Business Model Innovation in Pharmaceutical industry:
Service Orientation Perspective

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Abstract

This study zooms in on the pharmaceutical industry and incorporates the perspectives of the service economy, in order to explore the possible frameworks for business model innovations. Business model innovation is gaining attention now, but still few researches compared with literatures of service innovation. An in-depth study of BMI is important for both theoretical exploration and business practice. The main objectives of this research are: (1) Construct an analytical typology of BMI in pharmaceutical industry; (2) Establish an BMI analytical model for pharmaceutical industry in Taiwan; (3) Based on the above-mentioned indicator establishing process and results, make suggestions for future researchers and recommend useful strategies for enterprises.

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1. Introduction

The transitions of business model could be divided into three research streams[1], [2]. In the first place, business model is used as basis for enterprise categorization, as the emerging of E-commerce in the begging of 21st century, the construction of business model is used to realize and categorize value driven factors in business model of E-commerce[3], [4] Second, Business Model is regarded as the pioneer of enterprise transformation, in concrete, business model is the significantly facilitating performance. Since certain business model is significantly better than other types[5]–[7], successful business model could be imitated[8], [9] or reproduced[10], [11]. Third, business model is regarded as potential innovation entity [7]. Therefore, as extension, business model innovation addressed some important research issues, which surpassed the restriction of conventional business model[12]. Business model innovation is gaining attention now, but still few researches compared with literatures of service.

The purpose is to drive the economic transformation and upgrade into a new model focusing on innovations, employment and distributions. The 5+2 Industrial Innovation Plan is anchored on five industries, i.e. Asia Silicon Valley, biotech & Medicare, green energy, smart machinery and national defense & aerospace, and two pillars, i.e. new agriculture and circular economy. Against this industrial backdrop. This study zooms in on the pharmaceutical industry and incorporates the perspectives of the service economy, in order to explore the possible frameworks for business model innovations. Compared to other industries, the pharmaceutical industries are known for long product development cycles, heavy upfront investments and high risks. Successfully developed products are protected by patents, promising high returns and enjoying long product cycles. Pharmaceutical products are highly relevant to life and health. Therefore, the industry should maintain high quality, high safety and medical benefits, subject to stringent laws and regulations.

The entry barrier is high, the industry is complex and the value chain is long, with a high degree of specialization. The pharmaceutical industries should re-gear from a manufacturing centric approach to a business-oriented approach. The industries should go beyond the traditional idea about resources recycling and waste management.

An in-depth study of BMI is important for both theoretical exploration and business practice. The main objectives of this research are: (1)Construct unanalytical typology of BMI in pharmaceutical industry;   (2)Establish an BMI analytical model for pharmaceutical industry in Taiwan; (3)Based on the above-mentioned indicator establishing process and results, make suggestions for future researchers and recommend useful strategies for enterprises.

2. Literature review

2.1 Business Model Innovation (BMI)

BMI is an extension of BM by combining a number of key research issues, going beyond the scope of BM in traditional literature[12]. BM is a conceptualized framework for organizations, rather than a simple financial model [9]. Foss & Saebi (2017)[12] summarize four BMI streams and relevant scholars and discourse:

(1) Conceptualizing BMI[9], [13], [14], and hence the necessity of augmenting the BMI dimension, contents and indicators;
(2) BMI as an Organizational Change Process[15]–[18], and hence the necessity to define the BMI competences and work flows that organizations require to drive transformations;
(3) BMI as an outcome[19]–[23]. BMI is manifested differently in different industries. One of the researches focuses in this research is the development of BMI for the pharmaceutical industries;
(4) Consequences of BMI[24]–[26]: as far as the effects of BMI on organizational performances are concerned, BMI can be divided into the study that connects behaviors, processes and outcomes, and the study on the influence of different BMs on firm performances.

