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What dynamic capabilities are needed in ERP activity?

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Abstract

Although many scholars have proposed all kinds of key successful factors (KSFs) for ERP activity to smoothly enhance the implementation of ERP, the KSFs are based too much on concept and protocol cannot help an enterprise to achieve this objective. Therefore, this research through qualitative interview method, integrating the KSFs and dynamic capability to set up a model so as to exhibit the kind of dynamic capability needed for each factor. This result not only creates practical value for the KSFs and displays implementable effectiveness for the dynamic capability concept, but also brings a new direction to the academic research.

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

Introduction

Although there are rich and diversified research results on the key successful factors (KSFs) of enterprise resource planning (ERP) activities, but the implementation process is a dynamic phenomenon of continuing variation, so they can only provide limited help for the implementation of ERP activity to an enterprise [1,2]. Therefore, this research, based on the opinion of Gilbert [3], is going to adopt an analogical model with

professional consensus and to associate two concepts, key factors and dynamic capability, so as to set up a "dynamic capability model of the KSF" for the implementation of ERP. In light of the above research objectives, this research is going to (1) summarize the perspectives, items and key success factors of the dynamic capability proposed by scholars; (2) using qualitative interview method, follow the PDCA management cycle to set up a dynamic capability architecture; (3) sort out 68 KSFs and give it an appropriate position in the implementation activity; (4) integrate KSFs and dynamic capability architecture to exhibit the implementation of a "dynamic capability model of the KSF" in ERP activities; (5) perform case comparison and use related coefficients of the statistics to confirm the rationality and application value of the model; (6) lay out the conclusions and manage meaning based on the findings.

Literature review

The perspective and item of dynamic capability

With the advancement and popularization in information technology, enterprises are in a rapidly changing environment today. Therefore, many scholars proposed the concept of dynamic capability, to assist enterprises maintain long-term competitive advantage. Teece et al. [4] from a resource point of view, believes that dynamic capability is the capability of an enterprise for integration, setup and re-deployment of internal and external skills and resources in order to cope with the rapid environmental changes. Eisenhardt and Martin [5]Error! Reference source not found. from the learning point of view, believes that dynamic capability is the evolution of an enterprise using all kinds of actions to cope with market change and generate new competitive advantage, with the enterprise's innovative and development capability enhanced accordingly. Wang and Ahmed [6] from the view point of capability, believes that dynamic capability was the deployment, creation or updating capability to modify the competitive advantage in accordance with the change of the market. Teece [7] has re-defined dynamic capability as the intangible asset of an enterprise to deploy resource effectively and to create, protect and support long term business operation performance.

ERP implementation stage process and key successful factors

Although the ERP system can bring many benefits, but implementation activity fraught with risk that is also an indisputable fact. Therefore, many scholars proposed ERP implementation stage process, to give businesses a clear policy to promote [1]. Umble et al. [8] emphasized the important of organizational adaptation and education from the view point of the user. Halikainen et al. [9] proposed stage process from the view point of process, to illustrate the importance of consistency between the process and the system. However, because the implementation activity will cost much resource, so many scholars proposed KSFs to assist enterprise to control the central points [2,10-12].

Qualitative interview method

Since the research objective has characteristics of high expert opinion and cause-and-effect basis, the quality interview method is going to be adopted for the entire research

process. Among them, KJ method has characteristics of summarizing chaotic factor, setting up mutual correlation and clustering into one group [13]. Therefore, it can perform classification and naming on related data collected under certain clear subjects so as to set up the structural architecture and level of the subject. The implementation steps include 5 items [14].

The focus group interview method is clustering discussion on certain special topics through multiple experts and scholars. Meanwhile, actions such as selection, confirmation, suggestion and correction are done so that the topic can display a complete and implementable result [15]. Therefore, Lin and Wang [16] used this method to acquire an expert's consensus and to set up a selection model so as to select appropriate software system. The implementation steps include 8 items [17].

