# The Study on Business Ecosystem Analysis based on the Big Data Environment

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## Abstract

*Recently, the computing environment is changing rapidly by a wide spread and the development of a wireless terminal. In particular, computing environment of enterprise is changing largely due to cloud computing and big data. Utilization value of big data is expanded across all sectors of society of administration, welfare transportation, health care, finance, manufacturing, etc. and the importance of big data as a driving force of the national economy is increased. In Korea, it is estimated that there is lack of professional staff, and a technology gap with developed countries although it is expected that demand of technology and professional staff will increase rapidly because big data is a source of future competitive advantage. In this paper, we identify concept and organization of big data business ecosystem and analyze the development step of the ecosystem. In particular, we investigated features by step of the big data business and analyzed systematically the development direction accordingly. The analyzed result in this paper is utilized to many companies and related policies of big data and will provide a number of advantages.*

*Keywords: Big Data, Business Ecosystem, Data Utilizing, Data Analysis, Data Mining*

## 1. Introduction

Recently, the significant data which was never thought just a few years ago has been generated by the rapid development of network technologies and the spread use of the smartphone and the wireless terminal. The high value creation potential through the analysis of the large amount of data has emerged due to realization based on broad information generation. This information is represented by rapid growth of social networks as the rapid spread of smart devices, personalized information services and IoT(Internet of Things). In particular, the form unlike the past data is changing. In recent years, most of data is unstructured data which the form is not defined such as pictures, audio, and video although most of data in the past is the text-based data which the form is decided. It is difficult to collect, store, retrieve, and analyze the unstructured data using the existing method that processed the fixed form data for the text [1].

Therefore, it is necessary to respond effectively to the upcoming big data era through the research and development of analysis techniques for big data. Understanding and appropriate cope for new phenomenon and through association analysis between a number of the accumulated data are expected to be available. Management strategy utilized big data is enhanced the performance of the company and will be a driving force that can continue to grow [2]. The data utilization accumulated in the private and public improve the productivity of company and is recognized as an opportunity to reduce the associated costs. Also, big data as a new ecosystem has emerged as platform for innovation power and new business and basic resources opened to all businesses. The new value creation through these big data is directly connected to competition of government as well as enterprise. The study on the analysis techniques of big data in the various

fields is needed the efforts of enterprises as well as policy support of government to be made to suit local characteristics [3].

In this paper, the characteristic of big data business ecosystem is analyzed step by step in order to enhance the competitiveness of enterprises utilizing big data and design systematic policy. The view of big Data business ecosystem based on the analyzed characteristics is analyzed. For this, big data business ecosystem as a concept which includes the big data ecosystem looks at the component using data in the big data ecosystem in terms of the value creation. It is necessary to study the organic relationship occurring in the industry.

The organization of this paper is as follows. The related research on big data ecosystem is explained in the Section 2 and the characteristics of big data business ecosystem are described in the Section 3. In the Section 4, we analyze the characteristics by step for the development direction of big data business ecosystem. Finally, we conclude in the Section 5.

## 2. Related Work

### 2.1. Big Data Ecosystem

Big data is investigated to entire data ecosystem structure and the importance and potential of big data as a public resource is emphasized. Big data as a public resource is expected to catalytic role of the government for activation and stabilization. The report supports government area, private area, and data collection and analysis of individual area in order to be leveraged to a public resource. Also, it purposes improving of the balanced system which can protect an individual privacy and security without containing the innovation [4].