Most studies over recent years emphasize on how to enhance company performances. Therefore, it is important to understand how to optimize strategies and business model designs. Based on the above-mentioned literature, this paper develops its research designs by referring to the streams and gaps identified by [12].
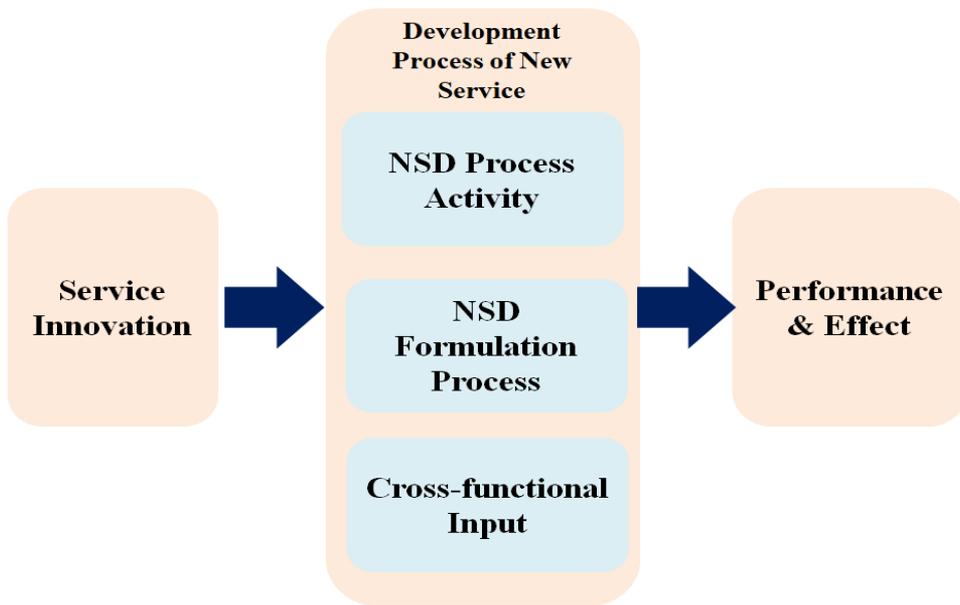
2.2 Service Innovation

In earlier stage, the research on service innovation mainly focuses on the innovation of conceptualized service and individual case innovation activity[27]–[29]. Thus, more than indicates the successful development of new service or new products, service innovation also contains all the innovation activities that can improve existing products as well as services, and transmit system. As economy develops toward globalization, the knowledge intensified service additional value presents in intangible products; so, in the highly intensified economic environment, service plays more important roles with rendering contributive innovation activities [30]. With respect to service features, its service system includes the interaction of three dimensions (Fig. 1); existing theories support the service system model as we observed, so the service can be regarded as an open system[31], [32]. The development and design of new service usually lack interaction between professional functions, which seldom executes official trial sale, and the release of new service generally needs to be explored constantly so that the correction or improvement of specific service can only be implemented after introducing new service into market.
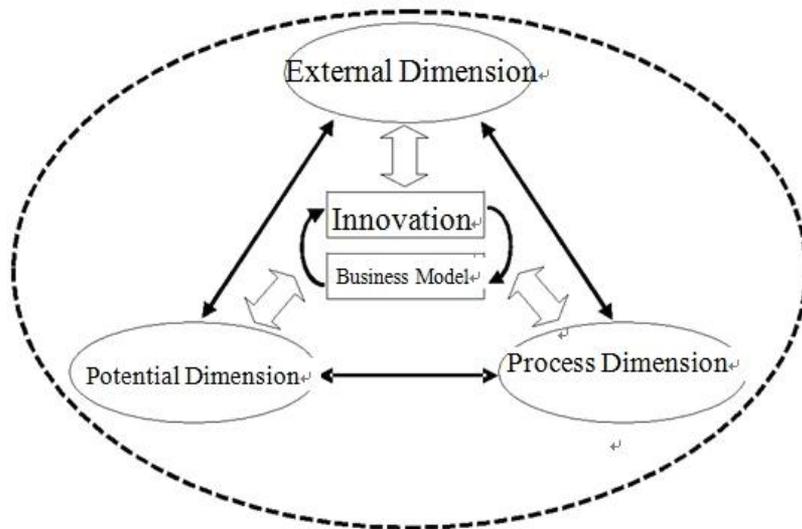
Figure 1   Service System Innovation Activity
Data resources: Edvardsson & Olson (1996); Edvardsson (1997)[31], [32]

Aimed at the research on program model of 132 new service developments of Greek financial service agency (New Service Development, hereinafter referred to as NSD), Avlonitis, Papastathopoulou & Gounaris (2001) [33] once proposed the framework of this concept (Fig. 2). The generation of a new service follows the procedure, and the service innovation influences development process of new service. The important purpose of USD activity is to understand customers' demands, which contributes to executing subsequent new service concept and better meeting customers' demands.

