The Conceptual Cultural Model of Information Technology Transfer*

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Abstract

Business organizations suffer from transferring information technology(IT) into practice. If the problem is solely an technical issue, the strategy to solve the problem is assumed to be identical regardless of the cultural differences of the organizations. Many studies, however, indicated that the cultural differences between organizations were attributed to the differences of championing behaviors in the organizations. This study develops the cultural model of IT transfer from the well developed countries to the less developed countries. It is assumed that the outcomes of IT systems are affected by the cultural sets, technology acculturation, and national technology infrastructure. This study examines the effects of cultural sets and technology acculturation on the outcome of IT systems, however. The analysis results show that technological acculturation has strong relationship with the individual IT outcomes and the cultural sets. The cultural sets, however, did not show any significant relation with the individual IT outcomes in the context of the structural model even though the correlation between the cultural sets and the IT outcomes were relatively high. Thus, it is considered that the interaction between the technological acculturation and the cultural sets might interfere the relations.

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Key words : IT transfer, culture, technological acculturation, structural equation model

1. Introduction

In many countries, organizations experience difficulty and even failure in transferring information technology(IT) into practice. This problem is even more severe in developing countries[1, 12]. This is because that much of the technology designed and produced in developed countries culturally-biased in favor of Western social and cultural systems.

IT is viewed widely as a potentially powerful enabler of process design in business. Transferring technology developed in one cultural area involves more than merely providing instruction about the technical aspects of using the equipment. If the culture has no impact on transferring IT, it means that all firms face identical problems world-wide and therefore the nature of championing behavior required to overcome these obstacles is assumed to be hypothesis holds that members of firms in different parts of the world act differently because they hold different cultural values. It involves the intricate relationship between people and machines. And, people bring what can be regarded as baggage - they come to their jobs with specific cultural knowledge about how the world works, how their job works, and the expectational boundaries of their employees/employers. These beliefs, attitudes, and expectations give their lives meaning within the context of their social and cultural environment. The acceptance of technology transfer involves communication and cooperation from various levels of the receiving organization. The culture of the receiving organization may have forms that resist the transformations that have to take place before a successful IT transfer.

While considerable research has been directed toward understanding the adoption and diffusion of IT in the U.S. firms [2, 5, 8, 13, 14, 15, 22], there have been handful effort to be made to adapt new technology to the unique characteristic of the host culture and environment [7, 18, 21]. Furthermore, although there is a substantial literature that documents cultural issues and

conflicts involved in making organizational and managerial changes, few attempts have been made to delineate cultural and social variable that foster and impede the adoption of new technology within different occupational groups.

2. Culture of Korean Organizations

Comparing to the Occidental culture which emphasizes the value of the individual, the Oriental culture puts more emphasis on the value of the community. This is mainly due to the effect of Confucism. Confucism has affected the Orient people a lot. And Korea people are no exception. Confucism pays a lot of attention in building the hierarchy of social system. In the Orient, there is a tendency to put a higher priority on organization than I, and nation than organization. This affects the organizational culture in Korea so that people prefer collectivistic job performing and family-like climate in a company [10].

Major characteristics of the management systems in Korea could be classified into three categories, owner-centered management systems, centralized organization control systems, collective decision making process [19]. These characteristics reveal highly centralized decision making structure(HCDM) and top-down organization operating systems. A typical exemplar of HCDM is shown in the decision making structure of Jaebol (which is another name of conglomerate in Korea). The decision making process is highly centralized so that even a strategic business unit(SBU) does not make important decisions by itself. The authority is soly on the owner of the Jaebol [11]. An SBU in Korea is a quasi-SBU in terms of the decision making mechanism.

In a survey based on 1000 largest companies in Korea, it is shown that only 22%(222 companies) of the surveyed companies have SBUs [19]. However, it should be very careful in interpreting the meaning of SBU in Korea. A Korean company prefers external diversification by building a subsidiary to internal diversification, i.e., SBU. This motivates a Korean company to build a

subsidiary if a SBU has a possibility to grow up. Thus, the authority of SBU in Korea is quite smaller than that of western companies. This results in the lack of decision making ability in the SBU.

