

A STUDY ON THE EFFECT OF ORGANIZATION'S ENVIRONMENT ON ACCEPTANCE INTENTION FOR BIG DATA SYSTEM

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ABSTRACT

Big data has become a worldwide topic. Despite this, Big data beyond the use of simple data accurately understand and acquire the business to take advantage of companies that were only very few. The purpose of this study is to investigate the factors that affect Korean firm's acceptance of Big data system. This study is based upon previous researches. The results of this study will increase users' awareness on Big data system and help develop a way to make it possible for the introduction of new technologies to be used as basic materials.

KEYWORDS: Big data system, Technology acceptance model, Organization innovation, organization slank, organization information system infra maturity

1. INTRODUCTION

Data, growing at an exponential rate now, is expected to keep increasing to reach 50 times the current volume by 2020. Collecting and storing big data and creating new information and knowledge from it are emerging as an important value and strategy for economic growth.

The World Economic Forum pointed out big data as the most noteworthy technology of 2012. In a 2011 report, McKinsey predicted big data in five domains - healthcare, the public sector, personal location data, retail and manufacturing - would create the equivalent of \$223 billion in value. By 2018, also, the United States alone will need 140,000 to 190,000 workers with analytical skills as well as 1.5million managers and analysts to analyze big data according to the report. While big data has become a frequent topic of discussion around the world, few companies in Korea accurately understand, obtain and use it at work according to researches.

Samsung Economic Research Institute (SERI) conducted a survey of 211 CEOs in last April and asked them how much they were doing to keep up with an "era of big data." 56.4% of respondents said they knew big data more than average levels but only 19.4% answered they were taking full advantage of it. In just less than 10 companies, data professionals practically acquire and use big data according to the survey. Only some of IT enterprises such as mobile phone carriers, portal sites and online game developers are reported to use big data while other industries barely do so (Samsung Economic Research Institute, 2012). There are main reasons for this phenomenon. Businesses in Korea have poor knowledge of data's value in general and academic researchers are under pressure to

achieve results in a short period of time with little time left for profound research. In this research, therefore, we considered big data as a new technology and an organizational innovation. Based on the Technology Acceptance Model established by Davis(1989), this study examines what makes organizations adopt innovative technologies and suggests guidelines necessary for domestic businesses to accept big data system.

This study has three main specific purposes as follows.

First, it examines adopters' environmental factors, which need to be considered when the organizations accept big data system, and the TAM in theory.

Second, it verifies effects environmental factors of adopters have on intention to accept big data system, based on the first purpose, by applying them to the extended TAM as external variables.

Third, it suggests an empirical model to find out factors that influence adoption and acceptance of big data system, as an innovative technology, based on research results.

2. THEOLOGICAL BACKGROUND

2.1 Definition of Big Data

Big data came to the world along with the spread of smart phones following TVs and PCs. The increased use of smart phones made it possible for individuals to send and receive data more and more, creating a massive volume of data. According to Cisco, a network equipment provider, mobile data traffic is expected to increase by an annual average of 78% from 2011 to 2016(Lee Eungyong, 2012). The spread of mobile devices, huge scale of personal data exchange, and widespread use of social media have led us forward into an era of big data. To keep up with the situations, businesses are trying it hard to acquire data by increasingly tracing and collecting data about noncustomers in order to understand consumers' hidden desire and taste and make a profit through atypical data.

In Wikipedia, big data is defined as "a collection of data sets so large and complex that it becomes difficult to store, manage, and analyze" and Mackinsey(2011) defines it as "datasets whose size is beyond the ability of typical database software tools to store, manage and analyze" in its report. Council on National ICT Strategies (2011) in Korea defines big data as "a new, innovative information technology essential for using and analyzing a large volume of data to collect valuable information, coping with change effectively with newly created knowledge and predicting change. Big data has four characteristics: Increasing volume, variety, complexity and velocity. The more those conditions are satisfied, the more it becomes suitable for data (Gartner, 2011).

2.2 Theoretical Consideration of Technology Acceptance Model

Davis (1986) suggested Technology Acceptance Model (TAM) first to predict how users come to accept and use information technology. It is one of the most influential models in explaining information technology's characteristics, which influence acceptance and use of new information technology, and has been applied to many researches.

Davis (1989) suggested perceived usefulness and perceived ease of use as important factors in the TAM. Perceived usefulness was defined by him as "the degree to which a person believes that using a particular system would enhance his or her job performance." He defined perceived ease of use as "the degree to which a person believes that using a particular system would be free from effort." According to Davis, perceived usefulness is

influenced by perceived ease of use because, under the same conditions, users would consider it more useful when it is easier to use technologies. Likewise, those two variables have an influence on users' attitude toward system use which, in turn, determines users' intention to use systems. And then, intention to use affects actual system use (Davis, 1989).

