An Information Technology Diffusion Process by Optional Adoption Decision Making Models

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Abstract: *The Information technology are easily implemented and introduced to the organization clearly. Some information technology is very difficult to run. It has been the cost increases due to run failure. It is not known for sure why this phenomenon occurs clearly. However, the success of IS implementation in many studies argue that rests on the adoption decision of new information technology individual level. The purpose of this study tested to Rogers' diffusion theory optional adoption decision which accounts for an important part of the model is described by new information technology adoption. This process is utilization processes of individual levels in end-user computing environment that purpose. In this study, we assume that the success of information system implementation depends on the adoption decision of the individual level of new information technology. The optional adoption decision model describes the innovation adoption decision-making process within the social system. The purpose of this study is to investigate and analyze the empirical data about how you can describe the new information technology adoption decision-making process of individuals under the end-user computing environment.*

Keywords: *Diffusion theory, Optional models, Management architecture, Adoption decision model.*

1. INTRODUCTION

Recently, some researchers have suggested the answer of the diffusion theory to information system implementation. However, in spite of the long history as a theory established in other fields, this theory is a need to study closely whether the need to test applicability in the management information systems field. The major research models of information system implementation were issued to research the development and the classification and the direction of research [1, 5]. But these cannot make a specific conclusion to manage the introduction of information technology clearly. Research results cannot tie the relevance to each other. The theory development is also insufficient. Therefore, it is need to powerful theory that can provide instructions to the organization manager. Brancheau and Wetherbe have examined the major issues targeted at executives and general managers in charge of information systems. The activation of the utilization in information technology and organizational learning and end-user activation of computerized management can to point out important managerial issues. They were pointed out that take activation of organizational learning of information technology and end-user computing as an important management issues. Zmud also published a study in management science [8]. He suggested the spread of information technology in the organization. And he suggested best assessment and recognition methods of the information systems department where innovation is important to be aware of activities. Therefore, the purpose of this study is intended to the empirical analysis the adoption personal decision process of new information technology level under the end-user environment. This can be applied to diffusion theory by Rogers. This will be building the foundation for future studies of information system implementation. This result will be able to provide an administrative guidance. Also, this result will be provided spreads of information technology in the organization to manager [14].

2. RELATED STUDIES

Many researchers were applied optional adoption decision model in organization [10, 11]. Recently, two researches have been announced for to verify the validity of this model. Bach examined the roles of interpersonal communication in diffusion process [1]. Rogers suggest that the people are adapted to the adopter easily. Bach did not support this conclusion.

The second was the research of Brancheau and Wetherbe [2, 3]. They examined the diffusion of the spread sheet software in finance/accounting department of several organizations. There was some test for Rogers' theory. They were trying to test utilizing any information transmission of path individual personal properties affecting the adoption decision. Their research supports the Rogers model generally. But, in the use of information pathway had some inconsistencies. The mass-media usage expects high percentage in knowledge step. The interpersonal channel was dominant in knowledge and persuasion step. These results have been enhanced because interpersonal relationship in organization. The previous researches did not try the test about the impact on the property of innovation and applicability of Rogers' model. In this study, we try to measure the variable that contains these points of Brancheau and Wetherbe using different ways.

3. INFORMATION SYSTEM IMPLEMENTATION MODEL

The diffusion is "innovation is a process that will be spread over time among the members of the social system". The innovation mean to refer to members of the idea, practice or object that can be recognized as 'new' [14]. The diffusion theory has been developed in several disciplines. The first research in this area was attempted by the anthropologist. [13]. Sociologist Gabriel Trade in his book discussed in some ideas that made a significant contribution to diffusion theory today. His agriculture sociology, education, medical sociology, geography was a substantial contribution to the development of this field. Two diffusion models have been developed in marketing field. Dodd and Fourt and Woodlock were suggested non-imitation model.

