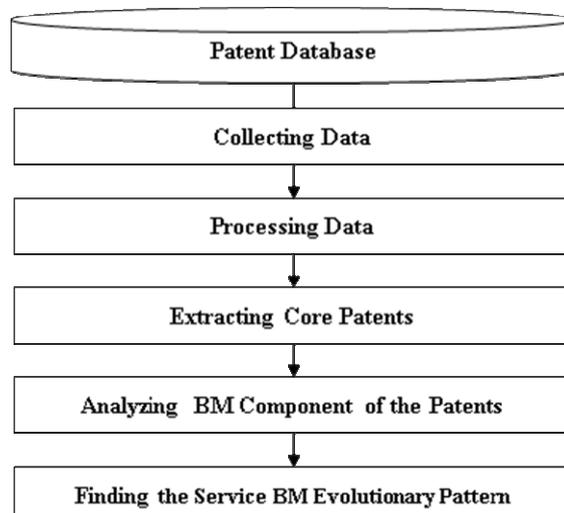

Fig. 1: Overall process of this study

4. Case study: Education service

As IT has developed, it has provided increasing opportunities, options and strategies for education [10]. In essence, the dramatic shift from a purely traditional education system to a widely IT-based learning and teaching forum assembles a number of forces for making such shift inevitable.

In this research, the education service, one of the typical service industries, was carried out as a case study.

4.1. Step 1 : Collecting data

First of all, BM patent data are collected to explore IT-based evolution of service BMs. The data used in this research are the BM patents registered in the United States Patent and Trademark Office (USPTO) and WIPS, especially in class 705, to which they are classified as a rule. The BM patent contains various information, such as patent number, title, registered year, inventor, assignee, claim, abstract, description, citation, family patents, and so on. As BMs are used mostly in commerce, the information and description of each BM patent are suited to this research.

For the education service BM analysis, 4907 BM patents, which are registered in class 705 from 1976 to 2010 and contain the keywords such as 'Education', 'Schooling', 'School', 'University', or 'College' in a patent document, were collected from the USPTO website (http://www.uspto.gov) and WIPS database (http://www.wips.co.kr).

4.2. Step 2 : Processing data

The BM patent data collected from previous step are transformed into a database by data parsing technique for further analysis. Then, manipulate the constructed database to get some information, such as citation index, number of family patents, and number of claims. And with several keywords related to the target service and collected BM patent data, text mining analysis is executed by a co-word analysis program. As a result, keyword frequencies for the service sector of each BM patent are calculated. Based on the keyword frequencies, some BM patents are exempted from this research because their keyword frequency is low. This means that exempted BM patents are less relevant to the target service.

By specially developed programs, 4907 BM patents data were parsed and transformed into a database and keyword frequencies of the patent documents were calculated. Citation index, number of family patents, and number of claims are also acquired from database handling.

4.3. Step 3 : Extracting core patents

To extract core patents from the data pool, we applied stepwise screening method. Firstly, remaining as valid patents based on the calculated keyword frequencies, on the assumption that a BM patent with the high frequency rates is more associated with the service (1st screening). Secondly, against valid patents, identify the contents of the BM patent through the multiple reviews of the title and the abstract of the patent, and then exclude irrelevant patents (2nd screening). Lastly, core patents are finally selected on the basis of the citation index, number of family patents, and number of claims.

A large portion of collected patents, the keyword frequency is lower than 7, was exempted to improve the accuracy of the analysis and 632 patents were remained as valid patents for analyzing education service BM. After 2nd screening and final selection, 32 patents were extracted as core patents of education service.

4.4. Step 4 : Analyzing BM component of the patents

After select core patents, next step is investigation of the core patents to identify its specific BM components. Before that, we defined the 5 kinds of BM components ─target market, customer, business activities, value proposition, and infrastructure management─ by literature review. Table 1 shows 5 BM components and its descriptions.

Via examination of the 32 extracted core patents, 5 BM components ─target market, customer, business activities, value proposition, and infrastructure management─ of each education service related BM patent were identified like Table 2.

Table 1: Definition of BM component

BM component	Description	Author
Target market	The scope or type of the market a firm chooses to pursue	[11]
Customer	The segments of customers a company wants to offer value to	[11, 12]
Business activities	The activities that an actor is supposed to perform in order for the value network to deliver the proposed service	[11, 13]
Value proposition	The overall values which are created through offering services that satisfy the needs of their target segments	[12, 14, 15]
Infrastructure management	The competencies necessary to execute the company's business model (including technological architecture, devices and organizational infrastructure)	[12, 15, 16]

Table 2: Example of BM component analysis for education service BM patents

Register year	Patent No.	Title	Target market	Customer	Business activities	value proposition	Infrastructure management
2005	6890179	Interactive games for teaching financial principles	e-learning	Students	Training	Entertain	Internet Interactive module (Computer, Client terminal)

4.5. Step 5 : Finding the service BM evolutionary pattern

As a result of step 4, BM components of core patents are derived. By analyzing changes for each component over time, technological evolution process and pattern of a certain service BM can be observed.