The Delphi method is methodology done through multiple and repeated questionnaire confirmation so as to acquire consistent expert opinion. Therefore, it can perform result confirmation such as recognition, revision and release on the entire questionnaire and respective question item of the complication issue [18]. Therefore, Huang et al. [19] applied this method to perform three questionnaire surveys and acquired 28 risk factors for the ERP implementation project. The implementation steps include 8 items [20].

Dynamic capability model of key successful factor

In order to make the KSFs to generate practical application value on the dynamic phenomenon during the activity process, this research will follow the opinion of Gilbert [3] and is going to adopt an analogical model with professional consensus and associate two concepts of key factors and dynamic capability so as to set up "dynamic capability model of KSF" for the implementation of ERP activities. In order to set up this model, this research will complete the following three results in sequence: (1) dynamic capability architecture; (2) KSFs and its appropriate position; (3) dynamic capability model of KSF. Since model has characteristics of high professional opinion and cause-and-effect basis, so this research is going to adopt three kind of qualitative interview method: (1) KJ method; (2) Focus group interview; (3) Delphi method.

In research process, In order to ensure the rationality of the implemented process and result of this method, this research is going to follow thoroughly the following four principles: (1) Invite 1 expert who has successfully instructed 40 enterprises for the implementation of ERP, and followed 5 steps proposed by Cheng and Leu [14] to co-implement the KJ method; (2) Invite 3 ERP consultants with more than 10 years of practical experiences and 2 scholars who have taught ERP curriculum for more than 7 years, and followed 8 steps proposed by Stewart et al. [17] to co-implement the focus group interview method; (3) Invite 5 ERP consultants with more than 10 years of practical experiences, 3 scholars who have taught ERP for more than 7 years and 5 enterprise directors who have acted more than 5 years in the ERP implementation project, and followed 8 steps proposed by Zolingen and Klaassen [20] to co-implement the Delphi questionnaire survey; (4) In the entire interview and questionnaire survey

process, there is 1 professor who has taught dynamic capability curriculum for more than 2 years in full participation.

Dynamic capability architecture

The Plan-Do-Check-Action management cycle under ISO (International Organization for Standardization) spirit usually can guide an enterprise in each stage of its activity process for continuous improvement and experience accumulation so as to reinforce its robustness and core competitiveness as well as to promote the achievement of overall goal [21]. Therefore, while the dynamic capability architecture is built up, this research is going to (1) follow the four perspectives of this management cycle to again give new meaning to the perspective and item of dynamic capability; (2) summarize 8 perspectives and 52 items (dynamic capability) from 5 dynamic capability related papers; (3) however, due to different research objectives of each paper, the results are very diversified too. Therefore, this research followed five steps proposed by Cheng and Leu [14] to carry out the KJ method so as to do transposition and classification on the perspective and item of dynamic capability of each paper.

Next, (4) this research followed eight steps of Stewart et al. [17] to perform the focus group interview method so as to confirm the rationality of the above-mentioned method. However, during the interview process, after the transposition from eight perspectives into the categories under four PDCA perspectives, the meaning of PDCA management cycle still cannot be fully described. Therefore, under the comments from experts and scholars, three categories are added, and eight dynamic capabilities are combined into four; (5) until now, this research has set up a dynamic capability architectural prototype of 4 perspectives, 11 categories and 48 items.

(6) In order to confirm the rationality of this prototype, this research followed eight steps proposed by Zolingen and Klaassen [20] to perform a 2 stage Delphi questionnaire survey, and Likert 5 scale was used to design the survey questionnaire. First, (7) this research followed the opinions proposed by Faherty [22] to take the Quartile Deviation (Q) method to confirm the consistency among all the question items in the questionnaire; (8) meanwhile, the opinion of Murry and Hammons [23] was followed; that is, when overall consistency of the questionnaire $>70\%$, this research will then call this question as acquisition of consensus from experts. Next, (9) to be cautious, this research performed, on questionnaire with overall consistency $>70\%$, on the next week the second stage Delphi questionnaire survey; (10) moreover, the opinion of Likert [24] is followed and mean value $\geqq 3.5$ is taken as the condition to confirm the appropriateness of each question item.

