Studies on the Interrelationship between Critical Success Factors of ERP Adoption

Hwal-Sik Chang · Seok-Jae Ok · Kwang-Oh Park

〈목 차〉

Ⅰ. Introduction

Enterprises are confronted with widespreaded, dynamic and rapid changes of management environment. To better adapt to the changes, enterprises often utilize information technologies such as ERP(Enterprise Resources Planning) packages. A large number of previous studies has investigated the major effect of CSF(Critical Success Factors) on ERP performances. However, previous studies tend to have repetitively tried to identify and categorize various ERP CSF without an effort to develop a deeper understanding of the factors by investigating the interrelationships among the factors.

We have learned that top management's commitment and support during ERP adoption

  * 부산대학교 상과대학 경영학부 교수, hwschang@pusan.ac.kr
  ** 부산대학교 상과대학 경영학부 부교수(교신저자), oksj@pusan.ac.kr
 *** 부산대학교 상과대학 경영학부 박사과정, kopark@pusan.ac.kr

and utilization can greatly affect users' performances. We also know of the great effects that user participation and involvement has on performances. However, there have been little effort to understand how top management's commitment and support can affect user participation and involvement, for example such a lack of research effort in the interrelationships among ERP CSF resulted in our incomplete understanding of ERP adoption process.

Ⅱ. Critical Success Factors in ERP Adoption

2.1 Top management Commitment and Support

It has been known that for an IT project succeess top management concern and support is critical(David et al. 2002). No single factor is as predictive of its success as the commitment and support of top management(Bingi et al., 1999; Slevin et al., 1986). Top managers must understand the roles and effects of ERP, establish reasonable goals for the ERP systems, fully support development and operation processes and costs, demand and evaluate the payback from ERP operations, communicate the corporate IT strategy to all employees, and champion the entire ERP development processes (Mckersie et al., 1991; Umble et al., 2003).

2.2 User Participation and Involvement

User participation and involvement has long been emphasized as a crucial factor to improve the chances of succeeding in system development(Barki et al., 1994; Hartwick et al., 1994; Ives et al., 1983). From the very beginning of the ERP development process, key end-users must be involved so that the conceived new system can be presented clearly to the users. Inputs from users must be accurately reflected in requirement definitions. Users' comments and reactions must be taken seriously(Andreas, 2001). User participation and involvement improves user satisfaction(Lin and Shao, 2000), system quality and usage(Hwang and Thorn, 1999), and adaption to the new system(Hunton and Beeler, 1997).

2.3 Depth of Business Process Reengineering

In general, the changes introduced by ERP packages involve two dimensions. First, the breadth of BPR measures the number of functions affected by the changes introduced by ERP. If more functions are involved in changes, it is safe to assume a more widespreaded confusions, needs for more vigorously adjusting interrelated activities throughout the entire business process, and perhaps a higher level of expected outcomes from the ERP adoption. Second, the depth of BPR measures the extent

of changes that individual users experience. One of the important questions that project managers face when adopting an ERP system is whether to implement the ERP software "as-is" or customize the ERP to the specific needs of the organization (Holland et al., 1999). In general, less customization means more changes to the organization and individuals. If more changes are required by the individuals, more difficulties of individuals to adapt to the new process are expected, more resistances to changes, and perhaps a higher level of expected performance improvement.

2.4 Change Management

Change management is concerned with developing organization-wide structure and culture for innovation, minimizing organizational and individual resistance to changes, and helping organizational members to better adjust to their changed environments. Generally the existing organizational structure and work processes of many companies are expected to be, in many respects, not compatible with the structure, work flows, and information processing being assumed by ERP systems. As a result, even the most flexible ERP system, unavoidably to a certain degree, imposes its own logic on a company's strategy, structure, culture, and many other aspects(Umble et al., 2003). Pawlowski et al.,(1999) stated that about one half of ERP projects failed to achieve the hoped-for benefits, because managers underestimate the efforts involved in managing changes.

2.5 Adaptation to Change

The success of ERP adoption depends on how effectively individual users adapt to the changed business processes and system environment(Landry et al. 2003). Two constructs from TAM (Technology Acceptance Model) are useful to measure users' adaptation to the changes introduced by ERP systems: ease of use and perceived usefulness. The more successfully a user has adapted to the ERP, the easier he or she may find the system to use. Likewise, a well-adapted user is likely to find the system more useful.

Ⅲ. A Research Model and Hypotheses

The purpose of this research is to identify the interrelationships among the CSF in ERP adaptation. The five ERP CSFs examined in this study include ① top management commitment and support, ② user participation and involvement, ③ depth of BPR, ④ change management and ⑤ user's adaptation to the changes.

Figure 1 presents the research model formulated in this study.