IT-based evolutionary pattern of education service BM components were drawn as Fig. 2.
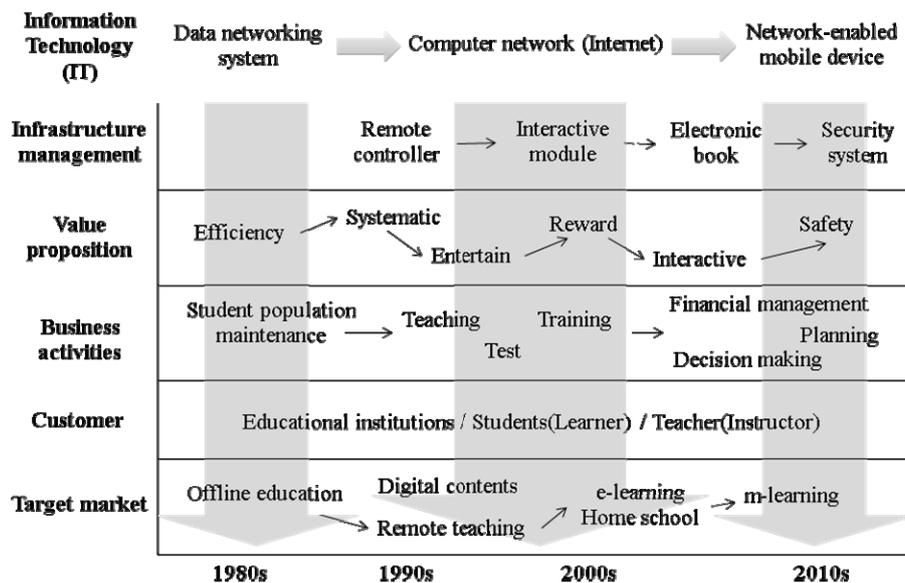

Fig. 2: Example of evolutionary pattern for education service BM

From the result, we can find some patterns of education service BM components evolution derived from IT. Chiefest of all, computer networking technology capabilities, such as internet, lead to many distance learning lectures and web-based courses. And mobile networking technology make possible to m-learning and u-learning and data networking system conduce to efficiency of offline education service. Let's examine it from all component perspectives. In terms of infrastructure management, evolution of education service was carried out in the process of remote controller, interactive module, electronic book, and security system. Value proposition of education service BMs went through efficiency, systematic, entertain, reward, interactive, and safety. Education business activities roughly varied from student population maintenance, teaching, test and training to financial management, decision making, and planning, but evolutionary pattern

of customer was not detected. Remarkably, evolution pattern of target market is discovered as a flow along by offline education, remote teaching, e-learning / home school, and m-learning.

5. Conclusion

It is natural that interests in service BM evolution are growing and that demands for new services are on the rise, due to humanity's constant need for newness. And a BM for a digital business should be reviewed continually to ensure its fit with the complex, uncertain, and rapidly changing external environment. Accordingly, in this research we proposed a method for investigating components of core patents by BM patent analysis to examine evolutionary pattern of service BM and carried out a case study of education service. Through the proposed method, we can understand the overall flow of service BM's IT-based evolution and observe the evolution in specific service BM component. This research is meaningful in its setting up of a process to explore service BM evolution. We found the evolution from BM patent data, so the evolution is basically derived from technology development. But there are opportunities for further research. In view of the technology-intensive characteristics of BM patent, exploring evolution of other technology-intensive services or knowledge-intensive business services (KIBS) also can be a meaningful work. Moreover, citation relationships between the BM patents can give clear identification of evolutionary path.

6. Acknowledgements

7. References

[1] J. Välimäki. Change of Business Models for Wireless Internet Access. *Seminar on Networking Business, Networking Laboratory*. Helsinki University of Technology, 2006.

[2] H. Chesbrough and R.S. Rosenbloom. The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin‐off companies, *Industrial and Corporate Change*. 2002, **11** (3): 529-555.

[3] M. Dorney. Intellectual piracy. *CIO*. 2001, **14** (9): 60.

[4] J. Hedman and T. Kalling. The Business Model concept: theoretical underpinnings and empirical illustrations. *European Journal of Information Systems*. 2003, **12** (1): 49-59.

[5] I. MacInnes. Dynamic business model framework for emerging technologies. *International Journal of Service Technology and Management*. 2005, **6** (1): 3-19.

[6] M. Al-Debei and D. Avison. Developing a unified framework of the business model concept. *European Journal of Information Systems*. 2010, **19**: 359-376.

[7] H. Koda. *Business models patent*. Tokyo: Nikel Kogyo Shinbunsha, 2000.

[8] B. Coriat and F. Orsi. Establishing a new intellectual property rights regime in the United States: origins, content and problems. *Research Policy*. 2002, **21** (8/9): 1491-1507.

[9] Y.-C.J. Wu. Unlocking the value of business model patents in e-commerce. *The Journal of Enterprise Information Management*. 2005, **18** (1): 113-130.

[10] M.W. Hill. *The Impact of Information Technology on Society*. London: Bowker Saur, 1999, p. 234.

[11] A. Afuah and C. Tucci. *Internet Business Models and Strategies*. Boston: McGraw Hill, 2001.

[12] A. Ostenwalder, Y. Pigneur, and C.L. Tucci. Clarifying business models: origins, present, and future of the concept. *Communications of the AIS*. 2005, **15** (May): 2-40.

[13] Y. Baghdadi. A business model for deploying web services: a data-centric approach based on factual dependencies. *Journal of Information Systems and E-Business Management*. 2005, **3** (2): 151-173.

[14] M.C. Mayo and G.S. Brown. Building a competitive business model. *Ivey Business Journal*. 1999, **63** (3): 18-23.

[15] P. Weill and M. Vitale. Place to Space, Migrating to eBusiness Models. 2001.

[16] P. Timmers. Business Models for Electronic Markets. *Journal on Electronic Markets*. 1998, **8** (2): 3-8.