IBIMA Publishing
Journal of Enterprise Resource Planning Studies
http://www.ibimapublishing.com/journals/JERPS/jerps.html
Vol. 2015 (2015), Article ID 205034, 16 pages
DOI: 10.5171/2015.205034

Research Article

What We Ignore During ERP Implementation Activity?

Te-King Chien and Jhih-Cian Syue

Department of Information Management, National Formosa University No.64, Wunhua Rd.,Huwei Township, Yunlin County 632, Taiwan (ROC)

Correspondence should be addressed to: Te-King Chien; tkchien@nfu.edu.tw

Received date: 23 January 2014; Accepted date: 11 December 2014; Published date: 19 May 2015

Academic Editor: Fayez Ahmad Albadri

Abstract

Many scholars have proposed all kinds researches of key successful factors (KSFs) for successfully implementing ERP, but which are quite conceptual and vague, caused enterprises couldn't apply it in practical and achieve objectives. Therefore, this research presents the required dynamic capability for each factor by integrating KSFs and dynamic capability through conducting qualitative interview method. This result not only describes the practical value of KSFs, provides a rational framework to apply dynamic capability concept, but guides academic research to a new direction.

Keywords: ERP, key successful factor, qualitative interview method, dynamic capability

Introduction

Many scholars had proposed many research results on the key successful factors (KSFs) of enterprise resource planning (ERP) activities, but due to the implementation process is extremely complicated and rapid changing, so only little research results can provide assistance for enterprise to implement ERP activity (Chien and Tsung, 2009; Hakim and Hakim, 2010). Therefore, this research based on the opinion of Gilbert (2005), will set up a "dynamic capability model of KSFs" for the implementation of ERP by combining experts' opinions, KSFs, and dynamic capability into analogical model. Hence, this research aims to (1) summarize the definition, items and KSFs of the dynamic capability proposed by scholars; (2) set up dynamic capability architecture by PDCA management cycle and qualitative interview method; (3) sort the priority of 68 KSFs in the implementation activity; (4) present the "dynamic capability model of the KSF" for ERP activities through blending KSFs and dynamic capability; (5) confirm the rationality and practical value of the model by applying case study comparison and statistical coefficients; (6) state the conclusions and management implication.

Cite this Article as: Te-King Chien and Jhih-Cian Syue (2015), "What We Ignore During ERP Implementation Activity?", Journal of Enterprise Resource Planning Studies, Vol. 2015 (2015), Article ID 205034, DOI: 10.5171/2015.205034

Literature Review

The Perspective and Item of Dynamic Capability

With the advancement and popularization in information technology, enterprises are encountering a dramatically changing environment. Therefore, many scholars propose the concept of dynamic capability to assist enterprises maintain a long-term competitive advantage. Teece et al (1997), based on resource point of view, believes that dynamic capability can cope with rapid changes of environment through integrating, setting, and redeploying enterprises' internal and external resource. In learning side, Eisenhardt and Martin (2000) consider dynamic capability as the internal evolution while enterprise using all kinds of action to deal with market change, and generate new competitive advantage, then enhancing the capability to innovate and develop. Wang and Ahmed (2007) view in the capability perspective, believe that dynamic capability is a deployment, creation and capability, which can gradually improve during enterprises modifying competitive advantage according to market change. Teece (2007) has redefined dynamic capability as enterprises' intangible asset to effectively deploy resource, and maintaining business long term advantage.

ERP Implementation Stage Process and Key Successful Factors

Undeniably, the ERP system can bring many benefits, but its implementation activity is fraught with risk. Therefore, many scholars had proposed ERP implementation process which can assist enterprises to establish a clear policy (Chien and Tsung, 2009). Umble et al (2003) based on the view point of user, to emphasize the importance of organizational adaptation and education. In process perspective, Hallikainen et al (2009) proposed staged process to illustrate the importance of consistency between process and system. However, the implementation activity requires many resources, so many scholars propose KSFs to assist enterprise controlling the key point (Bueno and Salmeron, 2008; Shafaei and Dabiri, 2008; Kronbichler et al, 2009; Hakim and Hakim, 2010).

Qualitative Interview Method

To achieve the objective, this research adopts 3 qualitative interview methods, because it can effectively summarize experts' opinions, and find clear causality. (1) KJ method can find the correlation between chaotic factors, and clustering them into a group (Kawakita, 1991). Therefore, KJ method not only assists enterprise to classify and rename the clustered group from certain data, but set up the structural architecture and the level of subject. The implementation processes include 5 steps (Cheng and Leu, 2011).