After the above procedure, this research collected back all 13 questionnaires in the first stage Delphi questionnaire survey, and it is found that 16 question items (dynamic capability item) have $Q \leqq 0.6$, which means that the experts have high consistency for their views on these 16 question items; and the Q values of 23 question items are in between 0.6 and 1 ($0.6 \leqq Q \leqq 1$), which means that the question item has medium consistency; in addition, there are 9 items with $Q>1$, which means that the question item does not reach consistency. Hence, the overall consistency of the questionnaire is as

high as 81.4% (=39/48). Although the overall consistency of the Delphi questionnaire in the first stage has exceeded 70% as suggested by Murry and Hammons [23], to be cautious, this research has, one week later, performed the Delphi questionnaire survey one more time. From the totally returned survey result, it can be seen that 24 question items (factors) have high consistency, 18 items have medium consistency, 6 items are inconsistent. Hence, the overall consistency is as high as 87.5% (=42/48). In addition, the mean of each question item in the survey questionnaire is usually ≧3.5, that is, the proposition of Likert [24] is satisfied, therefore, the dynamic capability architecture (table 1) acquired in this research has appropriateness and rationality.

KSFs and its appropriate location

In addition, in order to set up for the implementation process, KSFs (hereafter abbreviated as factors) corresponding to each stage, this research (1) has summarized 187 ERP factors as proposed by 10 scholars, yet due to the language difference and meaning repetition phenomena, KJ method is used to summarize and correct, and eventually, a draft of 79 ERP factors is acquired. Next, (2) in the focus group interview, this research has followed experts' opinion to combine eight items that have close meanings into four items. In the meantime, two inappropriate factors are deleted, eventually, 73(=79-6) appropriate factors are obtained.

(3) In order to understand the order of these 73 appropriate factors in the process of the implementation activity, this research performed the KJ method one more time and transposed it to before, in the middle of and after the implementation step. Moreover, in order to confirm the rationality of the result, this research performed two stages of the Delphi questionnaire survey. In the first stage, among the fully returned 13 survey questionnaires, this research acquired 28 items of high consistency, 28 items of medium consistency, 17 items of inconsistency. Therefore, the overall consistency of the survey questionnaire is as high as 76.7% (=56/73). In the second stage, this research acquired 32 items of high consistency, 31 items of medium consistency, and 10 items of inconsistency. Hence, the overall consistency is as high as 86.3% (=63/73)＞70%. However, the mean values of five question items (factors) such as implementation time and software setup＜3.5, were thus deleted. Therefore, 68 items of (=73-5) KSFs obtained in this research are appropriate and rational.

Although 68 items of KSFs are categorized into three stages such as before, in the middle of and after the implementation, they are still too rough and too difficult to be applied. Therefore, this research invited five ERP consultants with more than 10 years of practical experiences to carry out the focus group interview method. After comparing five ERP implementation related papers [1,8,25-27], it was found that 25 items of implementation. categories proposed by Chien and Tsung [1] based on PDCA management cycle architecture not only can help an enterprise in seizing the implementation items and cause and effect the relationship in different ERP implementation stages, they are also the most clear and detailed ones. Therefore, this research is going to cite the architecture to carry out the transposition of 68 factors.

After second KJ method, this research transposed 68 factors into appropriate locations of 22 categories. Next, this research performed a focus group interview method to confirm the rationality of this result. During the interview process, the expert group only suggests adjusting the attribution locations of four factors but not increasing or decreasing factors. Therefore, this research is going to continue carrying out second Delphi questionnaire survey so as to confirm the location rationality of each factor.

In the first questionnaire survey result, this research obtained 18 items of high consistency, 39 items of medium consistency, and 11 items of inconsistency, hence, the overall consistency is 83.8%(=57/68); in the second questionnaire survey result, there are 23 items of high consistency, 37 items of medium consistency and 8 items of inconsistency, hence, the overall consistency is 88.2% (=60/68). In the meantime, the mean values of all the question items are all ≧3.5 (match the standard), hence, the attribution locations made for 68 KSFs in this research are appropriate and rational (The perspective, category and KSFs of Table 2).