Big data as economic development tools constitutes the new data ecosystem and `has been produced, accumulated, and utilized data by various subjects of the ecosystem.
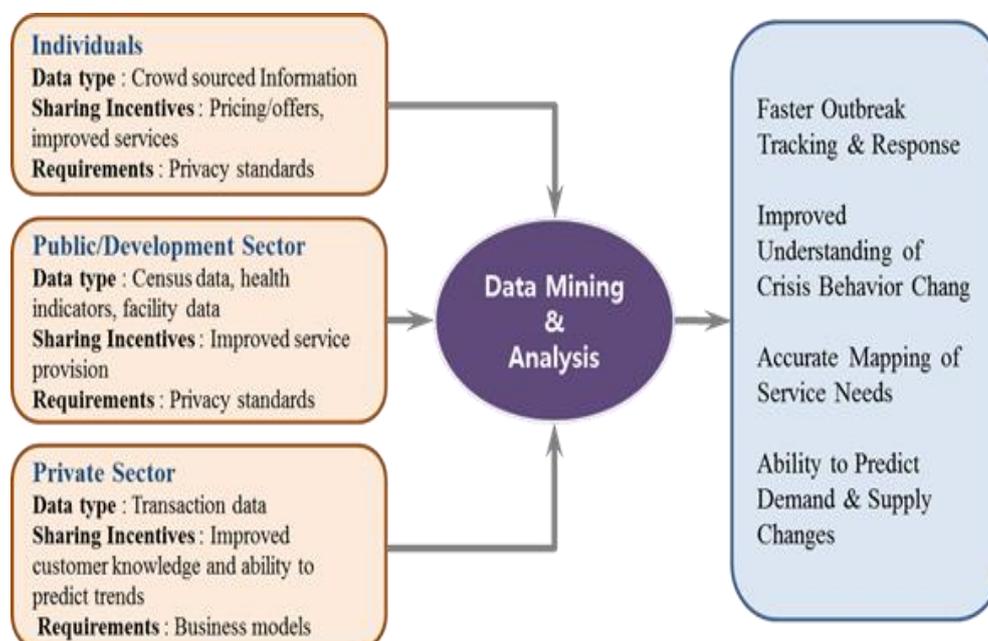


**Figure 1. The Actors and Public Resources of Big Data Ecosystem**

In world economic forum, it was emphasized that all subjects of ecosystem should participate positively and openly in order to realize the mutual benefit by creating an

environment for sharing Big data [5, 6]. The government protects the individual and should be set up data public principles and legal framework. The private area should work mechanism for data sharing that the public can benefit.

And development agency should create an environment so that government support, public and business value can be shared easily. WEF has argued that some ecosystem requirements must be provided in order to leverage public resource of data ecosystem. In other words, legal utilization for the data produced by the first individual should be sought to share the collaborative data [7]. It is important to understand meaning of the ecosystem, various service types and service combinations while ecosystem with a focus on infra, software and analysis tool consisting Big data has been expanded. It is necessary to understand the ecosystem whole process comprehensive if business associated with big data is understood and big data within the public area is utilized [8, 9].
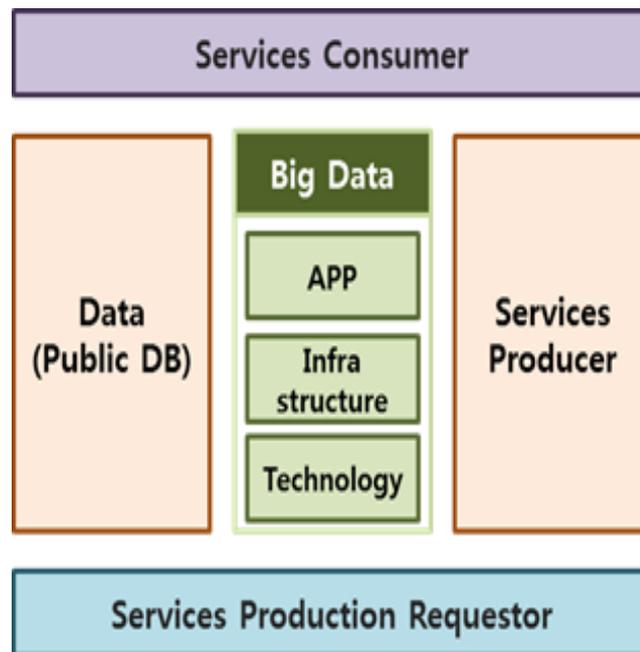


**Figure 2. The Actors and the Public Character of Big Data Ecosystem**

Big data ecosystem is largely comprised of service providers, big data users, and application providers. Ecosystem needs to break away from simply a collection of data, generation, analyzing, processing, and utilizing [10]. Entire ecosystem of only the system itself cannot be explained as experience in the smartphone and cloud market. The market can be understood if it expands to surrounding the platform and software. The flow of the strategy between eco system subjects and the big data market should be looked by providing a big data service, being provided and expanding to the interaction between the subjects connecting this [11].