Figure 2 Service Innovation Research concept
Data resources: Avlonitis, Papastathopoulou & Gounaris （2001）[33]

However, the more the new service accords with market demands and perceives change of customers' demands and customers' values, the higher the opportunity of success will be. It includes developing new activity, creating new service, and cross-functional participation in new service. The above research results show that, compared with conception generation, screening, business analysis, marketing strategy, technological development and listing, product test is the activity that being executed scarcely. The research discovers that, the lower innovation degree and inclination to improvement of existing products help obtain higher product performance. Therefore, except for meeting customers' demands, market development and attracting new customers, NSD activities shall also pay attention to the measurement of team execution and subsequent performance, etc.

2.3 Fuzzy Theory and Fuzzy Hierarchy Analysis Method

Zadeh proposed fuzzy theory in 1965[34], with converting conceptual language into mathematical form and adding calculation as well as sorting. Since fuzzy theory can render a group of numerical expression to human behavioral fuzziness, it carries higher flexibility in handling decision making can better embodies human thinking mode. Fuzzy set is used to manifest the set with boundary or ambiguous boundary that contains objects in specific properties; it aims to solve the uncertainty and ambiguity in realistic environment. For this reason, fuzzy theory is absolutely not the ambiguous theory because it is famous for rigorous discussion in mathematical mode. In view that analytic hierarchy process (AHP) cannot overcome the fuzziness

during decision making, Laarhoven & Pedrycz[35] evolved Saaty's[36] traditional AHP and developed fuzzy analytic hierarchy process (FAHP) so as to substitute triangle fuzzy value into pairwise comparison matrix and prevent the ambiguous issues generated during handling of measuring as well as judging criterion.

FAHP replaces the exact value in traditional AHP with interval value. Since experts' cognitions and subjective judgments are various, in order not to influence tastes' preference to certain factor or generated large overall gap, the degree is relatively objective, which may neglect the "paradox" characteristics between semantic value. Thus, this research takes rigorous research method as measurement foundation

3. Construction of business model innovation in pharmaceutical industry
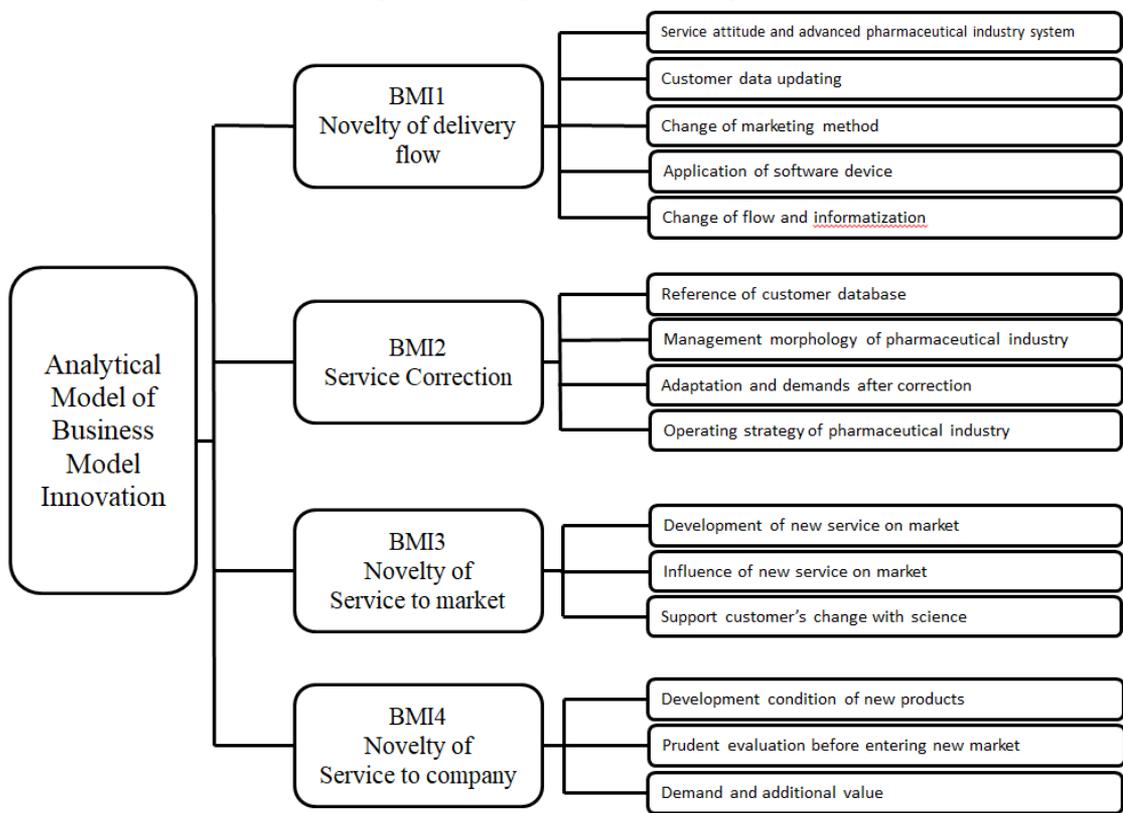
【Target】【Major Dimensions(j)】