The first hypothesis examines whether top management commitment and support affects the depth of BPR or the degree of changes introduced
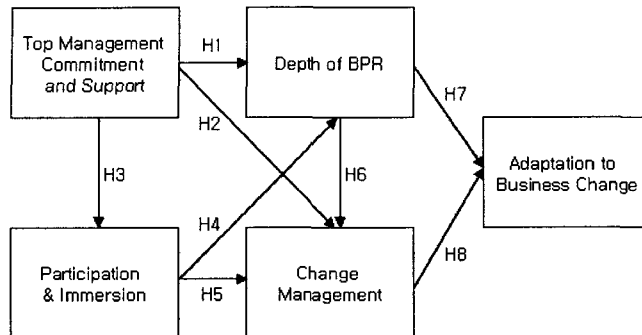
<Figure 1> Research Model

by ERP. Levene and Braganza(1996) postulated that top management's strong leadership in system development is a prerequisite for successful organization-wide changes. If top management pays more attention to ERP adoption, it is likely that more changes would be introduced to improve business processes. Thus, a positive relationship is hypothesized between the two constructs.

The second hypothesis evaluates the influence that top management commitment and support has on the degree of efforts devoted to managing changes. One of the key roles that top management plays during ERP adoption is to present a vision of organizational changes, encourage workers to change, and manage the organizational change processes(Boeker, 1997). A higher level of management commitment and support is expected to be related to a more active organizational change management.

The third hypothesis examines how management commitment and support affects user participation and involvement. It is the top management's responsibility to establish policies and procedures that allow end users to devote themselves to system development. Previous studies have shown that executives(Suh et al., 2000), project leaders(Amoako-Gyampha and White, 1997), and chief Information Officer(Lee and Ahn, 1997) can influence the degree of user participation and involvement. Thus, this study hypothesizes that a strong management commitment and support has a positive impact on the degree of user participation and involvement.

The fourth hypothesis examines the impact of user participation and involvement on the depth of BPR. Although it has been well known that user participation and involvement positively affects user satisfaction as well as system quality(Hong et al. 2002; Laughlin, 1999; Lin and Shao, 2000), little is known about the impact that user participation and involvement has on the depth of BPR. In general, a higher level of user participation and involvement may lead to more creative and innovative changes from the old system to a new system.

The fifth hypothesis tests whether user

<Table 1> Operational Definition

Construct	Item	Operational Definition	Reference
Top Management Commitment and Support	T1 T2 T3 T4 T5	Understanding the purpose of ERP adaption Long-term strategic plan for ERP usage Managerial support for ERP adoption Preparation for a possible ERP failure Eagerness for ERP adoption	Umble (2003) Igbaria et al. (1989)
User Participation and Involvement	P1 P2 P3 P4 P5	Take part in introduction process Take part in planning phase Take part in analysis phase Take part in design phase Take part in construction phase	Andreas (2001) Barki and Hartwick (1994) Mckeen (1994)
Depth of BPR	B1 B2 B3 B4 B5 B6	Change of organizational structure Change of business process Change of IS roles Change of worker's roles Change of worker's measurements and incentives Change of worker's shared values	Andreas (2001) Levene and Braganza (1996) Hall, Rosenthal, and Wade (1993)
Change management	M1 M2 M3 M4 M5 M6 M7	Clear understanding of the project vision Recognition of the system's values Construction of the communication channels Establishment of procedures, rules & standards Education and training of workers Formation of a new organizational culture Regular meetings for organizational changes	Umble (2003) Stoddard and Javenpaa (1995) Kettinger and Grover (1994)
User's adoption to the changes	A1 A2 A3 A4	Adaptation to business process changes Ease of the system use Usefulness of the system Intention to use the system	Landry, Lamari and Amara (2003) Guimaraes and Igbaria (1997)

participation and involvement has an impact on the degree of efforts for change management. Generally a more actively participating and highly involved user group may introduce more changes to the system and thus necessitate a higher level of change management efforts. On the other hand, a highly motivated and ready-to-be-changed user group may require less organizational support for the changes. For the reason, no direction of influence is presumed for the relationship between the two constructs.