Table1. *The studies of information system implementation*

|	Method	Sample	Fields
Chan	Survey	164	Impact on information system and corporate performance through relationship between corporate strategy and Information system strategy
Harris	Survey	92	Linkage of organizational factors and information system performance
McFarlan	Interview	15	Problem of information systems planning and information system performance
McKinsey	Survey	36	Linkage of information systems planning and information system performance
Prekumar & King	Survey	249	Organization property and information system planning
Premkumar	Survey	249	Relationship of information system planning and system department roles
Pyburn	Case study	8	Organizational factors and information system planning performance
Raghunathan & King	Survey	140	Information system planning and Information system performance
Sullivan	Interview	37	Linkage of information system usage and planning methodology
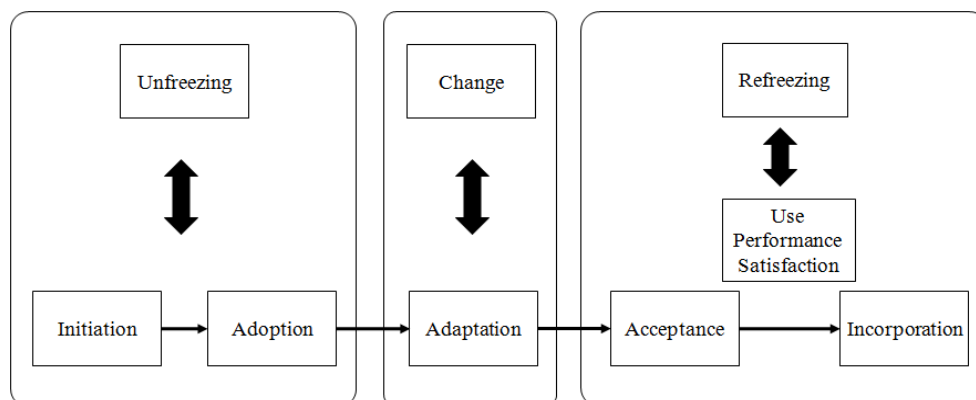
Fig1. *Information system implementation model*

Rosers was presented diffusion model by incorporating theoretical developments in various fields of study for first time. Through the updated work, it was published a book called "Diffusion of Innovation". It has emerged as the dominant theory explaining the diffusion process of recent innovations. Rogers's diffusion theory is largely composed of a collective, authority, optional, contingent, adoption decision model. Among them, interest of this study is optional adoption decision model that describes the decision making in individual level. Kwon and Zmud assert to be impossible the formation of theory that can accommodate and explain the results derived from different research

methods without common perspective. It was stressed that very difficult to develop guidance on the practical useful management by the absence of these theories. It is defined as the process of information system implementation by the administrator for efficiently diffusing in the information system organization. They presented a model of Fig. 1. [17].

The model is many steps as shown in Fig. 1. The research of Kwon and Zmud started from 3 steps model (Initiation→Adoption→Implementation) by Pierce and Delbecq published in Academy of Management Review. The Implementation step extended to 4 steps. It connected with IS implementation model. Also 6 step models connected with 3 step model of Lewin. Initiation of step is step of pressure change in organization. Pressure change is need-pull or technology-push. The adoption step is step of adaptation efforts to change. And this step is procedure to develop and to install the information system. The acceptance, use, performance, and satisfaction steps are corresponds to the decision making process of user focus. The final step is the Incorporation process of organization-wide. The new information technologies are settled down over the course of that day-to-day organization. Kwon and Zmud were investigated five groups of the factors affecting the success of the implementation and diffusion with implementation model.

- Individual factors: jobs tenure, cosmopolitan, education, and organizational role involvement.

- Structural factors: specialization, centralization, formalization, and informal networks.

- Technological factors: compatibility, relative advantage, and complexity.

- Task-related factors: task uncertainty, autonomy, responsibility, variety, and feedback.

- Environment factors: heterogeneity, uncertainty, competition, concentration/ dispersion, and inter-organizational dependence.

The model of Kwon and Zmud is derived by diffusion theory. This model is to understand the diffusion process of new information technology organization. Thus, it is required detailed discussion to explain the determining new information technology in EUC environment.

4. DESIGN OF OPTIONAL ADOPTION DECISION

4.1. Analysis Step

Here is explained that the optional adoption-decision model is the most appropriate model for understanding introduction and integration of technology in organization. The points of discussion have at the following three. The Kwon and Zmud model is similar to authority decision model of Rogers. Mainly, their interesting are in entire organization. The adoption unit is the organization also. Their model reflects the decision-making process of individual in organization. However, it is not enough to explain the decision-making process of individual. Also, it is not enough to answer the following some questions.

