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The Intention of Switching in System Maintenance Using Migration Theory

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Abstract: This study investigated the switching intention factor of infra system maintenance and the study model was created by advanced studies to meet the purpose of this study. The study model used the push-pull-mooring model and the empirical analysis was conducted for push factor, pull factor and mooring factor by moderating variables of switching barrier (cost) for dissatisfaction and attractiveness of alternatives. To the empirical analysis, IT and its related fields workers had conducted a survey and the survey results had statistical analysis by SPSS and AMOS as analysis tools. The structural equation model was used to test the hypothesis and the relations between factors were analyzed and verified its effects. The result of this study has understood the concept of push-pull-mooring model and verified the significant effects of switching intention for system maintenance in PPM Model. It is considered to contribute its business with understanding of switching intention to other service company.

Key words: System maintenance, switching, intention, migration theory, PPM Model, Korea

INTRODUCTION

The words system maintenance is not a new term today. From the start of the IT-based industry, it can be said that it is a part of the industry that is deeply involved in our industry. The rapid development of artificial intelligence is bringing about changes in the industry in general and the question of how to find a job in the Fourth Industrial Revolution is one of the worries for an IT worker at present. A variety of information and experiences is one of the key factors that can have a great impact on service continuity and service quality.

This study verified what correlation each variable factor of PPM Model has in maintenance conversion through empirical analysis. The transition from individual maintenance to integrated maintenance may have the right function on customers who receive the service such as cost saving and management efficiency but has adverse effect such as a lot of cost increases, poor management due to contract failure and learning costs for new system maintenance companie's technical investment in many fields.

Currently, maintenance is done from the point that a new IT-based infrastructure is built taken over in general, at the point when a company that builds an infrastructure performs maintenance work during the warranty period and selects a separate maintenance company and entrusts maintenance work to that company at the end of the warranty period. In this situation, this study is going to analyze with what factor the customer changes into a new maintenance company when the contract period with the existing company is completed and the new company is re-selected.

Literature review

System maintenance

Concepts and types of system maintenance: According to Jeongmook (2014), the concept of maintenance means solving by service companies, though all the activities necessary for the operation and improvement of the information system such as changing the function, adding, supplementing, improving the usage method and documenting in the information system operation process are ordering of maintenance. It is important not to end the initial installation and construction of the system infrastructure but to continue to provide stable operation even after construction and it is required to accurately resolve the system infrastructure errors that occur during use and to continuously manage the latest version of the operating system for smooth performance management.

In IEEE 1219, types of system maintenance types are categorized as corrective maintenance, perfective maintenance, adaptive maintenance and emergency maintenance. Adaptive maintenance, complete

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maintenance and modification Maintenance are equivalent to ISO/IEC 14764 but IEEE 1219 urgent action means an activity that corrects unforeseen errors that occur while using the infrastructure system.

The International Software Benchmarking Standards Group (ISBSG) an international software benchmarking standards group that provides and supports practical development data such as system development is divided into four types of system maintenance; Maintenance, enhancement, operation and support.

The United Kingdom Software Metric Association (UKSMA) divides system maintenance activities into Support and Maintenance, like the ISBSG. Maintenance is defined as perfective/preventive maintenance and corrective maintenance without function changes and adaptive maintenance with function change.

In the guide of current domestic system business, maintenance of system referring to maintenance type is defined as partial change of the functions of the system developed or improvement of method of using and largely divided system maintenance and redevelopment type as defects repair, maintenance and re-development. Among them, maintenance is classified into two types of maintenance and service maintenance and service maintenance includes complete maintenance, application maintenance and repair.

Necessity of system maintenance: Unlike system development, maintenance work can be said to be performed mainly by the understanding of the operator. Ongoing maintenance and management activities for the infrastructure system are required to understand the work and the revised security activities are conducted based on the understanding of the system. Unlike, the new system development project, this is the reason why we cannot easily participate in maintenance projects without a wide range of information.

Maintenance researchers have also argued that, infrastructure maintenance costs are between one-third and three-fifths of the cost of system development in comparison of the system development. This means that systematic maintenance management is important. If a failure occurs in an infrastructure system operated by many companies and such failure cannot be detected immediately, the image loss of that enterprise is rapidly increased. In addition, these obstacles and defects will have a significant impact on the image of the company and on the customer's credibility as well. As a result, we can easily see that many companies are concentrating on systems that customers can directly respond to it such as internet business (Lim and Jung, 2004).