The sixth hypothesis examines the relationship

<Table 2> Descriptive statistics of respondents' characteristics

Measure	Value	Frequency	Percentage
Type of Business	Finance	18	8%
	Information/Communication	50	24%
	Manufacture	89	42%
	Service	21	10%
	Others	35	16%
Number of Employee	Under 100 persons	12	6%
	100 - 500 persons	15	7%
	500 - 1000 persons	27	13%
	1000 - 5000 persons	33	15%
	Above 5000 persons	126	59%
ERP Package Distribution of Business	SAP R/3	98	46%
	ORACLE	62	29%
	uniERP	30	14%
	Others	23	11%
Construction Period of ERP System	Under 6 months	33	15%
	6 months - 1 year	74	35%
	1 - 2 years	50	23%
	2 - 3 years	29	14%
	More than 3 years	27	13%
ERP System Using Period of Business	Under 1 year	3	1%
	1 - 2 years	53	25%
	2 - 3 years	68	32%
	3 - 4 years	53	25%
	4 - 5 years	9	4%
	More than 5 years	27	13%
Respondents' Position	Deputy Manager	112	53%
	Manager	72	34%
	General Manager	24	11%
	CIO	5	2%

between the depth of BPR and the time and efforts devoted to change management. In general, the deeper changes a BPR introduces, the more change management efforts are required to help individuals to deal with the changes(Ives et al., 1983). A positive relationship is assumed between the two

constructs.

The seventh hypothesis tests whether the depth of BPR has a negative impact on users' adaptation to changes. Introduction of ERP to an organization typically is accompanied by changes not only in the types and amounts of information that users utilize to perform their jobs but also in the business processes, authorities, responsibilities, and roles that are assigned to the groups of users. The more changes are introduced to users, the more difficulties the users are expected to experience.

The last hypothesis examines the impact that the change management effort has on users' adaptation to the changes introduced by ERP. Previous studies have shown that a systematic change management helps users to adopt to the changes(Landry, 2003; Hong et al., 2002; Toni et al., 2001).

A questionnaire survey was conducted to test the hypotheses. Measurement of 300 users were taken on companies enlisted on the KOSPI stock exchange, Republic of Korea. A total of 213 usable, complete responses were obtained; Detailed descriptive statistics relating to respondents' characteristics are shown in Table 2.

Ⅳ. Empirical Results

The research model was analyzed by the structural equation modeling(SEM) technique, supported by SAS 9.1.3 and AMOS 7.0. Data analysis proceeded in two stages. The measurement model was first examined for validating and refining the research instruments, as well as assessing reliability. Then, our research model was tested.

4.1 Reliability and Validity of Measurement Model

The internal consistency of the measurement was assessed by calculating the Cronbach α Alpha coefficients for the top management commitment and support was 0.876, for the participation and involvement was 0.839, for the depth of BPR was 0.834, for the change management was 0.787, for the adaptation to business change was 0.831. Hair et al. (1998) suggested that the lowest limit for Cronbach's

<Table 3> Results of Internal Consistency Test

Construct	Item	Cronbach's alpha
Top Management Commitment & Support	T1, T2, T3, T4, T5	0.876
Participation & Involvement	P1, P2, P3, P4	0.839
Depth of BPR	B1, B2, B3, B4	0.834
Change Management	M1, M3, M4, M5	0.787
Adaptation to Business Change	A1, A2, A3, A4	0.831

alpha be 0.70. All constructs in our research model demonstrated acceptable reliability. Five items, P5, B5, B6, M6, M7, were during the reliability analysis, because they did not load well on their underlying constructs. These results of internal consistency in Table 3.

A confirmatory factor analysis using AMOS 7.0 was conducted to examine the convergent and discriminant validity of the constructs. The fit of the overall measurement model was estimated by various indices. The ratio of X^2 to degrees of freedom(X^2/DF) was used, and a value 1.2420 was obtained, which is within the suggested value of 3. Also note the Goodness of fit (GFI) was 0.9107, which was good, being above the maximum desired cut-off of 0.9000. Root Mean Square Residual (RMSR) was 0.0549, slightly higher than the maximum desired cut-off of 0.0500. Root Mean Square Error of Approximation (RMSEA) was 0.0338, which was good, being below the maximum desired cut-off of 0.0800.

Adjusted goodness of fit (AGFI) was 0.8711, which was good, being above the maximum desired cut-off of 0.8000. Comparative fit index (CFI) was 0.9084, which was good, being above the maximum desired cut-off of 0.9000. Turker-Lewis Index (TLI) was 0.8798, slightly lower than the maximum desired cut-off of 0.9000. Parsimony Goodness of Fit Index (PGFI) was 0.6308, which was good, being above the maximum desired cut-off of 0.6000. The composite reliabilities range from 0.9283 (Adaptation to Business Change) to 0.8575 (Change Management) which exceed the recommended level of 0.70. The Average Variance Extracted measures range from 0.6431 (Adaptation to Business Change) to 0.5041 (Change Management) which also exceed the recommended level of 0.50 (Hair et al., 1998). The result, therefore, demonstrate convergent validity of the measurement models.