(2) Focus group interviews method is a congregate discussion, which is concerning on special topics, and communicate with numerous experts and scholars. Meanwhile, it can generate a complete and implementable result through selecting, confirming, suggesting, and correcting consensus with experts (Krueger, 1994). Furthermore, Lin and Wang (2011) used the method to acquire experts' consensus, and set up a selection model so as to find appropriate software system. The implementation processes of this method include 8 steps (Stewart et al, 2007).

(3) Delphi method can acquire experts' consistent opinion through distributing expert questionnaire several times. Therefore, it not only can help experts to revise and confirm the result, but ensure all participants present its opinion comprehensively, and free from other experts opinion (Steinert, 2009). Hence, Huang et al (2004) applied this method to carry out 3 questionnaire surveys, and acquired 28 risk factors in the ERP implementation project. The implementation processes include 8 steps (Zolingen and Klaassen, 2003).

Dynamic Capability Model of KFSs

In order to make KSF more useful and valuable during implement ERP, this

research follows Gilbert's (2005) opinions, then set up "dynamic capability model of KSFs" for implementation of ERP activities through combining professional consensus, dynamic capability, and key factors. Hence, this research will obtain the following 3 results: (1) dynamic capability architecture; (2) KSFs and its appropriate position; (3) dynamic capability model of KSF. However, due to experts, professional opinions and complicated causality are required for the result; this research will adopt the following 3 qualitative interview methods: (1) KJ method; (2) Focus group interviews; (3) Delphi method.

To ensure the rationality of implemented process and result of these 3 methods, this research adopts following 4 principles in overall research process: (1) execute KJ method with a professional management consultant through 5 steps proposed by Cheng and Leu (2011); (2) held focus group interview with 3 experienced ERP consultants and 2 scholars through 8 steps proposed by Stewart et al (2007); (3) implement Delphi questionnaire survey with 5 ERP consultants, 3 scholars, and 5 enterprise ERP implementation project directors through 8 steps proposed by Zolingen and Klaassen (2003); (4) invite a professor who had experienced in teaching dynamic capability and practices.

Dynamic Capability Architecture

Enterprise can continuously improve and accumulate experience in ERP implementing through practicing Plan-Do-Check-Action management cycle and ISO (International Organization for Standardization) standards, then achieving goal with cultivating vitality and enhancing core competitiveness (Chien et al, 2002). Therefore, this research will build the dynamic capability architecture through following the process: (1) based on PDCA cycle to redefine the categories and item of dynamic capability; (2) summarize the 8 categories and 52 items (dynamic capability) from 5 dynamic capability related papers; (3) To integrate dynamic capability item from different researches into PDCA cycle, this research classify the above 8 dynamic capability categories and 52 items into PDCA dimensions through KJ method; (4) Then, this research based on the attribute of each cluster, to defines the name of each category, and perform focus group interview method to confirm the rationality of the above research result. However, the meaning of PDCA management cycle still cannot be fully described by the 8 categories. Thus, according to experts and scholars' comments, this research adding 3 categories, and combining 8 items into 4 items, then set up dynamic capability architectural prototype, which contains 4 dimensions, 11 categories and 48 items; (5) This research conduct the first Delphi questionnaire (Likert 5 scale) survey to confirm the rationality of this prototype; (6) This research examines the consistency among all items in questionnaire through Quartile Deviation (Q) method and judgment criteria proposed by Faherty (1979); (7) Furthermore, while the overall consistency of questionnaire $>$70%, it means an adequate experts' consensus is generated (Murray and Hammons, 1995); (8) distributes the second Delphi questionnaire survey in the next week to ensure the overall consistency $>$70%; (9) Finally, once the item's score $\geqq$3.5, it implies the appropriateness of questionnaire items is sufficient (Likert, 1932).

With the above procedure, this research received all 13 completed Delphi questionnaires in the first stage. And, this results presents: (1) 16 dynamic capability items are highly consistent ($Q \leqq 0.6$); (2) 23 dynamic capability items are fairly consistent ($0.6 \leqq Q \leqq 1$); (3) 9 dynamic capability items are poorly consistent ($Q > 1$). Hence, the overall consistency (high and medium consistency) of the questionnaires is achieving 81.4% (=39/48). Although the overall consistency of Delphi questionnaire in the first stage had exceeded 70%, which is fitting the criteria suggested by Murry and Hammons (1995), but this research still carried out the second Delphi questionnaire survey in next week. The second Delphi survey result says: (1) 24 items are highly consistent; (2) 18 items are fairly consistent; (3) 6 items are poorly consistent. Hence, the overall consistency is 87.5% (=42/48). At the same time, the mean of each item in the survey

questionnaire is ≧3.5, which achieve the standard proposed by Likert (1932). Consequently, this research establish the dynamic capability architecture (as shown in Table 1), which is rational and reliable through comprehensively examining.