System maintenance tasks will increase in the future because of the following reasons. First, unlike the development process, the system maintenance process takes more manpower and costs. Second, current business requirements are constantly changing and system maintenance tasks are increasing more and more. Third, infrastructure system maintenance activities require more expertise than the development of similar functions in the early stages of development and often require a lot of maintenance costs. Fourth, the system maintenance cycle is a process that takes a lot of time from the stability of the system and requires systematic management plan as it is a long period. Fifth, lack of awareness and management of infrastructure system maintenance can lead to a lot of loss to the enterprise.

Migration theory and PPM (Push-Pull-Mooring) Model: Migration theory is a theory that explains the movement of people between two different places over a period of time, using push factors and pull factors. Push factors are the factors that enable us to move from the original settlements to the new ones and the pull factors are related to the settlements that lead to the new ones (Bansal *et al*., 2005; Lewis, 1982). Moon (1995) argues that, the push and pull factors cannot adequately account for the consumer's transition behavior and insists on social and personal circumstances and adds a mooring factor that either hesitates or distracts the movement (Lewis, 1982).

In a study by Bansal *et al*. (2005), the PPM Model was applied to identify the service provider switching behaviors of consumers using car repair shops and beauty salons and verified that the push, pull and mooring factors had a direct effect on the conversion intention and showed that the interaction between the mooring effect and the push effect had a significant effect on the conversion intention.

Hsieh *et al*. (2012) studied on an online service blog, the relationship between precedence factor of the intention to switch to the SNS and the conversion intention and behavior. As a result of analyzing 319 subjects both push and pull had significant positive effects and the mooring effect had a negative effect on the conversion intention and the interaction effect between push and mooring had a significant effect on the conversion intention (Hsieh *et al*., 2012).

This study could check the possibility for expansion and application of the PPM Model through the various studies that explain the decision of the service change of the consumer and the user and the intention of the individual turnover. When generalizing the aspect that both human settlement and supplier turnover are conceptualized as similar movements and risk aspect by both decision making of emigrants and that of the person in charge of purchase department, we can reason that applying a PPM Model for the process of changing buyer's existing suppliers is reasonable (Jihyeok *et al*., 2009).

MATERIALS AND METHODS

Research model and hypothesis setting:

- H_1: human factors will have a significant effect on dissatisfaction factors
- H_2: system factors will have a significant effect on dissatisfaction factors
- H_3: material factors will have a significant effect on dissatisfaction factors
- H_4: the unsatisfactory factor will have a significant effect on the intention to switch
- H_5: the reliability factor will have a significant effect on the attractiveness factor of the alternative
- H_6: the service quality factor will have a significant effect on the attractiveness factor of the alternative
- H_7: the diversity factor will have a significant effect on the attractiveness factor of the alternative
- H_8: the attractiveness factor of the alternative will have a significant effect on the conversion intention
- H_9: transaction costs will do control action
- H_{10}: learning costs will do control action
- H_{11}: dissatisfaction and attractiveness of alternatives will affect on the intention to switch to a new company (Fig. 1)

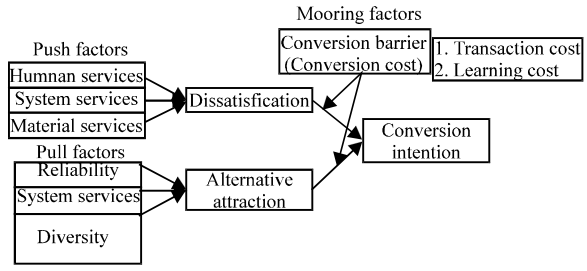

Fig. 1: Research model

RESULTS AND DISCUSSION

Empirical analysis

Characteristics of the sample: In order to verify the factors affecting the conversion intentions of the existing suppliers, this study selected various respondents as the subjects such as IT purchasing personnel and IT related workers. A total of 360 questionnaires were used to remove unreliable responses and a total of 335 questionnaires (285 males and 50 females) were used for final analysis.

Exploratory factor analysis: SPSS 18 was used for exploratory factor analysis and the data analysis were determined considering the criteria of more than 1.0 for eigenvalues of over 0.60 load in each factor, items of over 0.5 communality. In this research, exploratory factor analysis, diversity 1, reliability 4, 5, attractiveness 1, 2, conversion intention 5, material service 1, 2, 5, human service 4, 5, system service 4, 5, service quality 1, 2 and 3 items were removed as they are not tied together.

In order to check the reliability of the measurement items used in this study, the Cronbach-a coefficient was checked by exploratory factor analysis. Cronbach alpha is used as an index to measure the degree of internal consistency of a measurement item and is usually a suitable method for reliability verification because it mostly produces conservative figures.