- Who is person or group that to lead acceptance new information technology for end user?

- What is the way that end user obtain new information technology?

- What information gives the most impacts to the end-user?

- What is the standard that end user evaluate new information technology?

Manross and Rice pointed out that should be considered by separating the adoption decision of member and adoption decision-making process in organization. Their idea is based on the fact that organization and individual are aware of the benefits of innovation differently. The evaluation criteria and information source are various. The organizational factors are very various also.

4.2. Decision Making Step

The weakness of Kwon and Zmud model is that personal decision-making process is displayed after a decision-making process in organization. The individual decision-making process is responding to the adoption decision of organization. In some cases, people form their attitudes to new technology on the basis of information from the mass media or peers before the adoption decision of organization. The individual decision-making process may be occur at the same time, earlier or after to decision-making process in organization. In particular, previous many researches were reported that the individual decision-making process is composed with the same time or earlier than determined by the official

authority on end user computing environment. The individual adoption decision process has a very important role that can make the decision-making without intervention of official authority in organization. This personal decision-making process is a similar model of dealing with the Rogers' optional adoption decision model.

Here utilize two models by Rogers. First, the model utilizes the decision process by organization authority. Then, it considers the decision-making process of individual level. It develop model which can describe any condition between them. Prior to the development of this model, it is important that the optional adoption decision model reveals how can be applied to end-user computing environment. It determines the relationship of optional adoption decision model and what part needs to be corrected.
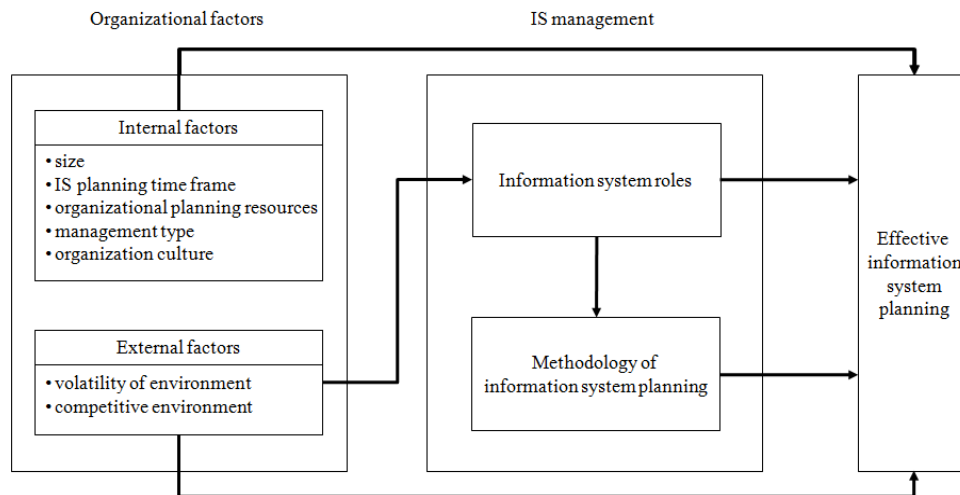

Fig2. *The relationship between information system implementation and organization steps*

5. IMPLEMENTATION OF MODLE

Here describe a detailed test method and method of data collection. Also, it presents an analytical method for each problem. The data collected through an interview from sample of potential adopters. Specific contents are treated in detail in the following three areas. This paper discussed an adoption decision process of new information technology by individuals in end-user computing environment. Therefore, the target of data collection consisted of relatively independent in decision-making. The sample form is to use simple random sampling method by a random number table. The data collection is progressed through individual interviews. We explain research purpose to selected participants by mail and we will plan interview schedule individually using telephone. Interview questions configure by three steps. Step 1, we explain the interview purpose and easy-written Rogers model to participants. Step 2, we explain the decision-making process of up to adopt new information technology by participants, or to reject. Step 3, we answer the specific questions in order to clarify the contents described in step 2. The specific questions in step 3 are to determine the temporal sequence of events, and are intended to identify the information source. The optional adoption decision model has to determine whether this applies to individuals who describe adoption decision-making process of new information technology in end-user computing environment of organization. The analysis has to proceeds the following two tracks.

5.1. Information Sources Track

- The cosmopolitan source has relatively important role in knowledge step?

- The local source has relatively important role in persuasion step?

