The impact mechanism of organizational culture on ERP assimilation: a multi-case study

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Abstract

Based on competing values framework (CVF), this study employed a multi-case study method to explain how organizational culture influences enterprise resource planning (ERP) systems assimilation. By analyzing the case evidence of four firms from China, we found that (1) internal-oriented culture influences ERP assimilation through coordination mechanisms; (2) external-oriented culture influences ERP assimilation through organization learning; (3) cultural balance within the CVF is of great importance in achieving higher level of ERP assimilation. The research findings can provide guidelines for the firms to facilitate appropriate organizational culture, so as to foster coordination mechanisms as well as organizational learning and achieve business benefits with the assimilation of ERP systems.

1. Introduction

ERP systems have become a necessary infrastructure for the enterprise information construction. However, what confused most companies are the truth that most firms did not achieve the promising benefits of the ERP investments [49]. Some companies have had to scale back their projects and accept minimal benefits, or even stop and reimplement the ERP systems in the post-implementation stage. Some studies suggested that the failure rate of ERP project is especially high in China [15].

In order to increase the success rate, studies have focused on the drivers of ERP systems success in the past decades, and organizational culture has been identified as one of the most critical success factors [6, 21, 22, 45, and 47]. Organizational culture is defined as a set of beliefs, values, and assumptions that are shared by members of an organization [43]. These underlying values have an influence on the behavior of organizational members, as people rely on these values to guide their decisions and behaviors [43]. In ERP post-implementation environment, organizational culture can affect the learning and assimilation behavior of ERP users, thus to impact the assimilation level of ERP systems [45].

Previous literatures have explored the direct relationship between organizational culture and assimilation or usage outcomes of information systems (IS) [19, 23, 25, 27, 39, 45-48]. Leidner et al. [25] suggested that culture may directly, or indirectly, influence IT. Although the relationship between organizational culture and IS assimilation is relatively well established in the literature, "how" and "why" this relationship exists has not been adequately addressed. In order to effectively manage the impact of organizational culture in ERP assimilation phase, it is important to explore the impact mechanism of organizational culture on ERP systems assimilation. In line with this quest, this study makes attempt to reveal how ERP assimilation within the organization is influenced by organizational culture. More specially, we seek to address the following questions: *(1) "How do four cultural types (group culture, hierarchical culture, development culture and rational culture) impact ERP assimilation in the post-implementation stage?" (2) "What specific cultural traits the organization needs to exhibit in ERP assimilation phase?"*

Given the sparse literature on the impact mechanism of organizational culture on IS assimilation, we pursued the research questions using an exploratory case study approach. The objective of this study is to explore the mediators between organizational culture and ERP assimilation in the hope of providing prescriptive insights for managing ERP assimilation from organizational culture perspective. In the remainder of this paper, we review the literature background of this research and present the research methodology and main findings.

2. Literature review

2.1. Organizational culture and ERP assimilation

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The concept of ERP assimilation originates in the concept of technology assimilation. Purvis et al. [37] defined technology assimilation as "the extent to which the use of technology diffuses across the organizational projects or work processes and becomes routinized in the activities of those projects and processes". Gallivan [13] divided the concept of assimilation into two sub-constructs: breadth and depth. Breadth refers to the number of users and percentage of business processes that are using the technology. Depth explains how extensively the technology is used by the users and its vertical impact on the business activities.

Prior literatures have identified a variety of critical success factors and theories that lead to a better assimilation of information technology [11, 20, 26-28, 33-34, 37, and 50]. In recent years, some studies have emerged that shed light on IT implementation and assimilation from organizational culture perspective [6, 23-24, 27, 29, 33, 48, and 52]. Based on these studies, we conducted a review concerning the relationship of organizational culture and IS/IT assimilation.