Table 1: Dynamic capability architecture

Perspective	Category	Item (dynamic capability)
Plan	PS Sense	PS1 Market dynamism
		PS2 Process to tap supplier and complementor's innovation
		PS3 Process to tap developments in exogenous science and technology
		PS4 Demonstrate leadership
		PS5 Best practice
	PA Analysis	PA1 Path dependency
		PA2 Technological opportunities
		PA3 Organizational and strategic routines
		PA4 Capability possession/distinctive Resource
		PA5 Calibrate asset specificity
		PA6 Assess appropriability
		PA7 Process to identify target market segments, change customer needs, and customer innovation
	PP Positions	PP1 Organizational boundary and Institutional asset
		PP2 Market asset
		PP3 Financial asset
		PP4 Reputational asset
		PP5 Technological asset
		PP6 Complementary asset
		PP7 Structural asset
	PD Decision making	PD1 Recognize, manage, and capture co-specialization
		PD2 Avoid decision error
		PD3 Select target customers
		PD4 Embrace open innovation
		PD5 Select the technology and product architecture
		PD6 Capability deployment/Resource allocation
Do	DP Processes	DP1 Coordination/integration/effective communication
		DP2 Reconfiguration and transformation
		DP3 Process to direct internal R&D and select new technology
		DP4 Anti cannibalization proclivity
	DS Structure	DS1 Design mechanisms to capture value
		DS2 Design revenue architectures
		DS3 Adopt loosely coupled structures
	DM Maintain	DM1 Minimize agency issue
		DM2 Achieve know-how and intellectual property protection
		DM3 Block rent dissipation
		DM4 Co-specialization
Check	CR Opportunity	CR1 Recognize non-economic factor, value, and culture
		CR2 Achieve incentive alignment
	CC Control	CC1 Recognize inflexion point and complementarity
		CC2 Check strategic malfeasance
		CC3 Control bottleneck asset
Action	AL Learning	AL1 Capability upgrading/dynamic learning and its mechanism

		AL2 Knowledge transfer
		AL3 Knowledge integration
	AC Capability	AC1 Adaptive capability
		AC2 Absorptive capability
		AC3 Creative capability
		AC4 Develop skill of integration and coordination

KSFs and Its Appropriate Location

Additionally, to place KSFs (hereafter abbreviated as "factors") into each stage of implementation process, this research (1) try to integrate factors which has similar definition, then combining 187 ERP factors into 79 factors by implementing KJ method; (2) this research has complied experts' opinion in focus group interview, to combine 8 similar items into 4 items, eliminate 2 inappropriate factors, and obtain 73 (=79-6) factors; (3) then, this research had classified the 73 factors to 3 stages: (a) before implementation; (b) during implementation; (c) after implementation, which describe a casual priority in the process of implementation activity. Furthermore, to confirm the rationality of result, this research has performed two stages of Delphi questionnaire survey. The first survey contains 13 questionnaires, which shows: (1) 28 factors are highly consistent; (2) 28 factors are fairly consistent; (3) 17 factors are poorly consistent. Hence, the overall consistency of the survey questionnaire is 76.7% (=56/73). In the second stage, this research acquires: (1) 32 factors are highly consistent; (2) 31 factors are fairly consistent; (3) 10 factors are poorly consistent. Consequently, the overall consistency is 86.3% (=63/73), which is $>$70%. However, the mean value of 5 factors such as "implementation time" and "software setup" is $<$3.5, so this research had deleted the 5 factors. Therefore, 68 (=73-5) appropriate and rational factors are obtained.

Although 68 factors of KSFs are categorized into 3 stages, but it still too rough and difficult to be adopted. Thus, this research invites 5 experienced ERP consultants to carry out focus group interview. Through these ERP consultants compared the 5 ERP implementation related papers (Parr and Shanks, 2000; Rajagopal, 2002; Umble et al, 2003; Esteves and Bohorquez, 2007; Chien and Tsung, 2009), they says the result proposed by Chien and Tsung (2009) is more practical, because which is found based on PDCA management cycle, to establish 25 implementation category. It not only draws a detailed implementation map, but help enterprise to figure out the causality of each implementation factor. Therefore, this research is referring the architecture to allocate the categories of 68 factors.