## 3. The Definition of Big Data Business Ecosystem

### 3.1. Conceptual Definition

Business using big data is activities that provide goods or services to accustom or other business. Business ecosystem is another terms for dependent network coupled loosely of suppliers, distributors, outsourcing firms, transportation service enterprises, and manufacturers of technology [12].

Past industry structure is that the boundaries are clear because it is fixed by each role and it focused on only one industry area. Recently, several companies are involved in the whole industry not only one industry and business ecosystem occurs across multiple industries. Business is an organization or activity recognized legally existing within the country. It enjoys economic freedom enough to sell goods or services to customers or other businesses. Ecosystem is a calling name interaction of the organism and inanimate environment which exchanges influence each other.

Therefore, business ecosystem suggests organic relationship between producer and hierarchy consuming this through requirement of requestor. In the case of big data, producer refers to the environment providing various services by utilizing the data [13].

### 3.2. Construction of Big Data Business Ecosystem

In order that service forms to market, it can be classified into three types like service producer which products and makes service, user using service provided to market, and service consumer by applying requested party of information production as role-party requesting service(information) and data.



**Figure 3. Big Data Business Ecosystem**

### 3.3. Analysis of Big Data Paradigm

Social, things, and life-log data is bound and the influence of big data is increased by coming smart era that commonplace of IT

The real-time connectivity and smart revolution reached the limit of the existing data storage, management, and analytical technology. Environmental change into big data exerts a large force enough to drive the paradigm of information society as long as data is the key moving information society.

The hyper connectivity network orienting smart society has evolved into a smart ecosystem from existing individual industry technology ecosystem through fusion between hierarchical cooperation based information and communication technology and industry. Smart service based on hyper connectivity provides continuously and safely optimal service for the situation of user anytime, anywhere and is the core value of future smart ecosystem.

**Table 1. The Transformation of IT Technology Trend**

| Division | PC | Internet | Mobile | Smart |
|---|---|---|---|---|
| Change of paradigm | Computerized digital | Online information | Social mobilization | Intelligent, Personalization Things |
| It issues | PC, PC communication, DB | High-speed internet www, Web server | Mobile internet Smartphone | Big data, The next ,generation PC, Network objects |
| Key sector(service) | PC, OS | Portal search engine, web 2.0 | Smartphone app service, social media | Future outlook, Situational awareness, personalized |
| Representative corporate | MS, IBM | Google, naver, youtube | Apple, facebook, twitter | |
| IT vision | PC for one | e-Korea | PC in hand, Communication | IT Everywhere |

## 4. Analysis for Development Prospects of Big Data Business Ecosystem

### 4.1. Big Data Business Ecosystem

The condition of big data business ecosystem in South Korea can be summarized as follows. IT infra is world-class but the scale of data traffic is weak because domestic market size is narrow. Also, it is limited that related solution and service leads global megatrend because the Korean language is not a global language in the language technical aspect. The core technology and leveraging experience also is lack and cooperation is vulnerable because of characteristic that all technology of HW, SW, computer science, cognitive science, neuroscience, and linguistics is covered. It is required that virtuous cycle like data accumulation, business advantage, related technology maturation, and data storage. It is a retrograde structure of add investment and poor of labor inflow by low level of superficial data analysis and lack of success because of weak systematic accumulation of data and adherence to short-term performance.

The use of consumer information is limited because privacy protection is powerful than necessary on national law. The social atmosphere overflows to minimize it than information disclosure, sharing, and spreading because of sensitivity for information security. On the other hand, in order to analyze big data, it is required understanding of statistical theory and computer science such as data storage and processing and computer skill. Also, in order to process unstructured data of various types, it is required a variety of expertise like engineering, medicine, law, and accounting for understanding of linguistics, psychology, cognitive science, and various sectors of society. But, ready of education system supporting interdisciplinary convergence education is lacking in the domestic universities [3, 5].

### 4.2. Development Stages of Big Data Business Ecosystem

Step 1 is a data-centric. It is steps to utilize to company's profits after it holds into the internal such as companies, public institutions, or organization and analyze using big data.

Step 2 is a technology-centric. Service is generated through grafting of data of internal corporate and generated data in the external environment of company.