While the horizontal integration is the coordination among organization members who are in the same level of organizational hierarchy, the vertical integration is the coordination through an organization hierarchy. The organization operating systems in Korean companies put more emphasis on the vertical integration rather than the horizontal integration [20]. This leads to ambiguous job scope and level of responsibility among employees. The employees are used to following the implicit order from the superiors and it is the operating mechanism in Korean companies. And this integration is not based on highly specialized management skills but based on low quality human relations. This shows a big contrast with the highly formalized American companies which operate the organization through standardization. For example, if there is a conflict between departments in a Korean company, people used to rely on their superiors rather than the rational discussion between counterparts to solve the problem. Thus, the department whose head is closer to the top executives would win the battle and this will reinforce the centralized power structure in repercussion. The low formality, the high vertical integration, and the highly centralized organization eventually lead the final decision making to the realm of top executives.

To understand the collective decision making behavior in a Korean company, it is necessary to figure out the way how to make a decision for business processes. Basically, a collective decision making is preferred in the Korean company. But the collective decision making does not mean gathering individual opinions based on the open discussion. It means predetermined implicit consensus through the informal discussion among the superiors prior to the formal decision making meeting. Thus, it looks like that a Korean company follows individualistic open decision making processes. But the truth is that members in an organization follow the opinions of their superiors or the

predetermined alternatives through the informal discussion and that it is very collective decision making process [19].

The adoption of IT in an organization often requires dramatic organization change and this leads to the change of the decision making processes. Most of the decision making process changes incurred by IT adoption focus on the delegation of authority. The organization structure is flattened by the adoption of IT and the end users of IT need to make many instant decision makings. This change makes information flow to the end users who are used to being in lower level of organization hierarchy. The more the information gathered, the stronger the authority. Therefore, the superiors should be willing to delegate their authority and also the inferiors should be ready to utilize the delegated authority to fully take advantage of IT.

IT could not be fully utilized as soon as the IT is implemented in an organization. This is because of not only the technical problem but also the organizational cultural problem. The individuals who are used to being in the highly centralized organization and the collective decision making process environment would feel more difficulty than those in the individualistic environment in adjusting themselves to the autonomous environment. Thus it could be hypothesized that the time lag in utilizing the implemented IT is shorter in the Occidental cultural environment than in the Oriental cultural environment, say Korea. In other words, it takes longer time in Korean companies than that in American companies to fully utilize IT as intended after the implementation.

3. Cultural Influence Model

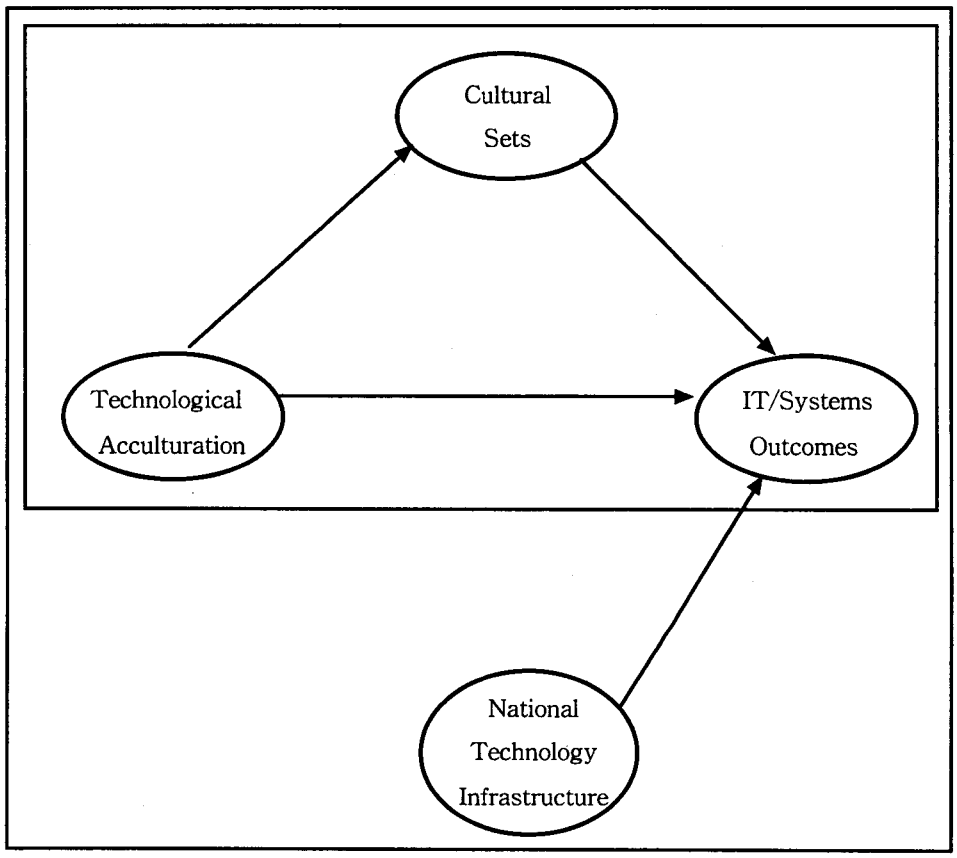
Information technology is gaining significant attention not only as a catalyst that is driving the global marketplace but also as a solution base from which to address international managerial challenge. The international environment