Table 1 Dynamic capability architecture

Perspective	Category	Item (dynamic capability)
Plan	PS sense	PS1 market dynamism
		PS2 Processes to Tap Supplier and Complementor Innovation
		PS3 Processes to Tap Developments in Exogenous Science and Technology
		PS4 Demonstrating Leadership
		PS5 Best practice
	PA analysis	PA1 path dependencies
		PA2 technological opportunities
		PA3 organizational and strategic routines
		PA4 Capability possession/Distinctive Resource
		PA5 Calibrating Asset Specificity
		PA6 Assessing Appropriability
		PA7 Processes to Identify Target Market Segments, Changing Customer Needs, and Customer Innovation
	PP positions	PP1 Organizational boundaries and Institutional assets
		PP2 Market asset
		PP3 Financial asset
		PP4 Reputational assets
		PP5 Technological asset
		PP6 Complementary asset
		PP7 Structural asset
	PD Decision making	PD1 Recognizing, Managing, and Capturing Cospecialization
		PD2 Avoiding Decision Errors
		PD3 Selecting Target Customers
		PD4 Embracing Open Innovation
		PD5 Selecting the Technology and Product Architecture
		PD6 Capability deployment/Resource allocation

Do	DP processes	DP1 Coordination/integration/Effectively Communicating
		DP2 Reconfiguration and transformation
		DP3 Processes to Direct Internal R&D and Select New Technologies
		DP4 Anticannibalization Proclivities
	DS structure	DS1 Designing Mechanisms to Capture Value
		DS2 Designing Revenue Architectures
		DS3 Adopting Loosely Coupled Structures
	DM maintain	DM1 Minimizing Agency Issues
		DM2 Achieving Know-how and Intellectual Property Protection
		DM3 Blocking Rent Dissipation
		DM4 Cospecialization
Check	CR Opportunity	CR1 Recognizing Non-Economic Factors, Values, and Culture
		CR2 Achieving Incentive Alignment
	CC control	CC1 Recognizing Inflexion Points and Complementarities
		CC2 Checking Strategic Malfeasance
		CC3 Controlling Bottleneck Assets
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 Developing Integration and Coordination Skills

The dynamic capability model of KSFs

In order to blend two concepts of KSFs and dynamic capability so as to set up ”dynamic capability model of KSF”, this research (1) performed the KJ method first, then the expert will propose a draft on the correlation between the 68 KSFs and the dynamic capability (289 dynamic capabilities). Next, (2) under the focus group interview, the expert suggests deleting 35 items of related dynamic capabilities, hence, this research acquired an initial result of 254 items of dynamic capabilities. (3) However, in order to confirm the rationality of the focus group interview result, this research has performed two stages of the Delphi questionnaire survey.

In the first stage questionnaire survey result, this research acquired 64 items of high consistency, 143 items of medium consistency, and 47 items of inconsistency, hence, the overall consistency is 81.5% (=207/254). Although this consistency result is larger 70% as suggested by Murry and Hammons [23] for the end of the survey, yet to be cautious, this research has, in the next week, performed the second questionnaire survey. The survey result of this stage in this research, 108 items of high consistency were obtained, 107 items of medium consistency were obtained, and 39 items of inconsistency were obtained, hence, the overall consistency is 84.6% (=215/254). Among them, the mean values of 11 dynamic capabilities related items are all $<$3.5 (not reaching the judgment standards), they are thus deleted. At this moment, this research

has acquired 243 items of related dynamic capabilities (Table 2) with appropriateness and rationality.