Figure 3 Analytical Model of Business Model Innovation in Pharmaceutical industry

As research shows that, when applying fuzzy theory to the researches related to appraise and election, its method of constructing election criterion is to survey the interviewees and ask them to realize structuration of election criterion based on their specialties; then list the criterion framework sorting out interviewees' suggestions and ask interviewees to check omissions, which is a method lacking system. For this reason, this research will adopt Fuzzy AHP to understand the determined weight of business model innovation in Taiwan pharmaceutical industry. According to the hierarchical structure established in Fig. 3. the of questionnaire still refers to the hierarchical analytical statement proposed by Saaty[36]. The questionnaire is implemented on 18 experts and except for introducing evaluation purpose and project, the pairwise comparison of importance of evaluation target and evaluation project is designed; meanwhile, each scale takes certain variable in last hierarchy as standard, and the filling of questionnaire applies pairwise comparison in the same hierarchy. In terms of handling decision making issues, the fuzzy mathematics can both maintain the accuracy of traditional mathematical statistics and is distinguished from the "on or the other" as well as "paradox" in traditional math. Thus, combining with the model established via fuzzy theory and hierarchical AHP can also solve the similar problem above. This research mainly issues and collects 18 questionnaires; the Expert Choice 2000 decision making supporting software is used to analyze the results of filling the questionnaire so as to calculate the weight of each hierarchy in service innovation FAHP questionnaire of Taiwan advanced pharmaceutical industry and determine the consistency. The above indicates that, the higher the relative importance of various evaluation indexes, the higher the significance of purpose dimension will be.

Table 1   Relative Weight of Each Index and Overall Sorting

System Dimension	Major Dimension	Secondary Dimension (Evaluation Factors)	Weight of Secondary Dimension
Business Model Innovation of Taiwan Advance Pharmaceutical Industry	Novelty of Delivery Flow (0.388)	Service attitude and advanced pharmaceutical industrial system	0.167
		Customer data updating	0.087
		Change of marketing method	0.071
		Application of software device	0.037
		Change of flow and informatization	0.026
	Service Correction (0.28)	Reference of customer database	0.080
		Management morphology of advanced pharmaceutical industry	0.072
		Adaptation and demands after correction	0.037
		Operating strategy of advanced pharmaceutical industry	0.071
	Novelty of Service to Market (0.179)	Development of innovation service	0.088
		Influence of new service on market	0.051
		Support customer's change with science	0.040
	Novelty of Service to Company (0.153)	Development condition of new products	0.099
		Prudent evaluation before entering new market	0.03
		Demand and additional value	0.024

With respect to the traditional AHP method proposed by Saaty, the result of data analysis shows that, it actually is a calculation process of Fuzzy AHP, namely the numerical value calculated by traditional AHP, which is the value that mij refers in Fuzzy AHP. Therefore, when the CI of calculated mij accords with consistency determination requirement (CI<0.1), it can be inferred that, the results calculated by Fuzzy AHP carry consistency. In the four dimensions of first hierarchy "service innovation", the CI, CR and feature vector respectively are 0.388 of novelty of delivery flow, 0.28 of service correction, 0.179 of novelty of service to market and 0.153 of novelty of service to company, CI= 0.058 (<0.1) λ_{max}= 4.174.