As a result of the analysis, Cronbach's alpha coefficient of the measured items was 0.7 or more securing reliability.

Confirmatory factor analysis: To confirm the validity of the variables used in the research model, discrimination validity, convergent validity and conceptual validity were verified through confirmatory factor analysis. The discriminant validity means that there is no similarity or overlap between the concepts composed of two or more latent variables and the convergent validity means that the latent variable explanatory power validity of the observational variables constituting the variables. Concept validity is a validation test that confirms if the observational variables that make up the variables in the confirmatory factor analysis are created with proper definitions and concepts. The conceptual validity is judged to be valid if the standardized coefficient value is 0.5 or more, the convergent validity is at least 0.6 of concept reliability, the variance extraction index (AVE) is 0.5 or more and the discrimination validity is greater than the square of the correlation coefficient in the value of variance extraction index.

Table 1: Cronbach's alpha

Dissatisfaction	Diversity	Learning costs	Reliability	Transaction cost	Conversion intention	Alternative attraction	Material service	Human Services	System services	Service quality
0.945	0.919	0.897	0.915	0.877	0.827	0.848	0.858	0.87	0.927	0.907

Table 2: Model suitability of confirmatory factor analysis

χ^2 (p)	χ^2/df	RMSEA	GFI	AGFI	NFI	CFI
p≤0.05~0.1	1.0≤χ^2/df≤3.0	≤0.05~0.08	≤0.8~0.9	≤0.8~0.9	≤0.8~0.9	≤0.8~0.9
804.429 (p = 0.000)	2.021	0.055	0.863	0.83	0.907	0.95

Table 3: Reliability of confirmatory factor analysis

Variables	Dissatisfaction	Alternative attraction	Conversion	Human services	System services	Material service	Diversity	Reliability	Service quality
CR	0.943	0.844	0.816	0.869	0.920	0.857	0.916	0.908	0.899
AVE	0.768	0.646	0.528	0.690	0.794	0.666	0.732	0.766	0.747

Table 4: Feasibility of confirmatory factor analysis

Variables	Reliability	Dissatisfaction	Attraction	Conversion intention	Human services	System services	Material service	Diversity	Service quality
Reliability	0.875								
Dissatisfaction	-0.135	0.876							
Attraction	0.564	0.094	0.804						
Conversion intention	0.109	0.227	0.380	0.727					
Human services	-0.122	0.774	0.032	0.174	0.830				
System services	-0.132	0.802	0.035	0.200	0.795	0.891			
Material service	-0.101	0.753	0.161	0.101	0.671	0.659	0.816		
Diversity	0.577	-0.192	0.479	0.251	-0.225	-0.273	-0.272	0.855	
Service quality	0.792	-0.166	0.578	0.121	-0.170	-0.192	-0.196	0.796	0.865

Table 5: Result of hypothesis verification

Hypothesis	Estimate	SE	CR	p-values	Label
Dissatisfaction					
Human services←	0.268	0.078	3.429	***	Adopted
System services←	0.412	0.071	5.816	***	Adopted
Material service←	0.389	0.066	5.865	***	Adopted
Alternative					
Trust←	0.204	0.098	2.08	0.038	Adopted
Diversity←	0.044	0.11	0.399	0.69	Rejected
Service quality←	0.377	0.173	2.183	0.029	Adopted
Conversion intention					
Dissatisfaction←	0.16	0.046	3.461	***	Adopted
Alternative attraction←	0.355	0.061	5.806	***	Adopted

The goodness of fit index of research model was measured to be p = 804.429 (p = 0.000), /df = 2.021, RMSEA = 0.055, RMR = 0.07, GFI = 0.863, AGFI = 0.83, PGFI = 0.693, NFI = 0.907, CFI = 0.95, IFI = 0.951. As whole items show satisfactory level within threshold criterion, it is judged that overall research model is suitable (Taylor and Todd, 1995; Tomarken and Waller, 2003).

The results showed that, the AVE value was greater than the latent variable and the correlation coefficient between the other variables, so, the discrimination validity of measurement tools used in this study was secured (Table 1-4).

Hypothesis verification: Hypothesis test results showed that diversity→alternative attractiveness hypothesis was rejected and all other hypotheses were adopted (Table 5). This study also conducted a control variable analysis to see the difference in intention to switch system maintenance companies according to transaction costs and learning costs. Multiple-Group Structural Equation Modeling (MSEM) was also executed to see the differences between two groups of the one with low transaction costs 259 and high 76 and low 56 and high 279 learning costs group according to the transaction costs and learning costs recognized by respondents and the results are as in Table 6 and 7, respectively.