While the TAM has been widely used as a useful theory regarding information technology acceptance, it has faced criticism that the theory is too simple and puts emphasis only on users' judgement about technologies (Malhotra and Galletta, 1999).

Accordingly, there have been many researches to redefine and expand the original TAM. First, researchers tried to establish theories that demonstrate perceived usefulness and perceived ease of use, which are considered to be main variables determining intention to use information technologies, and intention to use are antecedents and determinants. In particular, Venkatesh and Davis(2002) suggested the extended TAM by adding external factors including social influence process, cognitive instrumental process, output quality and feasibility (Lee Jeongseop, 2005).

As the second approach, researchers are focusing on explaining different variables other than two existing variables affecting intention to use. The original model has been criticized for failing to replect users' many different views by limiting variables only to perceived usefulness and perceived ease of use.

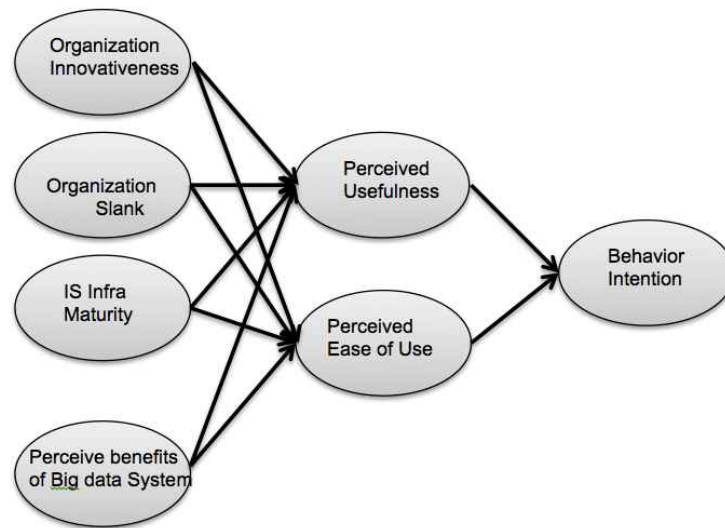
Since the research of Davis (1989), studies regarding the TAM have been conducted in various ways from the researches that apply the same analysis model to various information technologies and make a prediction to the researches that redefine and expand the original model (Jeong Dobeom, 2009).

3. RESEARCH MODEL AND HYPOTHEISIR

3.1 Research Model

This study was designed to predict and apply influential factors affecting acceptance of big data system based on Davis (1989)'s technology acceptance model, the most famous one regarding new information technology acceptance. The model is most widely used and a proper theory in figuring out whether it is possible to predict new technology acceptance. Thus, the model is also suitable for this research that examines factors deciding acceptance of big data system.

<Figure 1> is a research model designed to conduct an empirical research about organizational environmental factors influencing intention to accept big data system. This research examines if environmental factors of adopters and characteristics of big data system have a direct influence on intention to use. We will also take a look at how parameters, perceived usefulness and perceived ease of use, affect intention to use.



<Figure 1>

3.2 Advancing Research Hypothesis

3.2.1 Adopter's Innovativeness

Adopter's innovativeness is the degree to which an individual unit of adoption is relatively earlier in adopting new ideas than other members of a social system (Gatignon, H. & Robertson, T. S., 1985). Innovators or early adopters are defined as one of the first people who embrace new products before most other people do. They have been constantly studied by researchers in the fields of communication, business studies, economics and psychology. This is because adopter's innovativeness has a significant influence on adoption of innovation and its speed when it comes to how easily and fast adopters, as consumers, accept new things (Midgley & Dowling, 1978).

Goldsmith and Hofacker (1991) also define innovativeness as intention to try something new. It is desirable to relate innovativeness to certain products as most consumer behaviors depend on certain situations according to them.

In this study, therefore, we chose adopter's innovativeness as an environmental variable of adopter's intention to use big data system. We considered adopter's innovativeness as a particular trait of technological innovation products and predicted that organizational innovativeness would have a positive effect on acceptance of big data system.

Research Hypothesis 1-1(H1-1): Organizational innovativeness will have a positive influence on perceived usefulness.

Research Hypothesis 1-2(H1-2): Organizational innovativeness will have a positive influence on perceived ease of use.

3.2.2 Organizational Slack Resources

Rogers (1993) concluded slack resources of organizations had an effect on their innovativeness through his research and demonstrated that organizations with slack resources were more likely to achieve innovation. Kim Boseung (2002)'s research also shows that organizations' slack resources are an important variable when they accept a new information system by proving slack resources of organizations have an influence on

CRM introduction in a significant way.

According to Fletcher et al (1997), slack resources of organizations are also related to the scale of organizations and can be defined as a degree of uncommitted resources – financial or human resources - available in organizations.