In order to comprehensively cover related articles, we first used "organizational culture" (or "corporate culture"; "cultural") and "IS" (or "IT"; "information system"; "information technology"; "ERP"; "enterprise system") as keywords in a search of electronic databases. Subsequently, we focused on the studies regarding the assimilation or usage outcomes of IT/IS, and ignored the studies focusing on IT/IS adoption and implementation. In addition, following Webster and Watson [51]'s recommendations, we remained open to bibliographical sources of interest, and analyzed the selected articles and their references. Our literature review revealed that the impact of organizational culture on IT/IS assimilation was documented, whereas few studies investigate how organizational culture affects IT/IS assimilation. Specially, some studies [24, 45] suggested that collaboration and cooperation culture, as well as learning culture, are key to understanding assimilation and usage outcomes of information systems. In ERP contexts, Liu et al. [27] proposed that creating and fostering an organizational-wide learning culture could have significant consequences to ERP assimilation. Ke and Wei [22] contended that ERP success is positively related with power sharing culture, participative behavior and participative decision making culture, and transformative vision and risk tolerance culture. Moreover, Shao et al. [45] proposed that organizational learning culture is positively related with exploitative and exploratory learning in ERP assimilation phase. However, there are very few studies related to the impact mechanism of organizational culture on ERP assimilation. The only study that touched the impact mechanism of organizational culture on ERP

assimilation is by Shao et al. [47] who argued that organizational culture and knowledge sharing are two mediators linking transformational leadership and ERP success. Furthermore, they suggested that development culture has direct impact on ERP success, while other cultural types influence ERP success through knowledge sharing. However, the focus of their study was to investigate the impact of transformational leadership on ERP success, and organizational culture just worked as a mediator between them. Therefore, based on Shao et al. [47]'s work, this study focuses on the impact of organizational culture and explore its impact mechanism on ERP assimilation.

2.2. The competing values framework and culture

According to Schein [43], culture exists at three levels: artifacts, values and basic assumptions. Schein [43] argued that values are more easily studied than basic assumptions and cultural artifacts. Additionally, value-based perspective is considered as the predominant approach to study culture [25], such as the competing values framework (CVF) [38, 44]. To be consistent with this predominant approach, we follow many organizational studies and adopt the CVF [38] as a theoretical basis to assess culture.

The competing values framework (CVF) explores the competing demands within an organization on two axes, as depicted in figure 1. The first dimension, the flexibility–stability axis, reflects the competing demands of change and stability. The second dimension, the internal–external axis, focuses on activities happening within or outside the organization. The two axes divide organizational culture into four culture domains: a group culture, a developmental culture, a rational culture and a hierarchical culture [10]. Below each domain culture is defined as described by Dension and Spreitzer [10]. The group culture emphasizes flexibility and maintains a primary focus on the internal organization. Belonging, trust, attachment, cohesiveness, and participation are core values. The development culture also emphasizes flexibility and change, but maintains a primary focus on the external environment. Growth, resource acquisition, creativity, stimulation and adaptation to the external environment are core values. The rational culture emphasizes internal stability and external environment. Planning, efficiency, productivity, goal fulfillment, and achievement are core values. The hierarchical culture focuses on internal organization and stability. Internal efficiency, coordination, order, rules, control and regulations are core values [10, 30].

There are several underlying assumptions of CVF. First, organizations do not necessarily reflect only one

Figure 1. The competing values framework for organizational culture

instance, an organization to have both high internal and external orientations simultaneously [36]. A second assumption underlying the competing values framework is the importance of balance. A balance culture is one in which the values associated with each of the CVF culture domains are strongly held. Dension and Spreitzer [10] suggested that when one cultural type is overemphasized, the organization may become dysfunctional and the strength may even become the weakness.

Based on Quinn [38]'s competing values framework, Patterson et al. [35] selected the dimensions that were most frequently utilized in research studies from 1960 to 2000 on CVF and developed 17 subscales that reflected the four cultural domains, as depicted in Table 1.

cultural type, but a combination of cultural types including paradoxical combinations [1]. It is common for individual organizations to exhibit characteristics of each of the dimensions independently, allowing, for