After performing twice KJ method, this research transposes 68 factors into appropriate locations of 22 categories. And, this research holds focus group interviews to confirm the rationality of the result. During interviewing, experts only adjusts the categories of 4 factors, but doesn't increase or decrease factors. Moreover, this research will implement the second twice Delphi questionnaire survey, to confirm the rationality of each factor location. The first questionnaire survey result reveals: (1)18 items are highly consistent; (2) 39 items are fairly consistent; (3) 11 items are poorly consistent. Hence, the overall consistency is 83.8% (=57/68). Sequentially, the second questionnaire survey result shows: (1) 23 items are highly consistent; (2) 37 items are fairly consistent; (3) 8 items are poorly consistent. Consequently, the overall consistency is 88.2% (=60/68). In the meantime, the mean values of all question items are $\geqq$3.5 (meet the standard). Hence, the attribution locations of 68 KSFs in this research are appropriate and rational through carefully confirming (in Table 2).

The Dynamic Capability Model of KSFs

In order to set up "dynamic capability model of KSFs", this research aims to blend KSFs and dynamic capability concepts, then (1) propose the correlation of 68 KSFs and 289 dynamic capability by conducting KJ method; (2) deletes 35 dynamic capabilities items depend on the consensus

from focus group interviews. Therefore, this research acquires 254 dynamic capability items as an initial result; (3) to confirm the rationality of focus group interview result, this research will perform twice Delphi questionnaire survey in following stages.

In the result of the first stage of questionnaire survey, this research acquired 64 items of high consistency, 143 items of medium consistency, and 47 items of non-consistency. Hence, the overall consistency is 81.5% (=207/254). Although the overall consistency is sufficient (≧70%), but this research still conduct the second Delphi questionnaire, to double-check the reliability. The second Delphi result presents: (1) 108 items are highly consistent; (2) 107 items are fairly consistent; (3) 39 items are poorly consistency. So, the overall consistency is 84.6% (=215/254). Among them, because the mean values of 11 dynamic capability items are ＜3.5 (lower than the judgment standards), so this research had delete the 11 items. Now, this research has acquired 243 reliable and rational dynamic capability items (in Table 2).

In Table 2, the left side is 4 dimensions and 22 categories proposed by Chien and Tsung (2009). Then, the 68 KSFs are included in categories. Additionally, the dimensions and categories in Table 2 are retrieved from the top of Table 1. Furthermore, the crossover points between the KSFs and the dynamic capabilities are the essential dynamic capability while enterprises aim to achieve the KSFs. Also, the serial numbers are filled in each crossover point is the body of Table 1.

The implication of the Dynamic capability model

In Table 2, each ERP implementation stage contains obviously different amount of dynamic capability categories, items, and KSFs, which is shown in Table 3 “Dynamic capability model of KSFs”. For instance, the Plan dimension contains 12 categories, 50 KSFs, 196 items, which acquire high score of KSF capability mean (3.92=196/50). This means once enterprises aim to implement the Plan dimension, which is (1) the most complicated part during implementing ERP; (2) requires many attentions, careful operation and treatment by the enterprise supervisor; (3) requires great efforts of manpower and resource; (4) needs many dynamic capability. Furthermore, this result says the Plan dimension may dramatically influence the ERP implementation activity, which was consistent with the research result proposed by AL-Hudhaif (2012).

Additionally, in dynamic capability, the “processes capability” in Do dimension involves 4 dimensions and 15 categories, which is the most active dynamic capability category obviously in the entire implementation process. Moreover, the “decision making” under Plan dimension contains 32 KSFs number of “DC involved IA”, and 42 dynamic capabilities number of “implementation activity”. So, the “decision making” capability category (1) can help the enterprise to achieve the large amount of KSFs; (2) feature giant effect within the processes activity. Hence, the “decision making” capability category needs many supporting and efforts from the top management. Furthermore, because following 4 categories (processes, sense, capability, analysis) containing relatively more “subtotal number of DC involved IA”, which imply they are crucial, so enterprise can set them as core education training items.

Table 2: Number distribution of implementation activity and dynamic capabili

Dynamic Capability (DC) / Key success factor				Plan				Do			Check		Act		IA involved DC		
				Sense	Analysis	Positions	Decision making	Processes	Structure	Maintain	Opportunity	Learning	Learning	Capability	Subtotal	Category mean	KSF mean
Implementation Activity (IA)	P	12	50	26	23	19	42	25	4	13	11	15	3	15	196	16.33	3.92
	D	5	10	1	2	0	1	6	0	1	0	0	3	9	23	4.60	2.30
	C	2	2	0	0	0	0	2	1	0	2	1	0	0	6	3	3
	A	3	6	1	0	0	1	2	1	0	2	6	2	3	18	6	3
DC involved IA		Subtotal	68	28	25	19	44	35	6	14	15	22	8	27	243	11.04	3.57
		Number of perspective		3	2	1	3	4	3	2	3	3	2	3			
		Category number		10	11	6	14	15	7	6	11	9	5	14			
		KSFs number		18	21	18	32	28	7	11	15	15	5	26			