The results of the multiple group analysis show that the difference between the transaction costs and the learning costs is χ^2 = *70.009, p = 0.000 and χ^2 = 40.338 and p = 0.079 which is statistically significant because the p value is smaller than 0.1.

In the group with high learning cost, it shows the degree of difficulty of system maintenance and when the maintenance difficulty is low, the reliability is not considered as important but when the difficulty is high, the trust is more importantly recognized. In particular, the reason why service quality is rejected when the degree of difficulty is high is that the influence of reliability is the most important factor among the attractiveness factors but seeing the case of system maintenance of cost, diversity is rejected for the above reason and further service quality is not important. The small cost is a simple and repetitive task, so, we can see that the human network or the service human factor do not have influence. When the cost of system maintenance increases, the human network or service quality again acts as an important factor, resulting that the influence of cost is very high.

Table 6: Result of multi-group analysis of transaction costs, learning costs

	Transaction cost		Learning costs	
Division	Non-constrained model	Constrained model (Structural weighted model)	Non-constrained model	Constrained model (Structural weighted model)
χ^2	1360.382	1430.391	1516.137	1556.475

χ^2 difference; 70.009, 40.338, χ^2 p = 0.00, 0.079

Table 7: Result of analyzing transaction costs individual sample

	Group with low transaction costs			Group with high transaction costs		
Variables	CR	p-values	Label	CR	p-values	Label
Dissatisfaction						
Human services	0.216	0.047	Adopted	0.443	***	Adopted
System services	0.401	***	Adopted	0.441	***	Adopted
Material service	0.422	***	Adopted	0.321	0.002	Adopted
Alternative attraction						
Trust	0.407	***	Adopted	0.635	0.041	Adopted
Diversity	0.015	0.862	Rejected	2.275	0.005	Adopted
Service quality	0.233	0.125	Rejected	-2.403	0.019	Adopted
Conversion intention						
Dissatisfaction	0.091	0.088	Adopted	0.325	***	Adopted
Alternative attraction	0.428	***	Adopted	0.236	0.02	Adopted

Table 8: Result of analyzing learning costs individual sample

	Group with low learning costs			Group with high learning costs		
Variables	CR	p-values	Label	CR	p-values	Label
Dissatisfaction alternative attraction						
Human services	0.055	0.653	Rejected	0.337	***	Adopted
System services	0.516	***	Adopted	0.373	***	Adopted
Material service	0.34	0.004	Adopted	0.403	***	Adopted
Dissatisfaction alternative attraction						
Trust	-0.363	0.302	Rejected	0.179	0.056	Adopted
Diversity	0.014	0.93	Rejected	0.084	0.585	Rejected
Service quality	1.136	0.005	Adopted	0.28	0.195	Rejected
Dissatisfaction						
Dissatisfaction	0.288	0.041	Adopted	0.132	0.005	Adopted
Alternative attraction	0.365	0.003	Adopted	0.32s	***	Adopted

Having checked that the difference between the low and high transaction costs was significant, this study executed a difference analysis about hypotheses between each group. The results of the individual sample analysis are summarized in Table 8 and when looking into the result of analyzing individual samples, there was much difference in result of verifying hypothesis of pull factor. In a group with low transaction costs, only the trust variable which is a pull factor, affects the attractiveness of the alternative. In the high transaction cost group, all hypotheses were adopted.

This phenomenon will require further research in the future. In the low learning cost group, only service quality affects the attractiveness of the alternative. This study could confirm the result that in the group with high learning cost only the trust give influence on the attractiveness of the alternative.

CONCLUSION

This study conducted an empirical study on the factors influencing intention to switch system maintenance. There are a lot of existing researches about the intention to switch from the software center to the management plan of the maintenance. However, this study seems to be the first to study the intention of switching to system maintenance. Though the business activities were done only with conviction on why conversion intention occurred and operated, this study executed empirical analysis and statistical verification by scientifically arranging it and through PPM Model of migration theory. This study has identified the system maintenance characteristics, designed the research model based on the previous studies related to the existing migration theory and the PPM Model and verified the hypotheses of the research model through migration theory. In the hypothesis test, diversity was rejected in the attractiveness of the alternative and this implies that diversity such as human trust is very important in project and system development, however, this kind of diversity is not so great in the field of system maintenance and in the case where risk is not considered to be great, so, the companies that are sincere in its main profession, than human network, would be preferred.