Table 1. Subscales of four cultural domains of competing values framework

Cultural types	Sub-dimension	Description
Group culture(G)	G1: Welfare	The organization values and cares for employees.
	G2: Autonomy	The organization gives employees wide scope to enact work.
	G3: Involvement	Employees share information and insights throughout the organization and have considerable influence over decision-making.
	G4: Training	A concern with developing employee skills.
	G5: Integration	The organization values interdepartmental trust and cooperation.
	G6: Supervisory support	Employees experience support and understanding from their immediate supervisor.
Development culture(D)	D1: Innovation & flexibility	The organization is very flexible toward change and encourages innovation.
	D2: Outward focus	The organization is responsive to the needs of the customer and the marketplace in general.
	D3: Reflexivity	The organization concerns with reviewing and reflecting upon objectives, strategies, and work processes, in order to adapt to the wider environment.
Rational culture(R)	R1: Clarity of organizational goals	A concern with clearly defining the goals of the organization.
	R2: Effort	How hard people in organizations work towards achieving goals.
	R3: Efficiency	The degree of importance placed on employee efficiency and productivity at work.
	R4: Quality	The emphasis given to quality procedures.
	R5: Pressure to produce	The extent of pressure for employees to meet targets.
	R6: Performance feedback	The measurement and feedback of job performance.
Hierarchical culture(H)	H1: Formalization	A concern with formal rules and procedures.
	H2: Tradition	The extent to which established ways of doing things are valued.

2.3. Coordination mechanisms

Coordination mechanisms, the mechanisms used to coordinate activities has long been a focal point of study in Organization Theory [2] and more recently in IS field [18, 32, and 54]. In this study, two types of coordination mechanisms are considered: vertical and horizontal. Vertical coordination is the extent to which coordination within the organization is undertaken through vertical means such as authorized entities (project managers or steering committees) with definite procedures and rules [5, 32]. Horizontal coordination is

the extent to which coordination within the organization is undertaken through mutual communications and adjustments, whether through personal or group means [5, 32].

In organizational behavior field, Buenger et al. [5] pointed out that organizational values were associated with the coordination mechanisms adopted by the firms. Some IS scholars suggested that vertical and horizontal coordination have positive impacts on project performance [7, 32]. Yin and Chen [54] proposed that coordination mechanisms have positive impacts on ERP systems assimilation. However, there is still a

missing link between the three factors of organizational culture, coordination mechanisms and IS assimilation, especially in the context of ERP assimilation.

2.4. Organizational learning

Organizational learning means the process of improving actions through better knowledge and understanding [12]. March [31] argued that there were two types of organizational learning: exploitative learning and explorative learning. Exploitation refers to the routine behavior involved in refining a firm's current capabilities and improving the performance of existing routines [4]. Exploitation includes such things as refinement, choice, production, efficiency, selection, implementation, execution [31]. Exploration refers to the innovative behavior involved in risk-taking and experimenting with unfamiliar alternatives [4]. Exploration includes things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation [31].

Cooper & Zmud [8] suggested that learning-based theories and models have great potential to explain success in using and exploiting new IT systems in IT assimilation context. Several literatures have also emphasized the importance of firms' learning capabilities, which have figured prominently in IT assimilation studies [11, 40, and 41]. Shao et al. [45] argued that explorative and exploitative learning are both indispensible in ERP assimilation phase.

3. Research design and methodology

3.1. Multi-case research design

Case study approach is considered as appropriate when 'how' or 'why' questions are asked about a focal phenomenon over which the researchers have little or no control [53]. Since there are few studies examining the mediating variables linking organizational culture and ERP assimilation, this study adopted the case study methodology [53] to conduct the research.

We followed the general guidelines for conducting our exploratory case study as presented in the literatures [9, 53] . A case study protocol was first developed based on an extensive literature review, which included the scope and objectives of the research; the characteristics of the target firms, interviewees; the initial set of interview questions; and confidentiality agreement.

To help ensure the validity and reliability of the research, on one hand, we ensured that the target firms have used ERP software at least 1 year; on the other hand, the research team was made up of six people in all, including one famous foreign IS scholar and one domestic college professor who have rich experiences in information system. Four other men are doctoral candidates of one domestic university who were responsible for contacting with the target firms and recording during the interview.

3.2. Background of case companies

A list of candidate companies in central China, the locus of Chinese, was then created, based on the researchers' knowledge about the firms and industries in the region. After initial contacts with managers in these candidate firms, four companies were selected based on their industry, ERP history, ERP vendor, availability of top managers, and their willingness to cooperate. The four firms had already finished the implementation of ERP systems, and were in the ERP assimilation stage.