Table 3: Dynamic capability model of KSFs

			Dynamic capability architecture										
			Plan				Do			Check		Act	
		Key successful factor	Sense	Analysis	Positions	Decision making	Processes	Structure	Maintain	Opportunity	Control	Learning	Capability
Plan	Activation of project	Support from higher level manager	PS4				DP4						
		Organization's commitment change, extensive support and high level of implementation	PS4			PD6	DP4			CR2			AC4
	Assessment of consultant	Hiring of consultant				PD2							
		Consultant knowledge, experience and capability	PS1 PS3	PA7	PP1	PD1 PD2 PD6	DP1	DS2	DM3	CR1	CC1		
		Effective and correct usage of consultant/ experienced expert					DP3 DP4			CR1	CC1		AC4
	Seizing of the current status	The exploiting of the current expert	PS2 PS3	PA6	PP5	PD1 PD5			DM2 DM3	CR1	CC1 CC2 CC3		
		Confirmation and understanding of the need of change, the degree of change needed, and the necessity of change	PS1				DP4			CR1			
		Possibility to define the concept objectively		PA7			DP1						
		Complexity of the organizational flow					DP1 DP2			CR1			
		Complexity of the organizational structure			PP7								
		Traditional organization and team work culture			PP7								
		Traditional organizational strategy		PA1									
		The exploitation of business and technological analyzer	PS1 PS2 PS3	PA4 PA5 PA6	PP5						CC2		

				PA7									
		Organizational IT technology and infrastructure and its architecture		PA2	PP6		DP3						
		Company and project scale and breadth/complexity and height/number of employee involved/does the time exceed three years			PP1	PD5							
		Organizational adaptation/architecture			PP7								
		Environmental effect	PS1										
		Human resource factor				PD4	DP1						
	Target ensuring	Corporate plan and vision		PA7		PD3 PD5	DP3						
	Team forming	Excellent project leader/decision maker/project manager	PS1 PS2 PS3 PS4	PA1	PP1	PD4 PD5 PD6	DP1 DP3 DP4	DS1			CC1 CC3		AC4
		Aggressive participation of related personnel such as user/customer, project leader and user	PS4				DP1 DP4			CR2			AC1
	Clear right and responsibility	Appropriate distribution of responsibility				PD6		DS3					AC4
	Selection of supplier	Support from the supplier			PP7	PD1			DM1 DM3 DM4				AC4
		Good supplier/subcontractor/consultant	PS3			PD2	DP3		DM3	CR1	CC1		AC4
		Enough information from ERP supplier				PD2 PD5			DM3				
		Supplier's experience, capability, reputation and quality			PP4	PD5							
		ERP system cost, which includes: hardware cost, software cost, system maintenance cost and consultation fee needed.		PA2		PD5			DM3				
		Partnership	PS2		PP7	PD1			DM4				AC4
		System reputation			PP2 PP4	PD5							
		Architecture selection				PD5							

		ERP system characteristics, which include: perceived usefulness, easy to learn, reliability and flexibility.		PA2		PD5							
		ERP system quality: That is, the accuracy and integrity of the data provided.		PA2		PD2 PD5							
		The appropriateness of ERP software on the current need and the planning consistency.							DM1				AC4
		ERP system characteristics, which include: System flexibility, its capability to provide real time information, modularization, possibility for development and upgrading		PA2		PD5	DP3						
		Possibility for implementing solution for that industry	PS5										
	Assessment of project	Risk treatment/assessment/management	PS1		PP3	PD2			DM3				
		Delivery date			PP3								
		Project planning				PD6							
		Effective project management		PA7	PP1	PD6	DP4	DS3		CR1	CC1 CC2 CC3	AL3	AC4
		Possess sufficient budget and resource, and allocate them well			PP6	PD6							AC4
		Different view point (It should be able to be combined with "diversified topics")	PS1 PS2 PS3	PA5 PA7		PD1				CR1	CC1		
	Setup of index	Clear, real and stable organization goal and objective		PA7		PD2 PD3 PD5 PD6							
	Discovery of difference	Select correct experiences for learning from the past project management method and experience as well as best paradigm from the same industry.	PS5	PA1								AL1 AL3	AC2
		Culture and architecture change			PP7								
	Activity	Real/perfect/detailed project scheduling				PD2					CC2		AC4