encompasses all environments of each nation in which the firm does the business. Each nation's environment consists of four basic components that include legal, cultural, economic, and political dimensions[17]. The transfer of technology to specific culture areas like the Oriental world, in itself, a clearly important area of study.

Cultural influence model in this paper uses cultural, social, and technology variables to predict the outcomes of the IT transfer process in culturally diverse settings. The approach assumes that system development and diffusion is influenced by culture. The components of the model which is shown in [Figure -1] is composed of three factors which is assumed to affect the outcome of IT systems. In this model, technological acculturation means how much an individual or a group is exposed to the occidental high technology culture. It is critical in how well the model predict IT transfer outcomes. The level of acculturation of individuals and groups in organizations determines variation in cultural beliefs and interactive patterns, national technology infrastructure, and, therefore, indirectly, information system outcomes.

In his "cultured-centered" approach to computing, Hakken [6] argues that the character of information technology will in the long run become more informed by a less technical, more cultural perspective. Thus, a cultural influence model assumes an interdependence of IT and the culture of people using the systems. Culture is defined at the patterns of thinking that are reflected in the meanings people attach to their behavior. In this model, it refers to those beliefs, values and meanings attached to information systems. Culture guides behavioral patterns. Management and occupational groups within the institutions of a society are constrained by their cultural context, by their structural positions in a society. Given that these constraints vary by social strata and occupational groups, it is interesting to find out how they "practice technology" in their everyday lives and the meanings of these "practices" to Korea people. It is hypothesized that these variables are one predictor of the success or failure of IT transfer to and within various countries.

National technology infrastructure refers to the specific technology policies that guide the information systems in a specific country together with the existing structure of computing and communication capabilities and the cumulative ability of the population to operate and utilize these capabilities.



