

“EMPLOYABILITY OF INTERNET OF THINGS IN BUSINESS FEASIBILITY FORECASTING, AND PREDICTION ANALYSIS”

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ABSTRACT

The improvement of an IoT business as indicated by the appropriate business system is fundamental for the achievement of IoT organizations. This paper expects to build up a plan of action system particularly for IoT-based business. Literature review interviews with professionals have been managed to characterize factors and their credits significant to the plan of action for IoT-based organizations. The study was disseminated to 150 interviewees in Korea. The overview accumulated 108 reactions. An exploratory factor examination was conveyed to decide if in secret factors are basic the "squares" (IoT innovation, business methodology, and procedure, cost structure, chose business territory). Discoveries: As the consequence of this investigation, a few factors are barred in each factor, in light of the fact that their legitimacy and unwavering quality are not adequate. For instance, the factor "IoT innovation" contains just 2 factors, "ICT innovation" and "Research and development limit". Different elements have additionally the same outcome after factor investigation. If there should arise an occurrence of the factor "Application territory", the factors, "Production network", "Transport", "Shrewd home" are picked in light of the fact that the interviewees accept that IoT business in these application zones will guarantee and beneficial. Along these lines, the changed plan of action structure for the IoT business is represented as the aftereffect of this paper. The consequence of this examination could be changed by the intrigue and information on respondents. The structure recommended in this paper can be a decent reference to the business designers, who are keen on arranging and making an Internet of Things business as new business openings. This paper tells the direction about the best way to build the IoT plan of action and may fill in as a kind of perspective guide on how the IoT business systems could be planned.

1. INTRODUCTION

The new term, “Internet of Things (IoT)” has become a fashionable saying in some circles. In business and academe, IoT is regarded as the new growth engine for the future business. Many global market research institutions forecast that the growth of business value of IoT will reach \$19 trillion by in1. And Gartner estimated the numbers of installed IoT to be 4.9 billion in2. For example, big Korean telecommunication companies, like Korean Telecom (KT) and SK Telecom, invest huge money and resources to form IoT related businesses, because they believe IoT is a promising and lucrative business item that enables them to provide differentiated services and products to their customers3,4. And other companies believe this new IoT business can create new possibilities and enhance their competitive power in the market. This is because the numbers of connected ‘things’ around our daily life grows rapidly5. In order to facilitate the IoT-based business in the market, the appropriate frameworks for IoT business models must be analysed and developed. This rising attention on IoT business has led to many research works about the conceptualization of IoT business8. Other studies investigated IoT applications, technical characters and influences on consumers9. This paper aims to present a framework for business models for IoT business. The business model framework is developed based on a literature survey and interviews in 15 companies that developed IoT business

recently. The commitment of this paper is an introduction of the plan of action structure, which could be a decent reference for the arranging and making of an Internet of Things business.

2. RESEARCH MODEL

A business model describes the processes of business activities in which a company performs its business¹⁰. Usually the business model consists of several components, such as customer relationships, supply channels and value added chains. Many companies develop their business model with the help of business model framework^{11,12}. A framework of IoT business model could be constructed by multiple factors and their attributes¹³. Figure 1 demonstrates the Research model of this paper. Figure 1 shows several factors, which may be called “Blocks,” which compose the platform of business model for IoT business. These components, “Blocks”, are business channels, business partners, resources, cost structures and business strategies¹⁴. The successive steps of research phase are illustrated. As shown in Figure 1, “IoT technology” and “Business strategy” have influences on “Business process approach” and “Selected IoT application”. As a result, “IoT based business performance” is influenced by these two antecedent factors. We will test these relationship between these factors.