Step 3 is a service- centric. The opened data of various forms in businesses, public institutions, and organizations is combined to the idea. Personalized on demand service is developed through solution provider and also provided in the environment which individual directly can generate service.
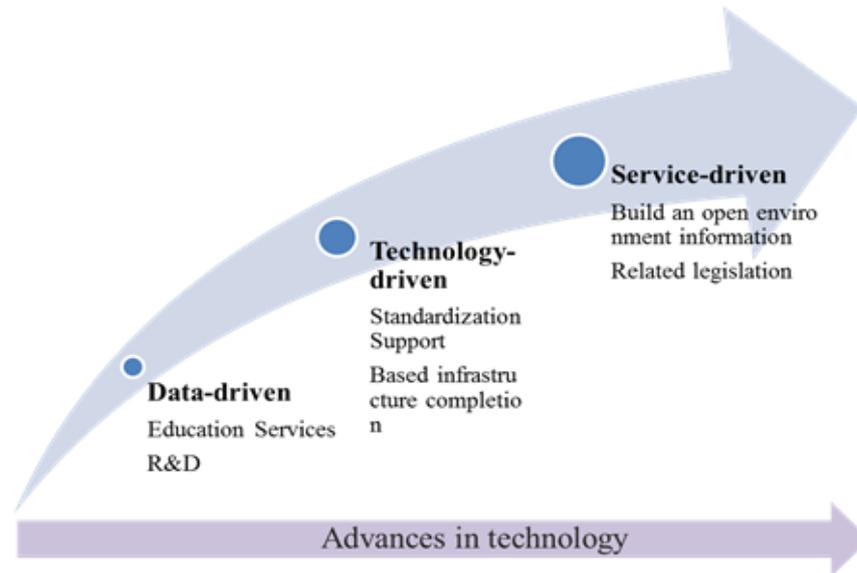


**Figure 4. Development of Big Data Business Ecosystem**

## 4.3. Evolution Direction of Big Data Service

The quality of public is evolved to improving step by utilizing public data of step 2 in the analyzing step for special purposes of step 1 in the big data service depending on the evolution of the ecosystem.

In the step 3, big data reaches a level that individual can produce personalized, customized, and intelligent service as well as professional organization such as solution provider.
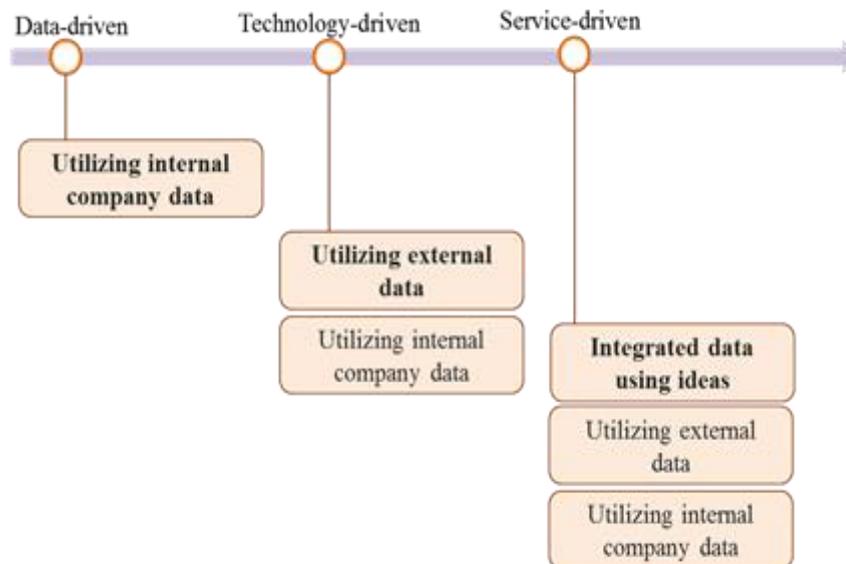


**Figure 5. Development of Big Data Business Ecosystem**

### 4.4. Evolution Prospects Analysis by Big Data Ecosystem Development

The evolution of big data ecosystem in the South Korea based on this study is analyzed.

1) Development stage of big data ecosystem

In the initial market that data is not public, the company which does not hold data is difficult to participate in business. In the current market, the role of the data holder appears very largely in order to create big data service. User company holding data is provided service and infra separately. Public companies and large corporations introduce if a service user holds the data.