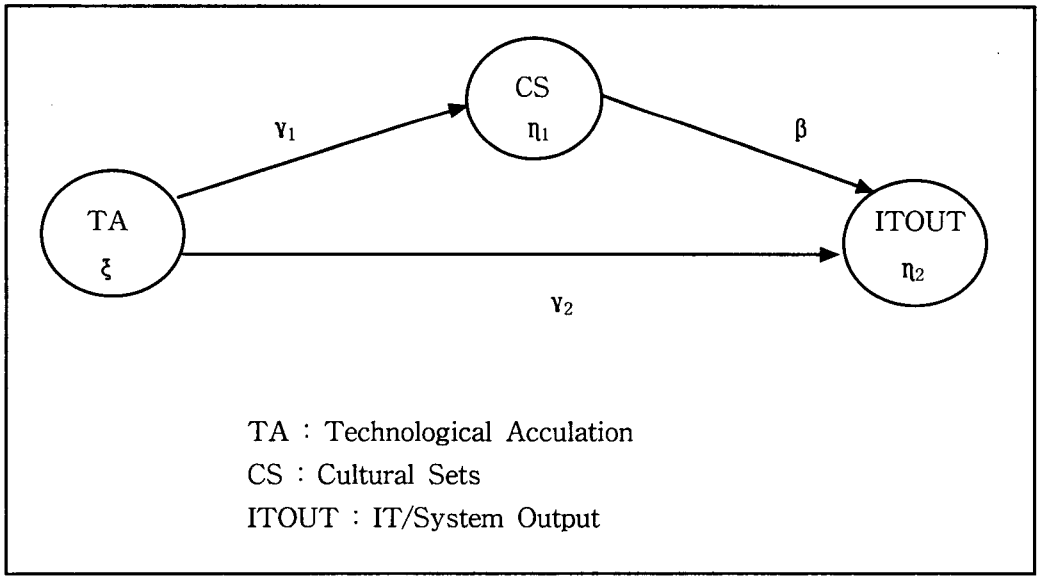
[Figure-1] A Cultural Influence Model of Information Technology Transfer

In this study, the focus of analysis is the inner box of [Figure-1]. If the study is conducted over multiple countries, national technology infrastructure could be included in the analysis. This study, however, is performed in one country, Korea. The analysis, then, is restricted to the dotted area in the above figure.

4. Research Method

The research reported here explores the predictability of cultural and social variables for IT transfer among Koreans. While cultural differences between IT developers and IT users may account for the difficulty or failure of implementing efficient and productive systems, no study has systematically tested cultural influences on IT transfer in Korea.

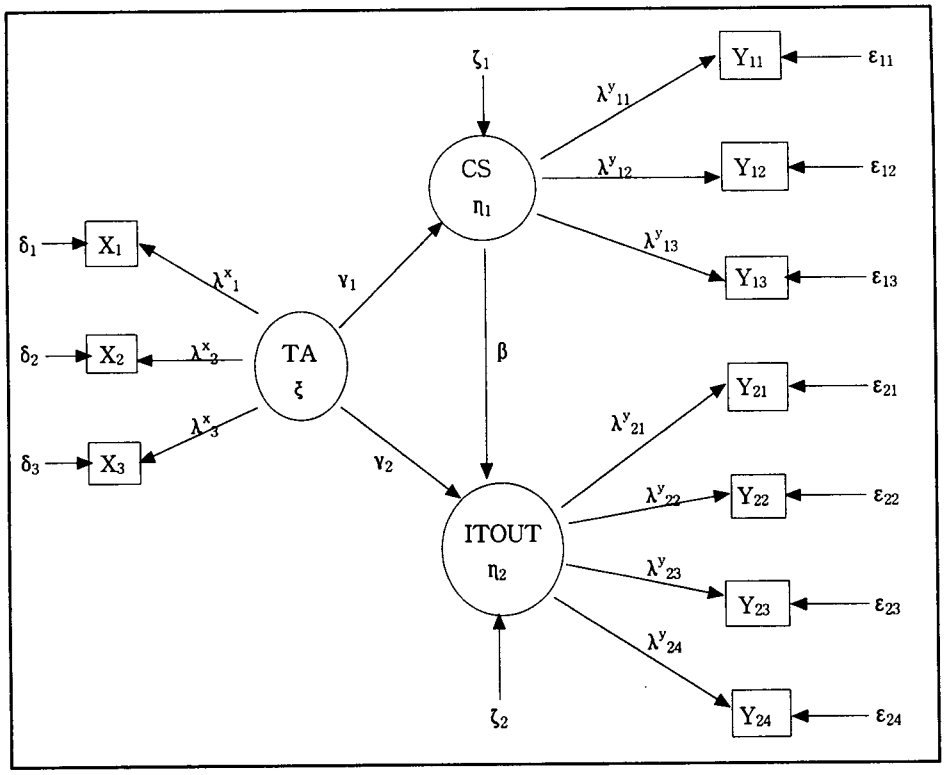
This research adopted LISREL approach to model the cultural influence on the IT transfer. The structural equation of this model is $\eta_2 = B\eta_1 + \Gamma\xi + \zeta$, where η_2 is for IT outcome, η_1 is for cultural sets, ξ is for technological acculturation, and ζ is residuals. The η's are latent endogenous variables and ξ is an exogenous variable. The graphical representation of the structural equation is in Figure 2.