<Table 4> Confirmatory Factor Analysis

Fit Indices (Recommended Value)		Models
	X^2 / DF ($\leq$ 3.000)	1.2420
	GFI ($\geq$ 0.9000)	0.9107
	RMSR ($\leq$ 0.0500)	0.0549
	RMSEA ($\leq$ 0.0800)	0.0338
Absolute Fit Indices	AGFI ($\geq$ 0.8000)	0.8711
	CFI ($\geq$ 0.9000)	0.9084
	TLI ($\geq$ 0.9000)	0.8798
	PGFI ($\geq$ 0.6000)	0.6308

<Table 5> Result of Convergent Validity Test

Factor	Item	Standardized Loading	Standard Error	Composite reliability	Average Variance Extracted
Top Management Commitment & Support	T1	0.6601	0.3506	0.9196	0.5937
	T2	0.8112	0.2366		
	T3	0.8074	0.2275		
	T4	0.7480	0.2853		
	T5	0.8146	0.1898		
Participation &Immersion	P1	0.6800	0.3330	0.8890	0.5710
	P2	0.7539	0.3531		
	P3	0.7718	0.2389		
	P4	0.8110	0.2109		
Depth of BPR	B1	0.8404	0.2164	0.8814	0.5768
	B2	0.7473	0.3378		
	B3	0.6927	0.3892		
	B4	0.7501	0.2920		
Change Management	M1	0.6545	0.2900	0.8575	0.5041
	M3	0.6615	0.3580		
	M4	0.7517	0.2463		
	M5	0.6994	0.3773		
Adaptation to Business Change	A1	0.7246	0.2219	0.9283	0.6431
	A2	0.8748	0.0931		
	A3	0.7095	0.3372		
	A4	0.8826	0.1345		

<Table 6> Squared correlations between two constructs

	Top Management Commitment and Support	Participation & Involvement	Depth of BPR	Change Management	Adaptation to Business Change
Top Management Commitment & Support	(0.5937)				
Participation and Involvement	0.4832	(0.5710)			
Depth of BPR	0.5085	0.5329	(0.5768)		
Change Management	0.5549	0.5682	0.4891	(0.5041)	
Adaptation to Business Change	0.5236	0.3921	0.3865	0.4841	(0.6431)
※ ( ) Average Variance Extracted					

Discriminant validity can be tested by comparing the squared correlation between two constructs with their respective average variance extracted measure. Table 6 shows the squared correlation of each pair of constructs and the average variance extracted measures. The average variance extracted measures of each construct are in the diagonal. It show that all squared correlations between two constructs are less than the average variance extracted measures of both constructs. The result, therefore, demonstrate discriminant validity of the measurement models.

4.2 Structure model

After assessing the reliability and validity, the hypothesized paths in models was tested by the AMOS 7.0 software to which a matrix of correlation between the variables was input, using the estimated maximum likelihood. The ratio of X

^{2} to degrees of freedom(X^2/DF) was used, and a value 1.1918 was obtained, which is within the suggested value of 3. Also note the Goodness of fit (GFI) was 0.9325, which was good, being above the maximum desired cut-off of 0.9000. Root Mean Square Residual (RMSR) was 0.0346, which was good, being below the maximum desired cut-off of 0.0500. Root Mean Square Error of Approximation (RMSEA) was 0.0301, which was good, being below the maximum desired cut-off of 0.0800. Adjusted goodness of fit (AGFI) was 0.8561, which was good, being above the maximum desired cut-off of 0.8000. Comparative fit index (CFI) was 0.9159, which was good, being above the maximum desired cut-off of 0.9000. Turker-Lewis Index (TLI) was 0.8824, slightly lower than the maximum desired cut-off of 0.9000. Parsimony Goodness of Fit Index (PGFI) was 0.6158, which was good, being above the maximum desired cut-off of 0.6000.

<Table 8> shows the results of the analysis. The

<Table 7> Fit Indices for each of the hypothesized models

Fit Indices (Recommended Value)		Models
Absolute Fit Indices	X^2 / DF ($\leq$ 3.000)	1.1918
	GFI ($\geq$ 0.9000)	0.9325
	RMSR ($\leq$ 0.0500)	0.0346
	RMSEA ($\leq$ 0.0800)	0.0301
	AGFI ($\geq$ 0.8000)	0.8561
	CFI ($\geq$ 0.9000)	0.9159
	TLI ($\geq$ 0.9000)	0.8824
	PGFI ($\geq$ 0.6000)	0.6158

table shows direct effects on the top of cells, indirect effects at the middle, and total effects at the bottom.