2) Culturing stage ecosystem strategically

It is a step that current global companies provide to the market. User integrates service and infra in order to utilize holding data. The phenomenon increasing dependency on their stable infra is appeared through vertical integration.

Service infra maintains a close relationship with each other and vertical integration integrating into center of foreign global companies occurs. It is service form utilizing mainly when domestic companies introduce first big data. In the case of domestic companies, vertical integration for providing service and infra is relatively incomplete.

3) Ecosystem maintenance and development

One company holds data, service, and infra at the same time. Individual and company are provided to the form using service rather than only data public. It can appear in the mature market of big data.

The companies holding a large amount of existing data create value in internal organ by introducing big data. Service is appeared and data retention is very important. It is necessary to create an environment which can distribute and open data based on this. In the development steps of the big data market, user holding data plays a leading role to introduce big data in the introduction. Companies which experiences introduction of big data will be developed into form to create value in the mature stage.

## 5. Conclusion

The form of big data is becoming very diverse and there are also many areas that it is to be utilized. The analysis of the convergence of analysis techniques and application for big data is not done systematically compared to the use request of such a big data. In this paper, we study the stepwise analysis and forecasts for the business ecosystem using big data.

In the development phase of the Big data market, introduction of Big data is held in the introduction phase of user having data and the company experienced Big data adoption offers integrated data, service and infra to create worth in the mature stage. The form providing integrated data service and infra has competitiveness in the market. The domestic enterprises  should lead to service creation and pull activation of big data market through call for service. It also should enter the big data market to the form of integrated service that involves the big data market by utilizing the holding data because it moves to data published by skeptical.

## References

[1]  Robins, G., Pattison, P., Kalish, Y., and Lusher, D., "An Introduction to Exponential Random Graph (p*) Models for Social Networks," Social Networks (29:2), (**2007**), pp. 173-191.
[2]  Wactlar, H., Pavel, M., and Barkis, W., "Can Computer Science Save Healthcare?" IEEE Intelligent Systems (26:5), (**2011**), pp. 79-83.

[3]     Watson, H. J., and Wixom, B. H., "The Current State of Business Intelligence," IEEE Computer (40:9), (**2007**), pp. 96-99.

[4]     Yang, H., and Callan, J., "OntoCop: Constructing Ontologies for Public Comments," IEEE Intelligent Systems (24:5), (**2009**), pp. 70-75.

[5]     Stonebraker, M., Abadi, D., DeWitt, D. J., Madden, S., Pavlo, A., and Rasin, A., "MapReduce and Parallel DBMSs: Friends or Foes," Communications of the ACM (53:1), (**2012**), pp. 64-71.

[6]     Pang, B., and Lee, L., "Opinion Mining and Sentiment Analysis," Foundations and Trends in Information Retrieval (2:1-2), (**2008**), pp. 1-135.

[7]     Patterson, D. A. 2008. "Technical Perspective: The Data Center Is the Computer," Communications of the ACM (51:1), (**2008**), p. 105.

[8]     Ben S., "Extreme visualization: squeezing a billion records into a million pixels," Proceedings of the 2008 ACM SIGMOD international conference on Management of data, (**2008**), pp. 3-12.

[9]     Big Data, Big Impact: New Possibilities for International Development, 2012 World Economic Forum

[10]    Rosenthal A, Mork P, Li MH, Stanford J, Koester D, Reynolds, "Cloud computing: a new business paradigm for biomedical information sharing," J Biomed Inform, 43(2), (**2010**), pp. 342–353.

[11]    Sangket U, Phongdara A, Chotigeat W, Nathan D, Kim WY, Bhak J, Ngamphiw C, Tongsima S, Khan AM, Lin H., "Automatic synchronization and distribution of biological databases and software over low-bandwidth networks among developing countries," Bioinformatics, 24(2), (**2008**), pp. 299–301.

[12]    Zook, M. and Dodge, M., "Mapping, Cyberspace," In In International Encyclopedia of Human Geography, Edited by: Kitchin, R. and Thrift, N. Vol. 6, (**2009**), pp. 356–367.

[13]    Shelton, T., Zook, M. and Graham, M., "The Technology of Religion: Mapping Religious Cyberscapes," The Professional Geographer, 64(4), (**2012**), pp. 602–617.

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