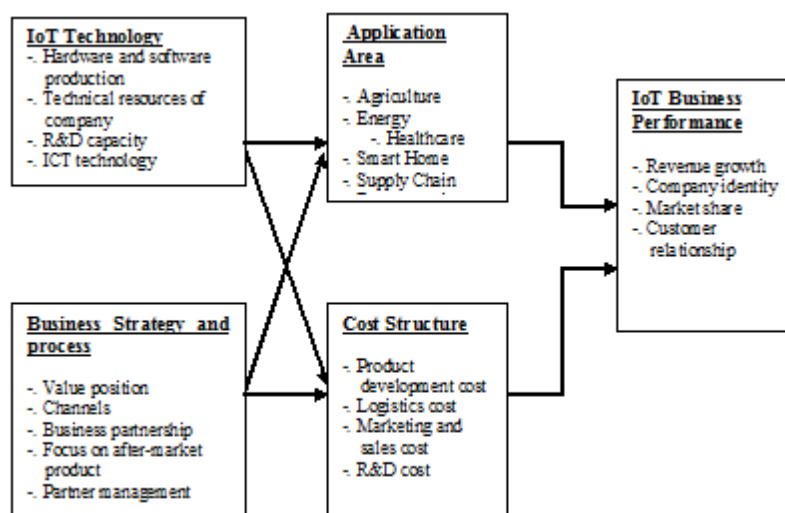


Figure 1. Research model.

3. OPERATIONAL DEFINITION OF DATA

The following factors and variables (constructs) are defined to complete the research model in five categories. They are “IoT technology”, “Business strategy and process”, “Cost structure”, “Application area” and “IoT business performance”. The operational definitions of these measured variables are as follows:

3.1 “IoT technology” is one of the decisive components of the IoT business model. As the measured variables of the “IoT technology”, we defined 4 variables. They are:

- Hardware and software production.
- Technical resources of company.
- R&D capacity.
- ICT technology.

3.2 Business Strategy and Process

“Business strategy and process” is the most important factor for the orientation and actuation of an IoT business. Generally, managers want to increase revenue and profit through their management activities. This category includes the following attributes:

- Value position.
- Channels.
- Business partnership.
- Focus on after-market product.
- Partner management.

3.3 Application Area

The selection of IoT application area could be a decisive factor for the business performance in the IoT market. And this factor is dependent on the business form of the company. The variables of “Selected application area” are:

- Agriculture.
- Energy.
- Healthcare.
- Smart Home.
- Supply Chain.
- Transportation.

3.4 Cost Structure

“Cost structure” of IoT business has strong impact to management performance of IoT business. “Cost structure” of IoT business comprises several costs ranged from the product development to sales and distribution of IoT product to the customers. Variables for this category are:

- Product development cost.
- Logistics cost.
- Marketing and sales cost.
- R&D cost.

3.5 IoT Business Performance

Business performance of IoT business (“IoT Business Performance”) is the result factor of business model. This factor contains the several measured variables as follows:

- Revenue growth.
- Company identity.
- Market share.
- Customer relationship.

4. RESULT OF RESEARCH

The aim of this paper is to develop and analyse the business development framework for IoT business. For that purpose, empirical research methodology will be applied. Subsequently, factors and attributes relevant to the IoT business will be constructed and statistically tested on their reliability and credibility. The survey based on 5 Likert scales was administered to analyse

the importance of each factor and its attributes. Here, the answers “strongly agree” and “agree”, mean that the selected factors and variables are relevant to the business model. And other types of answers explain the irrelevance of selected factors to the business model. The survey was distributed to 150 interviewees in Korea. The survey gathered 108 responses. An exploratory factor analysis was deployed to analyse whether unobserved factors are underlying the “blocks” (technical aspect, business strategy, cost structure, selected business area). To determine which factors and variables are important to business model, a sample t-tests (two-tailed, $\alpha = 0.05$) was carried out.

4.1 Validity and Reliability of Variables

A 23-item questionnaire survey was administered to 150 IoT related persons in Korea. 109 valid responses were gathered. After the test on validity and reliability, several measured variables have been deleted. As the result of factor analysis, 15 measured variables are retained, which converged to 5 factors. Table 1 shows the result of factor analysis. As shown in Table 1, the Cronbach’s alphas of the 5 factors ranged from 0.72 to 0.93 and all the values of each factor loading were larger than 0.5, which is suggested as minimum level by in15.