[Figure-2] Structural Equation

In this model, it is hypothesized that individual level of technology acculturation (TA) affects the individual's information technology outcomes(ITOUT) directly and also indirectly via individual cultural sets(CS). The manifest variables for the latent variable TA are the level of education(X_1), level of foreign language competence(X_2), and frequency of contacting western countries(X_3). It is believed that those variables are influencing the level of how much an individual is exposed to the Occidental culture which is more technology oriented than that of the Oriental culture. It is assumed that an individual is more exposed to the Occidental culture, he/she is more technologically acculturated. The manifest variables of CS are the personal judgments for the importances of financial benefits(Y_{11}), scheduling capabilities (Y_{12}), reduction of face-to-face meetings(Y_{13}) in successful operation of information systems. Those variables are measuring the strength of the Occidental cultural belief. The manifest variables of ITOUT are the levels of computer usage in the company(Y_{21}), personal computer usage(Y_{22}), improvement of job performing speed (Y_{23}), and job performance(Y_{24}).

Those variables are frequently used in many studies in measuring the individual's performance in using information technology. The measurement model is in [Figure-3].



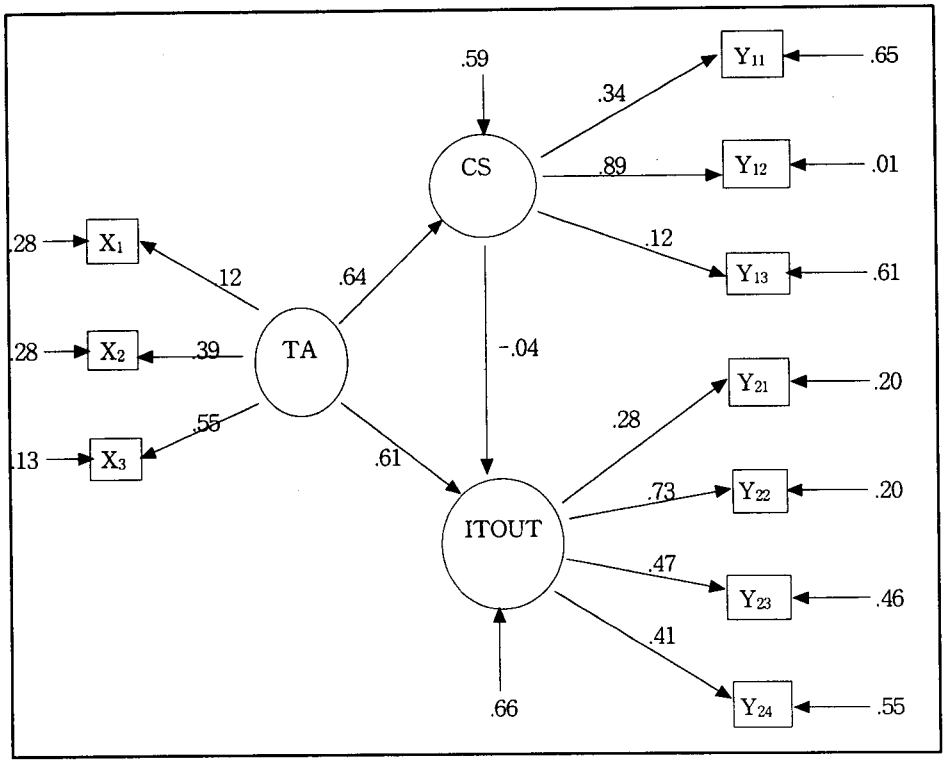
[Figure-3] Measurement Model

This paper reports on a research project conducted among those working on member companies of a jaebol and a medium-size company in Korea. The medium-size company is a foreign invested company. This will ensure some differences among the subjects in terms of the technology acculturation. Total sample size of this study is 43 people. Even though it is generally recommended to use sample size of more than 100, some studies suggested that the small sample size such as around 50 would provide valid output if maximum likely estimation is used[4]. The small sample size is not generally recommended in this kind of research. However, this study could provide the clue for the research concerning cultural effects on the IT transfer even though suffering from the small sample size. The subjects were asked to answer their personal experience concerning information technology. A scenario was developed to measure the perception of the subjects regarding the information technology outcomes. Participants were asked to read the scenario and respond to a series

of questions regarding their cultural beliefs and norms and their assessment of the likely success or failure of the information systems described in the scenario. Basic demographic data were also collected. The scenario described the characteristics and benefits of network systems of hospital information systems and asked the subjects how they felt about the systems and put priorities of some occidental cultural factors and some oriental cultural factors affecting the success or failure of the systems.