The contents illustrated at the left side of Table 2 (model) are 4 perspectives and 22 medium categories (categories) as proposed by Chien and Tsung [1], and the subsequent KSFs are 68 factors summarized by this research. The perspectives and categories underneath the dynamic capability architecture at the right side are perspectives and categories of table 1. However, the crossover point between the KSF and the dynamic capability is the dynamic capability needed to achieve the KSF. The serial number filled at each crossover point is the content in the item field of table 1.

The meaning of the model

From the data in Table 2, great difference can be seen in the number of category, number of KSF and number of dynamic capability needed under the perspective of each stage. The result is as shown in "number distribution of implementation activity and dynamic capability" of Table 3, it can be seen that P perspective has the largest number of category (12 category), number of key successful factor (50KSFs), number of dynamic capability need (196 items) and mean of KSF capability (3.92=196/50). This means that P perspective (1) is the most complicated one; (2) needs delicate operation and treatment by the enterprise supervisor; (3) needs more investment of manpower and resource; (4) needs the incubation of more dynamic capability before the need of each KSF can be achieved. Therefore, the P perspective has key influence on the success or not of the implementation activity. Moreover, the result of this research is consistent with the result of AL-Hudhaif [28].

In addition, if we take a look from the viewpoint of the dynamic capability, the processes capability category underneath the Do perspective, cover the largest number of perspective (4) and the largest number of categories (15). Hence, it can be seen that this dynamic capability category is the most active one in the entire implementation activity. Moreover, for the decision making capability category under the Plan perspective, the KSF number (32) of "DC involved IA" and dynamic capability number (42) under P perspective of "implementation activity" are the most. Therefore, the decision making capability category (1) can help the enterprise to achieve the most KSFs; (2) has the highest influence on the processes activity; hence, it needs the most support and care from the top level manager. In addition, regarding the decision making and procedure capability category, the subtotals of four categories of sense, capability, analysis and control are relatively larger, hence, the enterprise can set them as the core items in the educational training.

Table 3 Number distribution of implement activity and dynamic capability

Key success factor				Dynamic Capability (DC)													
				Plan				Do			Check		Act		IA involved DC		
				sense	analysis	positions	Decision making	processes	structure	maintain	opportunity	learning	learning	capability	Subtotal	Category mean	KSF mean
Implement 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		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			
		KSF number		18	21	18	32	28	7	11	15	15	5	26			

Table 2 Dynamic capability model of KSF

Key successful factor			Dynamic capability architecture										
			Plan				Do			Check		Act	
			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 PA7	PP5						CC2		
		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		PA2		PD5	DP3						

		to provide real time information, modularization, possibility for development and upgrading											
		Possibility for implementing solution for that industry	PS5										
	Assessment of project	Risk treatment/assessment/management	PS1		PP3	PD2			D M3				
		Delivery date			PP3								
		Project planning				PD6							
		Effective project management		PA 7	PP1	PD6	DP 4	DS 3		C R 1	CC1 CC2 CC3	AL 3	AC 4
		Possess sufficient budget and resource, and allocate them well			PP6	PD6							AC 4
		Different view point (It should be able to be combined with "diversified topics")	PS1 PS2 PS3	PA 5 PA 7		PD1				C R 1	CC1		
	Setup of index	Clear, real and stable organization goal and objective		PA 7		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	PA 1								AL 1 AL 3	AC 2
		Culture and architecture change			PP7								
	Activity regulating	Real/perfect/detailed project scheduling and continuous updating.				PD2					CC2		AC 4
		Change management and procedure		PA 6			DP 1	DP 2					
		Effective/sufficient change management				PD4	DP 2						
		Change management capability											AC 3
		Business process management and reconstruction		PA 3		PD6	DP 1 DP 4			C R 1	CC1		AC 4
	Module assignment	Appropriate implement strategy and implementation method	PS1 PS2	PA 1		PD2 PD5			D M3				
Do	Educational training	System user/client end commitment and support					DP 4						AC 1
		Encouragement of team work and personnel cooperation, and the adoption of effective action by the user											AC 1
		The providing of continuous and sufficient to the final user (employee)					DP 4					AL 1 AL 2	AC 2
		Effective and good communication and feedback					DP 1						AC 4
	Confirmation of template	Total document and improvement										AL 3	AC 4
	Data conversion	Old system (The remained IT system)		PA 2		PD5	DP 3						
		The capability to integrate ERP and the current IS/IT		PA 2			DP 2						AC 1 AC 4
		Analysis and conversion of the data remained in the old system							D M3				AC 4
	Confirmation of system	Correct expectation and trust on ERP system	PS4				DP 4						
	Online announcement	System development, test and the release of error/trouble											AC 4
Check	Monitoring result	Preparation of performance system and related system, and the effective management, monitoring, assessment and control of the result and performance.					DP 4			C R 2			
	Confirmation of result	Information quality					DP 1	DS 1		C R 1	CC2		