This study reflected push, pull and mooring models as dissatisfied with the conversion intentions between the system maintenance purchaser and existing suppliers, reflecting the attractiveness of the alternative. That is the purpose of this study is to suggest a better solution to various factors influencing the partial conversion intention to reduce the share of transactions with existing suppliers and by applying the PPM Model of migration theory to the conversion relationship between the system purchaser and the existing supplier and suggested the problem and method through empirical verification. This study suggested human, material and system services as for the main variables of push factor which is dissatisfaction factor that system using companies push away and alienate the existing buyer to switch from the existing maintenance vendor to the other maintenance vendor. This study explained that the push factor has a negative effect on the overall conversion intention of the purchaser regarding the maintenance relationship with the supplier. This study suggested a pull factor that the supplier attracts the buyer as for another factor influencing the conversion intention of the existing supplier on the purchaser. Also, this study suggested the reliability, service quality diversity benefit as for a pull factor influencing the conversion intentions of the existing suppliers of the purchaser and on the other hand, reducing the proportion of traders to existing suppliers and allocating a little more to other suppliers is reflected as a mooring factor that strengthens or makes the conversion intention more hesitant. This study explained that in the psychological aspect of maintaining the current state among mooring factors and that the influence of the buyer's conversion intention to the existing supplier is influenced by the recognition of the transaction cost and the conversion cost of the learning cost. On the other hand, the analysis result of the influence of the buyer on the conversion intention in trms of the transaction cost of the existing supplier in the push, pull and mooring factors is summarized as follows.

First, in view of push factor, human services, material services and system services of low transaction costs group all affect on dissatisfaction. Also, the group with high transaction costs affects on transaction costs. Therefore, transaction costs in system maintenance are also influential on the conversion intention of existing suppliers.

Second, in terms of pull factors, diversity and service quality in the group with low transaction cost are not enough to attract alternative attractiveness. For low maintenance costs or low importance of system maintenance, diversity and service quality may be considered to have little impact on the transition from existing suppliers to other suppliers. That is it can be said that the purchasing company can easily switch to another company because the transaction cost is low. In a group with high transaction costs, all of them can be said to have an impact. Diversity, service quality and trust affect the conversion intention of other vendors to switch to maintenance and the need for technology. In other words, although the transaction cost is high, they cannot easily replace companies which affect the importance of the system.

Dissatisfaction and attractiveness of alternatives can be said to affect the conversion intention of the maintenance company in the low transaction cost group.

The results of analyzing the influence of the push, pull and mooring factors on the intention to switch from the existing supplier in terms of learning cost are summarized as follows.

First in the group with low learning cost, the human service has no effect on dissatisfaction and both material service and system service affects dissatisfaction. Also the groups with high transaction costs affect on it. Therefore, it can be said that learning costs in system maintenance are also influential on the conversion intention of existing suppliers.

Second, pull factor is not significant for reliability and diversity in low learning cost group and service quality affects attractiveness of alternative. It is considered that for low maintenance costs or low importance of system maintenance, reliability and diversity have low impact on the transition from existing suppliers to other suppliers. Reliability only affects groups with high learning costs. It can be said that diversity and service quality can be said to be influenced by other companie's conversion intention to switch to other companies for the necessity of maintenance importance and technology. That is dissatisfaction and attractiveness of alternatives affect the conversion intention of the maintenance company with low transaction cost group. Even groups with high learning costs can affect their existing maintenance conversion intention.

LIMITATIONS

The limitations of this study and future research directions are summarized as follows. First, this study fully considered the various factors that affect the conversion intention of customers to a limited extent. However, it was not possible to confirm whether the

difference in reliance on suppliers affects the intention of conversion intention by rejecting the disclosure criterion on the selection of the questionnaire respondents.

Second, as a study that measured the conversion intention of the buyer to the supplier for the company currently having maintenance, this study measured the conversion intention factors in the future.

Third, this study selected a sample for various related industries in order to minimize influence of various variables affecting the conversion intention of the existing suppliers and analyzed the data without identifying the supplier's location of buyer.

RECOMMENDATIONS

So, in future studies, it is necessary to consider the importance of system maintenance of customer maintenance department and maintenance supplier for more accurate analysis. Therefore, in future research, it will be necessary to conduct a comparative analysis of past conversion behavior factors and future conversion intention factors by examining what kind of problems or what kind of influences have been switched in the past.

So in the future research, it will be necessary to try to identify the difference of the new characteristic variables that can affect the conversion intention of the existing maintenance company by grouping similar related industries and the study considering the difference in supplier's conversion intention upon the size of maintenance supplier.

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