	regulating	and continuous updating.											
		Change management and procedure		PA6			DP1	DP2					
		Effective/sufficient change management				PD4	DP2						
		Change management capability											AC3
		Business process management and reconstruction		PA3		PD6	DP1 DP4			CR1	CC1		AC4
	Module assignment	Appropriate implement strategy and implementation method	PS1 PS2	PA1		PD2 PD5			DM3				
Do	Educational training	System user/client end commitment and support					DP4						AC1
		Encouragement of team work and personnel cooperation, and the adoption of effective action by the user											AC1
		The providing of continuous and sufficient to the final user (employee)					DP4					AL1 AL2	AC2
		Effective and good communication and feedback					DP1						AC4
	Confirmation of template	Total document and improvement										AL3	AC4
	Data conversion	Old system (The remained IT system)		PA2		PD5	DP3						
		The capability to integrate ERP and the current IS/IT		PA2			DP2						AC1 AC4
		Analysis and conversion of the data remained in the old system							DM3				AC4
	Confirmation of system	Correct expectation and trust on ERP system	PS4				DP4						
	Online announcement	System development, test and the release of error/trouble											AC4
Check	Monitoring result	Preparation of performance system and related system, and the effective management, monitoring, assessment and control of the result and performance.					DP4			CR2			
	Confirmation of result	Information quality					DP1	DS1		CR1	CC2		
n	Discovery of major cause	Proposition/suggestion from the user								CR1	CC1		
		(Monitoring and) feedback						DS1			CC1		

											CC2		
	Correction of the target	Minimal customization					DP1						AC4
	Correction of mechanism	Plan stop/review/acceptance of possible failure									CC2		
		Solving of problems								CR1	CC1 CC2		AC4
		Continuous education on the decision making group	PS4			PD2	DP1					AL1 AL3	AC4

Case Comparison

In order to understand the rationality and application value of the result, this research carries out case studies and investigates the ERP implementation activity from 6 enterprises; they are coming from north, central, and south of Taiwan.

The overview and implementation condition of these 6 companies are shown in Table 4. In table 4, the column of "enterprise overview" includes 5 parts: (1) the "enterprise scale" means the number of ERP end-users in the organization; (2) the "number of implementation year" means the period from implement ERP until now; (3) the "external consultant" means the number of external management consultants; (4) the "project team (year)" means the ages of project team; (5) the "project team (person)" means the amounts of team members.

In this table 4, the "implementation result" reveals 5 stages to implement ERP, which was proposed by experts and scholars who were participating on focus group interviews. The values in the "implementation result" are the average values (Likert 7 scale) replied from by 5 enterprise project team directors. In "activity achieving capability" column, (1) the P, D, C, A implies 4 dimension of PDCA management cycle, which is placed under "Key Success Factor" English alphabet under the column of "perspective", representing in the column of Table 2. And, the scores under "DC" column are calculated from the "Subtotal" field of "Dynamic Capability (DC)" in Table 2; (2) the "value" in table body was "mean value" calculated by averaged KSF number and DC number that the enterprise is achieving currently. Finally, "The achievement rates (%) of KSF and DC" are ratios, which indicate KSF number/total KSF number, and DC number / total DC number.

Table 4: Comparison of case study enterprise in achieving KSFs and possessing DC

Comparison items				Corporate attributes					
				Automobile	Electric appliance	Machines	Services	Components	Temples
Enterprise overview	a. Enterprise scale (person)			220	198	75	53	46	21
	b. Number of implementation year (year)			18	16	15	11	9	3
	c. External consultant (person)			8	6	3	2	1	1
	d. Project team (year)			18	16	15	10	9	1
	e. Project team (person)			12	10	8	6	5	1
Implementation result	1. Understanding of module function			6.1	6.4	5.8	5.0	5.0	4.3
	2. Real time login data			6.2	6.4	6.2	5.6	6.0	4.4
	3. Data integrity and correctness			5.9	6.2	6.1	5.3	5.8	4.9
	4. Setup performance index			5.7	6.1	5.1	3.8	4.2	2.1
	5. Prediction of future trend			4.1	4.3	3.5	2.5	3.2	2.0
Capabilities achieving	Perspective	KSF	DC	KSF number/DC number that each company can achieve					
	P	50	196	45/161	47/178	42/153	33/109	38/112	27/89

	D	10	23	10/17	9/21	8/14	7/12	7/15	6/12
	C	2	6	2/4	2/5	2/4	1/3	2/4	1/2
	A	6	18	6/12	6/12	5/10	3/7	4/8	2/5
	Subtotal	68	243	63/194	64/216	57/181	44/131	51/139	36/108
The achievement rates (%) of KSF and DC				1.16 (=93/80)	1.06 (=94/89)	1.12 (=84/75)	1.02 (=65/54)	1.32 (=75/57)	1.20 (=53/44)

In order to understand the correlation among all items of "enterprise overview", "implementation result", and "the achievement rates (%) of KSF and DC", this research performed paired test through applying Spearman's Rho coefficient, which says (1) in "enterprise overview" section, the correlation coefficient and significance between "external consultant" and KSF number, or DC number is relatively poor (0.882** and 0.841**); (2) in "implementation result", the correlation coefficient and significance between "data integrity and correctness" and KSF number or DC number is relatively poor (0.899**, 0.943**); (3) the correlation coefficient between KSF number and DC number is 1.000***; (4) the correlation coefficient and significance between "enterprise overview" and KSF number or DC number is lower than "implementation result", but still remains highly positive.