- The cosmopolitan source has relatively important role to the leading adopters in knowledge step and persuasion step?

- The local source has relatively important role to the delay adopters in knowledge step and persuasion step?

5.2. Attributes Of Innovation Track

- What are the attributes of the technologies that use people to assess the new information technology?

- Can explain that these properties are individuals to adopt new information technology?

Table2. *The correlation of situational variables*

Control variables	Situational variables	Plan of information system
Future information system roles	Organizational culture Decision-making period	Target level
	Management type Decision-making period	Management level
Present information system roles	Not applicable	Target level
	Not applicable	Management level

The methods of data analysis are divided into the following two tracks. Here is reveal the research questions again, and explains the operational definition of methods and variables. Here describes the used techniques to analyze the each research problem.

(Problem 1) cosmopolitan sources are an important role than local source in knowledge step, and local source is an important role than cosmopolitan source in persuasion step?

(Problem 2) cosmopolitan sources are an important role than local source to early adopter in knowledge step and persuasion step?

The operational definition of the cosmopolitan source is defined as an information source that respondent has been found outside. For example, newspaper, TV advertising, magazine, products magazine, vendor, external association, external relationship, company and more. The operational definition of the local source is defined as an information source that respondent has been found inside. For example, related department, internal association, internal relationship and more. The independent variables are knowledge step and persuasion step. The following equation, the dependent variables are used to calculate the ratio of the importance of cosmopolitan and local source by each answer in knowledge step and persuasion step.

$$X = \frac{(\text{importance of the cosmopolitan source})}{(\text{importance of the local source})}$$

(Problem 3) People are evaluating the new information technology using what attributes?

(Problem 4) It is possible to explain the new information technology by these attributes?

The analysis method of (problem 3) and (problem 4), it is similar to the method described in (problem 1) and (problem 2). In order to clarify the attributes of the new information technology or innovation, we collected the data using modifying a part of Moore and Benbasat questionnaire. Questionnaire was developed. We used this questionnaire to validity analysis and reliability analysis through respondent. We collected the data for test of each question to (problem 1) and (problem 2) with respondents interview. Also to clarify the innovation attributes of (problem 3) and (problem 4), here developed a separate survey. But, the development of interview questions and survey questions will not be easy. Thus, we will test carefully the empirical literature of Rogers' model and the literature with the properties of information technology. And we developed the question instrument for purpose of this study.

Table3. *The factor analysis of organization*

Variables	Factors
Internal factors of organization	Size
	Information system planning time frame
	Organizational planning resources
	Management type
	Organization culture
External factors of organization	Volatility of business environment
	Competitive environment

Table4. *The relationship between independent variables and dependent variables*

Independent variables	Dependent variables	Result and property
Internal factors of organization	Information system planning	Accept, organization culture, Management type
External factors of organization	Information system planning	Reject
Internal factors of organization	Information system roles	Accept, organization culture, Management type
External factors of organization	Information system roles	Reject
Information system roles	Information system planning	Accept
Information system roles and planning methodology	Information system planning	Accept

6. CONCLUSION

Recently, end-user computing environment is spreading by the increase of hardware performance and the emergence using software. The end user performs independently multiple decisions related to their computing environment. This is running without the organizational involvement by changes of the computing environment. In some cases, end user does not follow the selected decision in organization to the user's own judgment. Also, there appears a tendency to ignore. Sometimes, the development of instrument may be achieved by hard work alone. However, there are many difficulties to the applicability as compared to the time effort. It is also accompanied by validity and reliability problems. Therefore, it is necessary to help researchers who have a lot of efforts in information system implementation. Future studies have to advance through many discussions carefully.

And, in order to prevent the budget waste and in order to maximize the effectiveness of end user computing in organization, it is necessary to analyze the decision-making process of the individual carefully. There was a lot of existing research for effective implementation of information system. However, it has focused the interest only to the process in most organization. Therefore, this is not sufficient to explain the decision-making process of individual in end user environment. Therefore, the development of model is required to explain the implementation of new information technology under end-user environment. There was such attempt in some research literature. The optional adoption decision model of Rogers was dominant theory that has been cited in their research. Rogers' model is the end-user computing environment has been developed in other fields. Therefore, it must be test before application to model development. The previous studies have attempted to this test also. However, they were test only some part as needed.

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