Action	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 this research result, this research performed a case study and interview on the ERP implementation activities of two enterprises respective of three sites: northern, central and southern Taiwan. The overview and implementation activities of these six enterprises are as shown in table 4.

Wherein, the enterprise scale in "enterprise overview" means rough number of head count using ERP within the organization; the number of implementation year means the number of experienced years in implementing the implementation activity; external consultant means the number of external consultants hired by the enterprise to perform the consultation activity; and the project team then means respectively years of formation and its head count.

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

				Corporate attributes					
Comparison items				Automobile	Electric appliance	Machines	Services	Components	Temples
Enterprise overview	A. Enterprise scale (person)			220	198	75	53	46	21
	B. Number of implement 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
Implement 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
achieving capability	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				93/80	94/89	84/75	65/54	75/57	53/44

In table 4, five grades of the “implementation result” are the opinions from the expert and scholar, in the focus group interview method, on the possibly displayed result difference for the ERP implementation activities within an enterprise. The values in the “implementation result” and among all the enterprises are the mean values replied by five directors within the project team of different enterprises using Likert 7 points survey questionnaire. In ”activity achieving capability”, (1) The numbers in perspective, KSF and DC are from three subtotal fields in Table 2; (2) the values for different enterprises mean the replied mean values made by directors for the key successful factor number (KSF number) that the enterprise can achieve currently and the possessed dynamic capability number (DC number). Finally, “The achievement rates (%) of KSF and DC” are the ratios in % for KSF number and DC number that each enterprise can reach to the total KSF number and DC number.

In order to understand the correlation among all the items of “enterprise overview” and “implementation result” and “The achievement rates (%) of KSF and DC”, this research has, through Spearman’s Rho coefficient, performed a paired test. It can be seen from the result that (1) in five comparison items of the “enterprise overview”, the correlation coefficient and significance among “external consultant” and KSF number as well as DC number are not good, which are respectively 0.882, 0.020 and 0.841, 0.036; (2) in five comparison items from the “implementation result”, the correlation coefficient and significance among “data integrity and correctness” and KSF number as well as DC number are not good, which are respectively 0.899, 0.015 and 0.943, 0.005; (3) between KSF number and DC number, the correlation coefficient is 1.000, and the significance is 0.000; (4) for the correlation coefficient and significance to KSF number and DC number, although the performance of the “enterprise overview” is inferior to the “implementation result”, highly positive correlation can be seen.

This means that (1) the “external consultant number” only has low correlation for an enterprise to achieve the KSF number and to possess the DC number; (2) “data integrity and correctness” only has low correlation for an enterprise to achieve the KSF number and to possess the DC number; (3) when an enterprise can achieve more KSF number, it will possess more DC number, and vice versa; (4) as compared to “enterprise overview”, the quality of the “implementation result” will have a stronger effect for an enterprise to achieve the KSF number and to possess the DC number.

In order to understand the difference in correlations for the case of more than three factors, this research used Kendall’s W test, and it was found that the coefficients of

concordance (W) under different conditions are respectively: (1) in "implementation result", W=0.901 among five items, and the significance is 0.000; (2) For the correlation coefficients among all items of "enterprise overview", five items of "implementation result" and "achievement rate (%) between KSF and DC", "e, 1~5, DC" has inferior performance with W=0.800 and significance of 0.000. This means that (1) in the ERP activity process, the display of five results are mutually accompanied; (2) as compared to other items in the "enterprise overview", if the quality of the "implementation result" and the DC number possessed are considered together, then the "project team (person)" displays weaker correlation.