In the dimensions of second hierarchy "novelty of service flow", the CI, CR and feature vector respectively are 0.167 of service attitude and advanced pharmaceutical industrial system, 0.087 of customer data updating, 0.071 of change

of marketing method 0.37 of application of software device, and 0.026 of change of flow and informatization, CI= 0.0595 (<0.1) λ_{max}= 5.238. In the dimensions of second hierarchy "service correction", the CI, CR and feature vector respectively are 0.080 of reference of customer database, 0.072 of management morphology of advanced pharmaceutical industry, 0.071 of operating strategy of advanced pharmaceutical industry, and 0.037 of adaptation and demands after correction, CI= 0.053 (<0.1) λ_{max}= 4.159. In the dimensions of second hierarchy "novelty of service to market", the CI, CR and feature vector respectively are 0.088 of development of innovation service, 0.051 of influence of new service on market, and 0.40 of Support customer's change with science, CI= 0.0735(<0.1) λ_{max}= 3.147.

In the dimensions of second hierarchy "novelty of service to company", the CI, CR and feature vector respectively are 0.099 of development condition of new products, 0.03 of prudent evaluation before entering new market, and 0.024 of demand and additional value, CI= 0.068 (<0.1) λ_{max}= 3.136.

The above research indicates that, index CI (consistency index) is smaller than 0.1; in the aspect of CR (consistency rate), since the dimensions are in pairwise comparison, CR is definitely smaller than 0.1. It means that, the evaluation index in this research reaches to the acceptable consistency standard.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusion

The analytical framework BMI in pharmaceutical industry developed in this research integrates the opinions and ideas of domestic and overseas scholars, which is tested through the parallel research of materialization and quantification. According to the analytical results, the following four service innovation theoretical connotations are proposed for reference of advanced pharmaceutical industrial personnel: (1) in the dimension of novelty of delivery flow, modern personnel shall be qualified with professional knowledge, work attitude and service concept. It means that, the professional service quality of personnel has become the critical factor of pharmaceutical industrial development. (2) With respect to service correction, advanced pharmaceutical industry must face massive customer data so that, except for implement correct setting of customer database, it shall make the most of acquired customer data and custom knowledge so as to interact with customers.(3) In terms of novelty of service to market, other than reinforce entity service and hardware equipments, the most important is to create new service atmosphere with innovative concept, and then continue it thoroughly. (4) For novelty of service to company, Crawford & Benedetto[37] pointed out that, the basic new product development procedure includes confirmation and selection of opportunity, formation of concept, evaluation, development and sales of concept/project. During the development of new product, the advanced pharmaceutical industry usually generates high similarity with other new product in the same region. Thus, the product isomorphism in advanced pharmaceutical

industry is high with weak innovation ability. Considering these reasons, to complete the construction of service innovation of advanced pharmaceutical industry, the measurement mode shall be simple, easy to understand and rigorous. In addition, the development of this mode shall be established on the new scale of service innovation of advanced pharmaceutical industry, and integrate the research orientation of behavioral school and decision school. All these show the contributions of this research to the service innovation of advanced pharmaceutical industry.

Implication of unique BMI development.

Manufacturing industries have played a pivotal role in the economic development of Taiwan. The market shift in the pharmaceutical market over recent years, and the government's efforts in promoting the circular economy and 5+2 Industrial Innovation Plan have pushed the pharmaceutical industries to the forefront of the key issues such as industrial sustainability and innovation for sustainable business models. Companies should explore how to create differentiations via innovations in sustainable business models, in out to stand out in the competition and enhance value added of products. This research develops unique business model innovation in pharmaceutical industry. This model is the synthesis of the literature and expert opinion. The unique BMI built by this research for the pharmaceutical industries is its key contributions.

4.2   Recommendations

This research deploys qualitative research techniques by interviewing senior executives in the sampled 18 listed pharmaceutical companies in Taiwan and seeks to produce quantitative results on the interview findings. Future studies should enlarge the research sample by covering all the pharmaceutical companies in Taiwan in the construction and validation for the innovations of   business models. To take a step further, it is recommended that inter-group comparisons should be made on the Taiwanese pharmaceutical companies and the subsidiaries of foreign pharmaceutical companies in Taiwan.

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