Variables	Factor Loading Value					Cronbach- α
	1	2	3	4	5	
R&D cost (cs4)	0.941	0.085	-0.175	-0.043	-0.162	0.877
Product development cost (cs1)	0.856	0.051	-0.121	-0.076	-0.045	
Logistics cost (cs2)	0.827	-0.042	-0.112	-0.075	0.115	
Marketing and sales cost (cs3)	0.757	0.000	-0.049	0.032	0.119	0.923
Focus on aftermarket product (bsp4)	0.044	0.937	-0.091	-0.068	0.071	
Business partner (bsp3)	-0.002	0.919	-0.015	-0.040	0.145	
Value position (bsp1)	0.028	0.911	-0.046	0.044	0.066	0.929
Supply chain (sa4)	-0.150	-0.049	0.956	0.005	0.040	
Transportation (sa5)	-0.131	-0.048	0.911	0.035	0.129	
Smart home (sa6)	-0.136	-0.054	0.899	-0.017	-0.032	0.867
Revenue growth (bp1)	-0.058	0.010	0.028	0.924	0.069	
Customer relationship (bp4)	-0.032	-0.122	0.040	0.907	0.161	
Company identity (bp2)	-0.046	0.045	-0.043	0.829	-0.182	0.719
ICT technology (iot4)	0.008	0.033	-0.036	-0.021	0.912	
R&D capacity (iot3)	0.055	0.267	0.177	0.065	0.802	

4.2 Rotated Component Matrix

As shown in Table 1, we can find that several variables are excluded in each factor, because their validity and reliability are not accepted. For example, there are only 2 variables, “ICT technology” and “R&D capacity” remaining as the components of the factor “IoT technology” instead of 4 variables as in Figure 1. This means that these two variables are important in the building of business framework for the IoT business. The same explanation can be applied to 4 other factors. In case of the factor “Application area”, the remaining variables, “Supply chain”, “Transport”, “Smart home” are chosen because the interviewees believe that IoT business in these application areas will be promising and profitable. The outcome might be changed, which means other application regions will be chosen by the intrigue and information on respondents. Therefore, the changed plan of action system for the IoT business is shown in Figure 2 as the aftereffect of this paper.

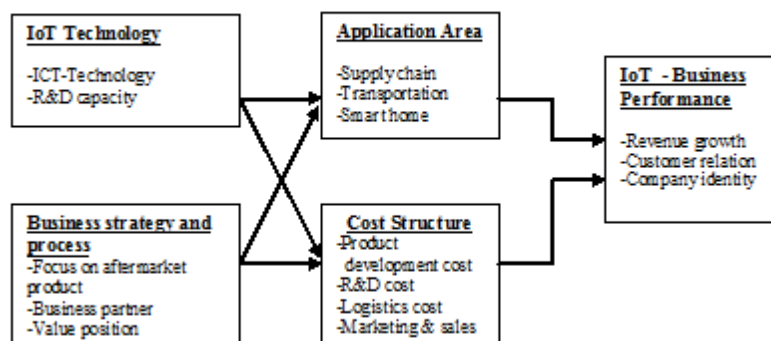


Figure 2. Modified IoT business model with important attributes

5. DISCUSSION

This paper presents a framework for business models for “Internet of Things” businesses. After having a literature study and conducting interviews with practitioners and academe, we have structured the modules of business models and specified the different attributes within those modules. Subsequently, we refined these attributes according to their importance. The result is shown in Figure 2. The differences between Figure 1 and Figure 2 explain the refinement of the attributes, which should be regarded as the important variables when the business model is to build for the IoT business. Our research has some limitations. Although this study has the meaningful results for IoT business models, it lacks a more detailed approach for specific modules in specific industry sectors. Secondly, the number of observations was not so large that important insights into patterns of various business models cannot be revealed. Lastly, because the interview was administrated in Korea, the results of this study may not be generalized to other countries. However, this paper does make some contributions. The first contribution to academics is bridging the gap between literature study and future research on IoT business models. In this paper, it is analysed what types of modules and attributes are important for IoT business. Besides, the consequence of this paper could help the administrators of the organizations who are dependable to settle on a choice for the advancement of IoT business as the new business venture. This paper gives a direction on the best way to develop the IoT plan of action and may fill in as a source of perspective guide on how the IoT business structures could be defined.