The results indicate that top management commitment and support has a significant direct impact on depth of BPR. The coefficient was 0.350 (p<0.01, t=2.86). The search conducted by (Belmonte and Murry, 1993; Grove et al.. 1995; Mahmood, Hall and Swanber, 2001) which states that top management must have a full understanding the objective of BPR for a successful BPR and their strong leadership playing a vital role for the success of BPR is in accordance(Levene and Braganza, 1996).
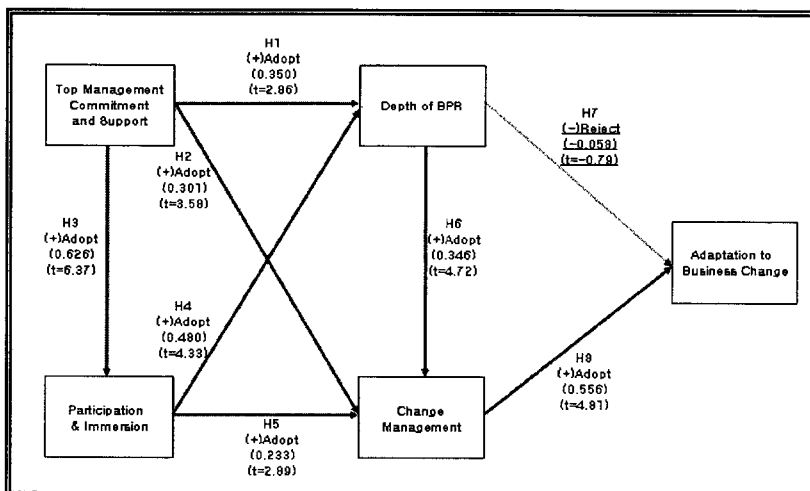
Top management commitment and support also affects change management. The coefficient was 0.301 (p<0.0001, t=3.58). This research is also in accordance with the study (King and Rodregues, 1978; Hall et al., 1993; Kotter, 1995; Stoddard and Javenpaa, 1995) which states that top management

levels must provide a continuous participation on the change project for it to be successful and, also, top management must provide their leadership to gain change projects (Kettinger and Grover, 1994).

Top management commitment and support also affects user participation and involvement. The coefficient was 0.626 (p<0.0001, t=6.37). This fact is similar to the study conducted by Amoako-Gyampha and White (1997) which states that the influence of the user's participation and user's satisfaction verifies the level of awareness of the project leader.

User participation and involvement has a significant direct impact on depth of BPR. The coefficient was 0.480 (p<0.0001, t=4.33). This fact is in accordance with the study (Grove et al., 1995) which states that the participation of the user influence the performance of BPR.

Also user participation and involvement has a direct impact on change management. The

<Figure 2> Path Coefficients for the Research Model

coefficient was 0.233 (p<0.05, t=2.89). This reveals the similarity in the study which states uses must participate before and after in order to obtain a successful change management (King and Rodrigues, 1978; Beer et al., 1990) and the user's participation and vigorous effort are needed in the introduction stage in order to obtain ERP effects (Stoddard and Javenpaa, 1995).

Depth of BPR has a significant direct impact on change management. The coefficient was 0.346(p<0.0001, t=4.72). As this change becomes larger more change management is needed not only to gain the support of the department but also to diminish the selfish behaviors of the department and, thereby, relieve any tension resulting from such practices (Ives et al., 1983; Kotter and Schlesinger, 1979).

On the other hand, it had no direct impacts on adaptation to business change. The coefficient of

the direct impact was -0.058 (t=-0.79). This is different with the study conducted by Guimaraes and Igbaria (1997) which states that if work change gets bigger due to BRP the user encounters difficulty in adapting to the system. The total impact of the depth of BPR on adaption to business change, however, was significant. It seems that the depth of BPR affects adaption to business change only through affecting the degree of change management.

Change management has a significant direct impact on adaptation to business change. The was 0.556 (p<0.0001, t=4.81). In the field of education and training of change management, this is in accordance to Landry et al. (2003) who states that one must express his objectives clearly in order to effectively utilize the system for the changing work.

<Table 8> Coefficients of Direct, Indirect, and Total Impacts

		P	B	M	A
Top Management Commitment and Support	Direct Effect	0.626****	0.350**	0.301****	–
	Indirect Effect	–	0.300**	0.371**	0.336
	Total Effect	0.626****	0.650***	0.672****	0.336
Participation and Involvement	Direct Effect		0.480****	0.233*	–
	Indirect Effect		–	0.166*	0.194
	Total Effect		0.480****	0.399***	0.194
Depth of BPR	Direct Effect			0.346****	– 0.058
	Indirect Effect			–	0.192**
	Total Effect			0.346****	0.134**
Change Management	Direct Effect				0.556****
	Indirect Effect				–
	Total Effect				0.556****
0 Significant at α= 0.1 　　*Significant at α = 0.05 　　** Significant at α = 0.01 *** Significant at α = 0.001 　**** Significant at α = 0.0001					

V. Discussion and Conclusion

5.1 Research Finding

Previously mentioned, the purposes of this study are to identify the interrelationships among the CSFs. In order to measure this kind of interrelationships the introduction of analysis of domestic companies which have introduced the ERP system for an average of three years and three months has been provided. In order to understand how the user's adaptation on change management has influenced the relationship of the preceding factors, this study has established a total of eight hypothesis. In order to accurately verify the research, this study has used the collected data to analyze the validity and reliability and has used structural models to verify the relationship of each variable. The results of this study can be summarized as following.