5. Analysis and Research Findings

The analysis results of the model is depicted in [Figure-4]. The goodness of fit statistics of the model and the t-test for the coefficients are presented in [Table-1].



[Figure-4] Analysis Results of Measurement Model

For the general goodness-of-fit, x^2 test is performed. The null hypothesis of the test is that there is no discrepancy between actual data and the estimates from the model. In this model, p-value of the test is 0.46, which we can't reject the null hypothesis. This means the model suggested in this study has significant level of conformation to the actual data. If the point estimate of root mean square error of approximation(RMSEA) is less than 0.05, the model is appropriate [9]. And according to the guideline of Browne and Cudeck[3], if the lower bound of RMSEA is lower than 0.05, the model is appropriate. This indicates that the model suggested here fits well. Another indication of model fit is shown in expected cross- validation index(ECVI). As the value of ECVI(1.81) is less than the ECVI for the saturated model(2.62) and the confidence interval of ECVI(1.81;2.24) does not include the ECVI for the saturated model, this also indicates the model fits well [9].

The t-test in the LISREL usually performs the over-identification of the model and the criterion for the deleting the variable from the model is often p-value less than 1 [16]. The t-test result in [Table-1] shows that λ^{y}_{13} and β are found to be irrelevant for the model. However, as the theory adopted for this model assumes the effect of cultural sets on information technology outcome and (Y_{13}) is measuring important cultural belief, these are decided to be remained in the model.

For the importance of the variables, p-value of each variable was investigated. In the case of the manifest variables for the cultural sets, the importance of the financial benefits(Y_{11}) and the scheduling capabilities(Y_{12}) are significant at α=0.05 and α=0.1, respectively. The levels of computer usage in the company(Y_{21}), personal computer usage(Y_{22}), improvement of job performing speed (Y_{23}), and job performance(Y_{24}) are significant for the information technology outcomes at α=0.05. The technological acculturation is well described by level of the foreign language competence(X_2), and the frequency of contacting foreign countries(X_3) at the significance level of 0.05.

[Table-1] Goodness-of-Fit Statistics and T-test Results

Statistics	Value (p-value)
χ^2_{34}	34.09(p=0.46)
Root Mean Square Error of Approximation(RMSEA)	0.0078
90% Confidence Interval for RMSEA	0.0 ; 0.11
P-Value for Test of Close Fit(RMSEA<0.05)	0.62
Expected Cross-Validation Index(ECVI)	1.81
90% Confidence Interval for ECVI	1.81 ; 2.24
ECVI for Saturated Model	2.62

T-Value

	Lambda Y of CS			Lambda Y of ITOUT	
	Coefficient	Test-Statistics		Coefficient	Test-Statistics
Y_{11}	0.34	2.29	Y_{21}	0.28	2.84
Y_{12}	0.89	1.74	Y_{22}	0.73	4.17
Y_{13}	0.12	0.97	Y_{23}	0.47	3.02
			Y_{24}	0.41	2.64