This means (1) the "external consultant number" only has lower effect to achieve KSF and DC; (2) "data integrity and correctness" also hard to influence enterprises to achieve the KSF and DC; (3) while an enterprise achieving more KSF number, it will feature more DC number; (4) "implementation result" has much stronger effect on achieving KSF and DC compared to "enterprise overview".

To figure out the correlation difference between multiple factors, this research aims to conduct Kendall's W test, which calculates concordance coefficients (W), and presents the following result: (1) in "implementation result", the "W" equals to 0.901***; (2) "Project team (person)", "DC number", and 5 parts of "Implementation result" featuring relatively lower correlation coefficient with "Enterprise overview" (W=0.800***). This implies that: (1) during the ERP activity process, the 5 scopes may influence others scope as well; (2) the "project team (person)" featuring weaker importance degree while "implementation result" and "DC number possessed by an enterprise" are considered as well.

Furthermore, this research found the correlation between "project team (person)" and "DC number possessed by an enterprise" is stronger than the "external consultant number". However, if "implementation result" is taken into consideration, the correlation would be worse. This indicates: (1) when project team contains more members, it is helpful to achieve DC; (2) once the "external consultant number" is fewer, the "implementation result" and the possession of such enterprise's DC number will become fewer also.

Management implication

So, this research interviewing with enterprises' directors, and structures this result of case study, which not only verifies the practical value of this research, but provides the following 3 aspects of management implication: (1) in management application aspect, the enterprises can (a) inspect the insufficiency of ERP implementation activity and improve project management action through reviewing PDCA management, KSFs categories, and items; (b) effectively set up the training direction of organizational dynamic capability through applying dynamic capability architecture; (c) discover risk and abnormity in advance, and find the weak dynamic capability, then prevent accidents occurrence; (d) examine the capability of ERP project team and consultant based on the result; (2) in management mechanism aspect, the

enterprises can (a) reinforce the operation mechanism of ERP implementation project activity; (b) establish the resource distribution mechanism for project activity through realizing key success factors; (c) correct training guideline and its operation mechanism; (d) set up the performance assessment mechanism for ERP project team and consultant through this model; (3) in management decision making aspect, the enterprises can (a) make reasonable resource allocation on each department and different ERP implementation stage; (b) propose well-designed appropriate human resource development strategy and decision, which could enhance the essential dynamic capability of ERP implementation activity; (c) indicate an appropriate guideline and resource adjustment decision to accelerate the effectiveness of ERP implementation activity.

Conclusion

In the past, although lots of scholars have proposed research results related to the KSFs, when enterprise directors are applying these conceptual guidelines and suggestions, they often fail to correctly seize necessary actions and required capabilities during the implementation process. Moreover, since the entire implementation is a dynamic and changeable process for project activity, enterprises frequently fail to obtain the ERP implementation benefit from previous research result.

Therefore, this research has (1) converted the perspective and item of dynamic capability into PDCA management cycle, so as to set up a dynamic capability architecture having 4 dimensions, 11 categories and 48 capability items (Table 1); (2) integrated the 4 dimensions and 22 categories (Chien and Tsung, 2009) and 68 KSFs proposed become a referable procedure, which can be implemented and generated more practical value of ERP implementation; (3) integrated dynamic capability architecture and KSF in the PDCA management cycle, then propose "the dynamic capability model of KSF" as shown in Table 2.

To further describe the implication of the model, this research presents the importance degree between different categories or KSFs and then displays important degree and selection basis of each dynamic capability category. Furthermore, this research aims to confirm the rationality and application value of this research result, so conduct case study comparison, which says highly positive correlation between "the achievement rate (%) of KSF and DC", "enterprise overview", and "implementation result". This means the result could assist enterprise to achieve KSFs, enhance dynamic capability, and even successfully implement ERP. Finally, this research has clearly described how to apply this model, and introduce the meaning of this model in management application aspect, management mechanism aspect, and management decision aspect.

This research suggestion following future research directions: (1) consider conditions such as importance, time and resource, then establish criteria for selecting and incubating all kinds of dynamic capability; (2) develop the map of dynamic capability through applying casual path method, and linking the relationship among each dynamic capability.

References

1. AL-Hudhaif, S A. (2012), 'ERP implementation at King Saud university,' *Global Journal of Management and Business Research*, 12 (5), 71-78.