First, ERP CSFs have a positive both effect on mutual relation and on preceding relationships. The results indicate that top management commitment and support has a significant direct impact on depth of BPR. Top management commitment and support also affects change management. User participation and involvement has a significant direct impact on depth of BPR. Also user participation and involvement has a significant direct impact on change management. Top management commitment and support also affects user participation and involvement change

management. Depth of BPR has a significant direct impact on change management. Change management has a significant direct impact on adaptation to business change. After all, ERP CSFs exclusive of depth of BPR have a positive both effect on mutual relation and on preceding relationships.

Second, on the other hand, it had no direct impacts on adaptation to business change. The total impact of the depth of BPR on adaption to business change, however, was significant. it seems that the depth of BPR affects adaption to business change only through affecting the degree of change management.

5.2 Implication

Although there have been many studies related to the ERP system in the field of MIS, the study on the relationship of mutual influence in relation to the critical success factors of ERP has been insufficient. Accordingly, this study has provided meaning by doing research to show how the ERP's materialized efforts have influenced the user's adaptation to the change management through the relationship of mutual influence that exists in the critical success factors.

First, the results indicate that top management commitment and support have a significant direct impact on depth of BPR. Top management commitment and support also affects change management. User participation and involvement has a significant direct impact on depth of BPR. Also user participation and involvement has a

significant direct impact on change management. Top management commitment and support also affect user participation and involvement on change management. Depth of BPR has a significant direct impact on change management. Change management has a significant direct impact on adaptation to business change. After all, ERP CSFs exclusive of depth of BPR have a positive effect on both mutual relation and on preceding relationships.

Second, the study examined the influence on how the weak ERP applied to the ERP system results. Although it is generalized that when there are many changes in the organization through the BPR the user's adaptation decreases, this study shows that there is no such relationship. It is revealed that rather than on how much the organization has changed but the management of change is what influenced the user.

5.3 Limitations and Henceforth Research Course

The limitations of this research can be seen is four different methods. These limitations will be further dealt with in future research.

First, to identify the research model this study has presented, companies which incorporated the ERP system for more than three years and three months had been selected. However, there were many difficulties in extracting ample data. Also, there were problems with survey responses due to personal bias opinions from

management level (managers and assistant general managers) in the business field.

Second, because this research conducted only one survey to analyse a longitudinal data for its results, insufficient evidence was obtained for from users dealing with management change. Accordingly, in further researches, there must be strict control on the exogenous variables which influence the research models. Also, through the longitudinal study which takes into consideration the time-delay effects, it will be possible to accurately clarify the user's adaptation in relation to the flow of time which affects the management change.

Third, although this research conducted studies on companies which incorporated the ERP system for an average of three years and three months, different analysis are needed.

Fourth, on the basis of this research it is also necessary to analyse whether or not companies with high user's adaptation in management change actually increased the financial or corporate results.
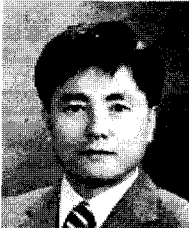
Reference

Amoako-Gyampah, K. and White K. B., "When is User Involvement not User Involvement," *Information Strategy*, Vol. 13, No. 4, 1997, pp. 40-45.

Andreas, "Critical Success Factors for ERP Implementations," *Business Process*

Management Journal, Vol. 7, No. 3, 2001, pp. 285-296.

Barki, H. and Hartwick, J., "Measuring User Participation, User Involvement, and User Attitude," *MIS Quarterly*, Vol. 18, No. 1, 1994, pp. 59-82.

Beer, M., Eisenstat, R. A. and Spector, B., "Why Change Programs don't produce change," *Harvard Business Review*, Vol. 68, No. 6, 1990, pp.158-166.

Belmonte, R. W. and Murray, R. J., "Getting Ready for Strategy Change," *Information Systems Management*, Vol. 10, No. 3, 1993, pp. 23-30.

Bingi, P., Sharma, M. K. and Godla, J. K., "Critical Issues Affecting and ERP Implementation," *Information Systems Management*, Vol. 16, No. 3, 1999, pp. 7-14.

Boeker, W., "Executive Migration and Strategic Change: The Effect of Top Manager Movement on Product Market Entry," *Administrative Science Quarterly*, Vol. 42, No. 2, 1997, pp. 213-236.

David, A., Thomas, K. and Mark, H., "ERP Critical Success Factors: An Exploration of the Contexual Factors in Public Sector Institutions," *Proceedings of the 35th Hawaii International Conference on System Sciences*, 2002.