	Lambda X of TA			Beta of ITOUT	
	Coefficient	Test-Statistics		Coefficient	Test-Statistics
X_1	0.12	1.18	CS	-0.045	-0.13
X_2	0.39	3.32			
X_3	0.55	2.53			

	Gamma of CS			Gamma of ITOUT	
	Coefficient	Test-Statistics		Coefficient	Test-Statistics
TA	0.64	1.83	TA	0.61	1.90

The relationships among the latent variables show that technological acculturation has significant effects on the cultural sets and the information

technology outcomes at the level of α=0.1 while the cultural sets does not show any strong relation with the information technology outcomes. The correlation between the cultural sets and the information systems outcomes shows 0.36 which is considered significant. It is, therefore, considered that the interaction between the technological acculturation and the cultural sets might jeopardize the direct effect of cultural sets on the information technology outcomes.

6. Conclusion

It has been hypothesized that the individual information technology outcomes are structurally affected by the level of individual's technological acculturation directly and indirectly via cultural sets. These variables are constructed with some observed variables. The observed variables used for constructing the technological acculturation are educational level, foreign language competences, and frequency of contacting foreign countries. While those used for constructing the cultural sets are perceived importances of financial benefits, scheduling capabilities, and reduction of face-to-face meetings, the levels of computer usage in company and personal usage, job performing speed improvement, and job performance are used for constructing the individual information technology outcomes.

The general goodness-of-fit test showed the model fitted well. And the analysis result of the basic model showed that the technological acculturation had strong relations with the individual IT outcomes and the cultural sets. The cultural sets, however, did not show any significant relation with the individual IT outcomes in the context of the structural model even though the correlation between the cultural sets and the IT outcomes were relatively high. Thus, it is considered that the interaction between the technological acculturation and the culturai sets might interfere the relations.

The relations between the latent variables and the manifest variables showed that the financial benefits and scheduling capabilities are significant for the cultural sets. All the variables used for constructing the IT outcomes were found to have strong relations with IT outcomes while the technological

acculturation was well described by the foreign language competences and the frequency of contacting foreign countries.

This research tried to show the conceptual cultural model of information technology transfer from the well developed countries to the less developed countries and performed the empirical testing. Even though the test results showed the some important paths in the model, it is not quite satisfactory in describing the whole technology transfer procedure. This is mainly due to the lack of understanding the interaction between the technological acculturation and the cultural sets. Thus it is suggested in further study to investigate the interaction and develop another set of latent variables to explain the procedure. And also, further efforts are recommended to develop the manifest variables in relation to the latent variables.

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정보기술 이전의 개념적 문화모형

강병구

요 약

많은 경영조직들이 정보기술을 실제로 사용하는데 많은 어려움을 겪고 있다. 이러한 현상이 단순히 기술상의 문제라면 그 해결책은 조직의 문화적 차이와 관계없이 어느 조직이나 다 동일할 것이다. 그러나 많은 연구들에서 이러한 문제를 해결책이 조직마다 다른 것은 조직들의 문화적 차이에 기인하는 것으로 나타났다. 본 연구는 정보기술선진국으로부터 정보기술후진국으로 정보기술이 이전되는 현상을 설명하는 문화적 모형을 제시하였다. 이 모형에서 정보시스템 성과는 문화변수, 기술적 문화이식변수, 국가의 정보기술 기반구조변수에 영향을 받는 것으로 가정하였다. 본 연구는 그 중에서 문화변수와 기술적 문화이식변수가 정보시스템 성과에 미치는 영향을 살펴 보았다. 이 분석의 결과 기술적 문화이식변수가 개인의 정보시스템 사용성과와 문화변수에 영향을 미치는 것으로 나타났다. 그러나 정보시스템 사용성과변수와 문화변수가 비교적 강한 상관관계를 보이고는 있으나 본 논문에서 제시된 구조모형에서는 유의한 관계를 보이지 못했다. 이러한 결과로 볼 때 기술적 문화이식변수와 문화변수와의 상관관계가 정보시스템 사용성과변수와 문화변수와의 관계를 방해하는 것으로 판단된다.