If we make a further comparison, it can be found that the correlation between the "project team (person)" and the DC number possessed by an enterprise is stronger than the "external consultant number". However, if the quality of the "implementation result" is considered at the same time, the correlation will become worse. This means that (1) when an enterprise has a project team with more head count, it will be helpful for an enterprise to possess more DC number; (2) when the "external consultant number" is fewer, the "implementation result" and the possession of the DC number of an enterprise will become fewer too.

Management meaning

Case study, in addition to verifying the practical value of this research result, through the interview with the enterprise director in the process, shows that the management meaning in Table 2. contains the following three aspects: (1) Management application aspect: An enterprise can (a) through the category and KSF in the PDCA management cycle architecture, inspect the insufficiency in the ERP implementation activity so as to adjust the project management action in the next cycle; (b) through the dynamic capability architecture, effectively set up the incubation direction of the organizational dynamic capability; (c) seize in advance the abnormity and risk caused by insufficient capability so as to achieve the preventive objective; (d) audit the capability of ERP project team and consultant based on this. (2) Management mechanism aspect: An enterprise can (a) through PDCA management cycle and category under it, reinforce the operation mechanism of the ERP implementation project activity; (b) through KSF, set up the resource distribution mechanism of the project activity; (c) through the category under the dynamic capability perspective, adjust educational training guideline and its operation mechanism; (d) set up the performance assessment mechanism for the ERP project team and consultant through this model. (3) Management decision making aspect: (a) through the PDCA management cycle architecture and its KSF, make reasonable decision on the resource allocation for each stage and department; (b) provide appropriate human resource development strategy and decision on the dynamic capability needed for ERP implementation activity; (c) through this model, provide appropriate guideline and resource adjustment decision for the effectiveness of the introduced project activity.

Conclusions

In the past, although lots of scholars have proposed research results related to the KSF, when enterprise directors are facing these conceptual guidelines and suggestions, they usually are unable to seize the necessary actions and needed capabilities correctly during the implementation process. Moreover, since the entire implementation is a dynamic and changeable project activity process, an enterprise usually cannot obtain the effectiveness for the successful implementation of the ERP activity from the past research results.

Therefore, this research has (1) transformed the perspective and item of the dynamic capability into the PDCA management cycle so as to set up a dynamic capability architecture owning 4 perspectives 11 categories and 48 capability items (table 1); (2) integrated 4 perspectives and 22 categories as proposed by Chien and Tsung [1] and 68 KSFs proposed by this research so as to make KSFs possess reference procedures that can be implemented and to make them be of more practical value; (3) under the PDCA management cycle, integrated dynamic capability architecture and KSF to propose "the dynamic capability model of KSF" of Table 2.

In order to further describe the meaning of this model, this research has analyzed the quantity distribution of the implementation activity and dynamic capability displayed by this model. Therefore, important difference between category and KSF, and the importance and selection basis of each dynamic capability category in each perspective stage of the implementation activity can then be displayed. In order to understand the rationality and application value of this research result, through case comparison, this research has found that highly positive correlation exists among "the achievement rate (%) of KSF and DC", "enterprise overview" and "implementation result". This means that through the model proposed in this research, KSF is achieved and dynamic capability is enhanced, and this is very necessary for successful implementation of the ERP activity. Finally, this research has clearly described how to apply this model, and the meaning of this model in the management application aspect, management mechanism aspect and management decision aspect.

In future research directions, the following can be considered: (1) add conditions such as importance, time and resource to be used as a decision making basis for selecting and incubating all kinds of dynamic capabilities; (2) through cause-and-effect path analysis, the cause-and-effect relationship among dynamic capabilities is given, and based on this, the development map of dynamic capability is then set up.

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