Grover, V. and Jeong, S. R., "The Implementation of Business Process Reengineering," *Journal of Management Information*

Systems, Vol. 12, No. 1, 1995, pp.109-144.

Guimarares, T. and Igbaria, M., "Client / Server System Success: Exploring the Human Side," *Decision Sciences*, Vol. 28, No. 4, 1997, pp. 851-876.

Hair, J. F., Anderson, R. E., Tatham, R. L. and Black, W. C., Multivariate Data Analysis, Prentice Hall, 1998.

Hall, G., Rosenthal, J. and Wade, J., "How to make Reengineering Really Work," *Harvard Business Review*, Vol. 71, No. 6, 1993, pp. 119-131.

Hartwick, J. and Barki, H., "Explaining the Role of User Participation in Information System Use," *Management Science*, Vol. 40, No. 4, 1994, pp. 440-465.

Holland, C. P. and Light, B., "A Critical Success Factors Model for ERP Implementation," *IEEE Software*, Vol. 16, No. 3, 1999, pp. 30-36.

Hong, W., Thong, J. Y. L., Wong, W. M. and Tam, K. Y., "Determining of User Acceptance of Digital Libraries: An Empirical Examination of Individual Differences and System Characteristics," *Journal of Management Information Systems*, Vol. 18, No. 3, 2002, pp. 97-124.

Hunton, J. E. and Beeler, J. O., "Effects of User Participation in Systems Development: A Longitudinal Field Experiment," *MIS Quarterly*, 1997, Vol. 21, No. 4, pp.

359-380.

Hwang, M. I. and Thorn, R. G., "The Effect of User Engagement on System Success: A Meta Analytical Intergration of Research Findings," *Information & Management*, Vol. 35, No. 4, 1999, pp. 229-236.

Igbaria, M., Pavri, F. N. and Huff, S. L., "Microcomputer Applications: An Empirical Look at Usage," *Information and Management*, 1989, pp. 187-196.

Ives, B., Olson, M. H. and Baroudi, J. J., "The Measurement of User Information Satisfaction," *Communication of the ACM*, Vol. 26, No. 10, 1983.

Kettinger, W. J., Grover, V., Guha, S. and Segars, A. H., "Strategic Information Systems Revisited: A Study in Substantiality and Performance," *MIS Quarterly*, Vol. 18, No. 1, 1994, pp. 31-58.

King, W. R. and Rodriguez, J. I., "Evaluating Management Information Systems," *MIS Quarterly*, Vol. 2, No. 3, 1978, pp. 43-51.

King, W. R. and Rodriguez, J. I., "Participative Design of Strategic Decision Support Systems: An Empirical Assessment," *Management Science*, Vol. 27, No. 6, 1981, pp. 717-726.

Kotter, J. P., "Leading Change: Why Transformation Efforts Fail," *Harvard Business Review*, Vol. 73, No. 2, 1995, pp. 59-67.

Kotter, J. P. and Schlesinger, L. A., "Choosing Strategies for Change," *Harvard Business Review*, Vol. 57, No. 2, 1979, pp.

106-114.

Landry, R., Lamari, M. and Amara, N., "The Extent and Determinants of the Utilization of University Research in Government Agencies," *Public Administration Review*, Vol. 63, No. 2, 2003, pp. 192-205.

Laughlin, S. P., "An ERP Game Plan," *Journal of Business Strategy*, Vol. 20, No. 1, 1999, pp. 32-37.

Lee, J. B. and Ahn, S. H., "A Study on the Effects of CIOs' Managerial Roles on Users," *The Journal of MIS Research*, Vol. 7, No. 3, 1997, pp. 236-143.

Levene, R. J. and Braganza, A., "Controlling the Work Scope in Organizational Transformation: A Program Management Approach," *International Journal of Project Management*, Vol. 14, No. 6, 1996, pp. 331-339.

Lin, W. T. and Shao, B. B. M., "The Relationship between User Participation and System Success: A Simultaneous Contingency Approach," *Information & Management*, Vol. 37, No. 6, 2000, pp. 283-346.

Mahmood, M. A., Hall, L. and Swanberg, D. L., "Factors Affecting Information Technology Usage: A Meta-Analysis of the Empirical Literature," *Journal of Organizational Computing and Electronic Commerce*, Vol. 11, No. 2, 2001, pp. 107-130.

Mckeen, J. D., Gumaraes, T. and Wetherbe, J. C., "The Relationship between User

Participation and User Satisfaction," *MIS Quarterly*, Vol. 18, No. 4, 1994, pp. 427-452.

Mckersie, R. B. and Walton, R. E., Organizational Change in M.S. Scott Morton(ed.), The Corporation of the 1990s: Information Technology and Organizational 63 Transformation, Oxford University Press, New York, 1991, pp. 244-277.