2. Bueno, S. and Salmeron, J L. (2008), 'Fuzzy modeling enterprise resource planning tool selection,' *Computer Standards & Interfaces*, 30 (3), 137-147.

3. Cheng, Y M. and Leu, S S. (2011), 'Integrating data mining with KJ method to classify bridge construction defects,' *Expert Systems with Applications*, 38 (6), 7143-7150.

4. Chien, T K. and Tsung, H S. (2009), 'How can we successfully implement the ERP activity' Proceedings of the IEEE International Conference on e-Business

Engineering (ICEBE), ISBN: 978-0-7695-3842-6, 21-23 Oct. 2009, Macau, 295-300.

5. Chien, T K., Su, C H. and Su, C T. (2002), 'Implementation of a customer satisfaction program: A case study,' *Industrial Management & Data Systems*, 102 (5), 252-259.

6. Eisenhardt, K M. and Martin, J A. (2000), 'Dynamic capabilities: What are they,' *Strategic Management Journal*, 21 (10/11), 1105-1121.

7. Esteves, J. and Bohorquez, V. (2007), 'An updated ERP system annotated bibliography: 2001-2005,' *Communications of the Association for Information Systems*, 19 (1), 386-446.

8. Faherty, V. (1979), 'Continuing social work education: Results of Delphi survey,' *Journal of Education for Social Work*, 15 (1), 12-19.

9. Gilbert, J K. (2005) Visualization: a meta-cognitive skill in science and science education, Springer-Verlag, Now York.

10. Hakim, A. and Hakim, H. (2010), 'A practical model on controlling the ERP implementation risks,' *Information Systems*, 35 (2), 204-214.

11. Hallikainen, P. Kivijarvi, H. and Tuominen, K. (2009), 'Supporting the module sequencing decision in the ERP implementation process- An application of the ANP method,' *International Journal of Production Economics*, 119 (2), 259-270.

12. Huang, S M., Chang, I C., Li, S H. and Lin, M T. (2004), 'Assessing risk in ERP projects: Identify and prioritize the factors,' *Industrial Management & Data Systems*, 104 (8), 681-688.

13. Kawakita, J. (1991), The original KJ Method, Kawakita Research Institute, Tokyo.

14. Kronbichler, S A., Ostermann, H. and Staudinger, P. (2009), 'A review of critical success factors for ERP-project,' *The Open Information Systems Journal*, 3, 14-25.

15. Krueger, R A. (1994), Focus groups a practical guide to applied research, Thousand Oaks, Canada.

16. Likert, R. (1932), 'A technique for the measurement of attitudes,' *Archives of Psychology*, 22 (140), 1-50.

17. Lin, C W. and Wang, C H. (2011), 'A selection model for auditing software,' *Industrial Management & Data Systems*, 111 (5), 776-790.

18. Murry, J W. and Hammons, J O. (1995), 'Delphi: A versatile methodology for conducting qualitative research,' *The Review of Higher Education*, 18 (4), 423-436.

19. Rajagopal, P. (2002), 'An innovation—Diffusion view of implementation of enterprise resource planning (ERP) systems and development of a research model,' *Information & Management*, 40 (2), 87-114.

20. Shafaei, R. and Dabiri, N. (2008), 'An EFQM based model to access an enterprise readiness for ERP implementation,' *Journal of Industrial and Systems Engineering*, 2 (1), 51-74.

21. Shanks, G. (2000), 'A model of ERP project implement,' *Journal of Information Technology*, 15 (4), 289-303.

22. Steinert, M. (2009), 'A dissensus based online Delphi approach: An explorative research tool,' *Technological Forecasting and Social Change*, 76 (3), 291-300.

23. Stewart, D W., Shamdasani, P N. and Rook, D W. (2007), Focus groups: Theory and practice, Thousand Oaks, Canada.

24. Teece, D J. (2007), 'Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance,' *Strategic Management Journal*, 28 (13), 1319-1350.

25. Teece, D J., Pisano, G., Shuen, A. and Shuen, A. (1997), 'Dynamic capabilities and strategic management,' *Strategic Management Journal*, 18 (7), 509-533.

26. Umble, E J., Haft, R R. and Umble, M M. (2003), 'Enterprise resource planning: Implementation procedures and critical success factors,' *European Journal of Operational Research*, 146 (2), 241-257.

27. Wang, C L. and Ahmed, P K. (2007), 'Dynamic capabilities: A review and research agenda,' *International Journal of Management Reviews*, 9 (1), 31-51.

28. Zolingen, S J V. and Klaassen, C A. (2003), 'Selection processes in a Delphi study about key qualifications in senior secondary vocational education,' *Technological Forecasting & Social Change*, 70 (4), 317-340.