In this research, we chose slack resources of organizations as an environmental variable of adopter's intention to accept big data system since slack resources can be also used to introduce an innovative big data system.

Research Hypothesis 2-1(H2-1): Slack resources of organizations will have a positive influence on perceived usefulness.

Research Hypothesis 2-2(H2-2): Slack resources of organizations will have a positive influence on perceived ease of use.

3.2.3 Organizational Maturity of Information System

In their research, Grover and Goslar (1993) say organizations are more likely to have a high awareness of a new information system, adopt and spread it when an organizational maturity level of information system is higher. A high level of maturity means organizations have a high flexibility and ample information (Grover and Teng, 1993).

In general, businesses with more mature information system better understand information system and are well-prepared to share the knowledge within the groups (Kim Boseung, 2002). If the department in charge of information system in a company has a higher level of information technology and maturity than those in other companies, it would have less fear about new technologies and, furthermore, be able to accept them more aggressively (Kym, 1990).

Companies with more firm infrastructure of information system face less burden of new technology adoption and strategically make use of new technologies initiatively or in an appropriate time (Kim Jongmin, Kong Munsu and Kim Seongguk, 2000).

The same is true of big data systems. Therefore, maturity of information system was used as an environmental variable of adopter's intention to accept big data system in this study.

Research Hypothesis 3-1(H3-1): Organizational maturity of information system infrastructure will have a positive influence on perceived usefulness.

Research Hypothesis 3-2(H3-2): Organizational maturity of information system infrastructure will have a positive influence on perceived ease of use.

3.2.4 Perceived Benefits of Big Data System

Perceived benefits are advantageous results that enhance self-efficacy or provide values by making it easier to achieve superordinate goals or values (Gutman, 1982).

In marketing researches, consumers' perceived value has been considered important as it is closely related to consumers' purchase intention and purchase of products and services. Mark, H. et al (2007) explains, through research of e-Government service, perceived benefits and perceived usefulness are associated in a meaningful way.

In his research about online shopping, Forsythe et al. (2006) also shows perceived benefits have an effect on perceived ease of use.

Perceived benefits come from productivity enhancement, quality improvement, cost reduction, gain in market share, new market development and intrinsic and extrinsic rewards (Calantone et al., 1998; Davis et al., 1989; Lefebvre et al., 1995).

Big data system is expected to achieve a higher level of value than existing data

processing systems due to its relative advantages; a huge volume of data collecting; high velocity of data streaming and use; a variety of data processing including atypical data as well as stereotypical data; complexity of data processing and management.

Therefore, we supposed four perceived benefits, intrinsic to big data system, would be involved with acceptance of big data system in a significant way and chose perceived benefits as an environmental variable of adopters.

Research Hypothesis 4-1(H4-1): Perceived benefits of big data system will have a positive influence on perceived usefulness.

Research Hypothesis 4-2(H4-2): Perceived benefits of big data system will have a positive influence on perceived ease of use.

3.2.5 Relations among Perceived usefulness, Perceived ease of use, and Acceptance Intention

Previous studies have proved influences three major variables of the TAM – perceived usefulness, perceived ease of use, and acceptance intention – have on each other. Researches of existing information systems are antecedents of perceived usefulness and perceived ease of use according to Davis (1989). Many empirical researches are ongoing now in various fields such as Information system, e-commerce or mobile service to verify the relations among those three variables.

We have advanced the following hypothesis to examine the relations among perceived usefulness, perceived ease of use and acceptance intention.

Research Hypothesis 5(H5): Perceived ease of use will have a positive influence on perceived usefulness.

Research Hypothesis 6(H6): Perceived usefulness will have a positive influence on acceptance intention.

Research Hypothesis 7(H7): Perceived ease of use will have a positive influence on acceptance intention.

4. IMPLICATIONS AND CONCLUSIONS

Based on Rogers'(1993) Innovation Diffusion Theory, it is expected that there will remain maturity level of information system infrastructure, perceived benefit level of new technologies, and organizations' slack resources in their concern at an early stage when big data system spreads.

Therefore, it will be essential to secure link resources for new technologies, impart expertise about information systems and inform about benefits from the related technologies in advance in order to bring more organizations to big data system at the early stage of new technology acceptance. Also, basic research hypotheses about perceived usefulness, perceived ease of use and acceptance intention in the extended TAM will be considered meaningful. Previous researches of the TAM will be proved valid again.

This research provided a new research model that includes attributes of big data to analyze factors influencing acceptance intention of big data system. Accordingly, we will be able to suggest a national level of policies and guidelines for a successful introduction of big data system and its growth. Furthermore, it is important to help organizations achieve a proper level of maturity in their information system infrastructure, procure

slink resources for system build-up, and understand benefits from big data system in advance. Lastly, this study is expected to be used as basic reference data in raising users' awareness about big data system and drawing more organizations to big data system.

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