Pawlowski, S., Boudreau, M. and Baskerville, R., "Constraints and Flexibility in Enterprise systems: A Dialectic of System and Job," *In Proceedings of AMCIS*, Milwaukee, WI, USA, 1999.

Slevin, D. P. and Pinto, J. K., "The Project Implementation Profile: New Tool for Project Managers", *Project Management Journal*, Vol. 17, No. 4, 1986, pp. 57-70.

Stoddard, D. B. and Javenpaa, S. L., "Business Process Redesign: Tactics for Managing Radical Change," *Journal of Management Information Systems*, Vol. 12, No. 1, 1995, pp. 81-107.

Suh, B. I., Chang, H. S. and Choi, S. Y., "Effects of Organizational Culture and Leadership on Information System Success," *Korean Management Review*, Vol. 29, No. 2, 2000, pp. 17-35.

Toni, M. S. and Nelson, K., "The Impact of Critical Success Factors across the Stages of Enterprise Resource Planning Implementations," *Proceedings of the 34th Hawaii International Conference on System Sciences*, 2001, pp. 1-10.

Umble, E. J., Haft, R. R. and Umble, M. M., "Enterprise Resource Planning: Implementation Procedures and Critical Success Factors," *ropean Journal of Operational Research*, Vol. 146, No. 2, 2003, pp. 241-257.

장활식 (Hwal-Sik Chang)

현재 부산대학교 경영학부 교수로 재직 중이며, 부산대학교에서 학사, 美 University of Oregon에서 석사, 美 Texas Tech University에서 박사학위를 취득하였다. 관심분야는 ERP, DSS, IT 성과 측정 및 평가 등이다.

옥석재 (Seok-Jae Ok)

현재 부산대학교 경영학부 교수로 재직 중이며, 부산대학교에서 학사, 석사, 영국 University of Wales, Cardiff 에서 박사학위를 취득하였다. 관심분야는 전자상거래, Supply Chain Management 등이다.

박광오 (Kwang-Oh Park)

부산대학교 경영학과에서 석사학위를 취득하고, 현재 동대학원에서 박사과정에서 중에 있다. 주요 관심분야는 ERP, 조직 변화관리, SCM 등 이다.

<Abstract>

ERP 주요성공요소간의 상호영향관계와 ERP 성과에 미치는 영향

장활식 · 옥석재 · 박광오

현대의 기업조직들은 역동적 경영환경변화에 직면하고 있다. 이러한 변화에 적응하기 위한 수단으로서, 많은 기업들이 정보기술의 도입을 적극적으로 고려하고 있다. 1990년대 중반에 등장한 ERP(Enterprise Resource Planning: 전사적 자원관리)는 이러한 정보기술의 대표적인 것으로 통합된 데이터베이스에 기초하여 기업의 연계된 업무기능을 지원하는 시스템이다. ERP시스템은 효용 및 효과 대비면에서 많은 장점을 가지고 있기 때문에 현재 우리나라의 많은 기업들이 ERP시스템을 도입하고 있다. ERP에 대한 기존의 연구들은 주로 ERP 도입 성공요소에 관한 내용이 주류를 이룬다. 그러나 이러한 주요성공요소들은 주로 시스템 개발과정의 특성만을 포함하고, 주요성공요소를 몇 개의 범주로 묶어 제시하는데 그 초점을 두고 있기 때문에, 이들 주요성공요소 간에 존재하는 상호영향관계를 충분히 반영하지 못하고 있는 실정이다. 이에 본 연구의 목적은 ERP CSF(Critical Success Factor : 주요성공요소)간에 존재하는 상호영향관계, 그리고 그러한 영향관계가 전체 ERP 성과에 어떤 효과를 가져다 주는가에 대한 총체적인 상호작용에 관한 연구가 부족하기 때문에, 이를 분석하고자 했다.

이 연구의 결과는 다음과 같다. ERP 주요성공요소 간에 존재하는 복잡한 상호영향관계를 실증분석을 통하여 측정하여 이들 간에 상호영향관계 및 선행관계가 있다는 것을 밝혀내었다. 다만, 일반적으로 BPR로 인하여 조직이 많이 변화하면 변화에 대한 사용자의 적응은 떨어질 것으로 생각되지만, 본 연구에서는 이들의 관계는 없는 것으로 밝혀졌다. 조직이 얼마나 많이 변화하였는가보다는 변화관리가 사용자가 적응하는데 더 많이 영향을 미친다고 나타나고 있다. 결국 BPR의 정도 또한 변화관리를 통해서는 사용자의 적응에 간접적으로 유의한 영향을 미치는 것으로 밝혀졌다.

Keywords: ERP, ERP CSF Interrelationship