The case study protocol was completed in June 2012, and sent to the four companies in early July. The actual interviews were conducted in late July with the research team. The research team visited each company and spent from half to one day in each company. A typical interview lasted about 30–60 min, with interviews with managers usually longer than the ones with frontline users. On one occasion, one of the companies sent two IT professionals together due to work schedule constraints. In such occasion, our research team made sure that each interviewee had opportunities to express his or her views. In all, the research team interviewed 17 middle and top managers and frontline users from different departments and divisions, resulting in about 13 hours of recording, averaging about 45 minutes for each interviewee. With the agreement of the participants, all interviews were digitally recorded. The recorded interviews were transcribed verbatim into text documents. In addition, we collected some documents concerning the firms and their products for some background information. For the purposes of confidentiality, the four companies are referred to as A, B, C, and D in this paper. Table A1 in appendix shows the profiles of the case companies, and Table A2 in appendix shows the profiles of the interviewees. In the remaining part, the interviewees will be quoted as the number in Table A2. For instance, "C-2" means the second interviewee from company C.

At the beginning of each interview, the respondent was briefed about the content and objective of the research, the definition of ERP assimilation, and core values of four types of organizational culture. We interviewed the staff at different levels to ensure cultural type. The top manager talked about the organizational culture from the point of overall organization, whilst the employees could describe their perceived organizational culture.

3.3. Data coding and analysis

All interviews were audio taped and transcribed. Based on the transcribed documents, this paper used a content analysis method to examine the organizational cultural type of each company. Content analysis is a methodology that falls midway between the quantitative survey and qualitative observation or interview [42]. Content analysis is a formal procedure for classifying the qualitative information contained in written and oral materials [42]. A content analysis classification scheme consists of categories, classification rules, and the words (or units) assigned to the categories [17]. This study used CVF and their corresponding 17 subscales as the basis for defining categories of cultural type, as shown in Table 1.

The classification process involved two steps. Firstly, two PHD students who participated in the whole interview coded the transcribed documents related to organizational cultural type into a number of sentences (units). They discussed the sentences and their intended meanings with each other to ensure consistent coding. Subsequently, the two PHD students applied the framework of CVF and its corresponding 17 subscales to the data and assigned the sentences into categories respectively. They classified each sentence as one subscale and further one type of organizational culture, as depicted in Figure 2. Agreement on the first round classification was 95%. The two PhD students discuss the sentences which they disagreed. After the discussion, their agreement increased to 98%. The research team reviewed the classification results and discussed the sentences with disagreements. Sentences that could not be agreed upon were discarded.
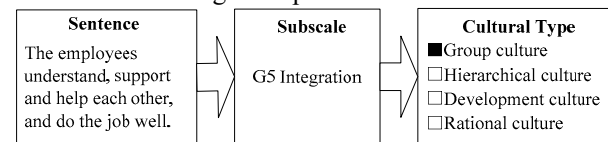

Figure 2. Example of classification process

Table 2. Cultural types of case companies

Firm	Subscale (Frequency)	Cultural type	Typical sentences
A	G3 Involvement(29) G4 Training(2) G5 Integration(24) G6 Supervisory support(3)	Group culture	(A-1): Everyone in our company has a very good rapport, and enjoys working together. (A-1): The employees understand, support and help each other, and do the job well.
B	H1 Formalization(25) H2 Tradition(18)	Hierarchical culture	(B-2): The company requests us to attend the morning meeting and sing songs every morning, and these have become an institution. (B-1): We have to follow a prescribed routine of reaching a resolution.
C	G1 Welfare(16) G3 Involvement(22) G4 Training(7) G6 Supervisory support(5)	Group culture	(C-3): Our company emphasizes employee-oriented culture. (C-3): When encountered some difficulties in work and life, the employees can ask the company for help. (C-3): With regard to the employees' requests, our company always gives us a definite answer.
	D1Innovation & flexibility(32) D2 Outward focus(16)	Development culture	(C-4): The culture of innovation is considered as the most important part of our corporate culture. (C-3): We continually refine and deepen the ERP functions on our own work position.
D	G2 Autonomy(5) G3 Involvement(21) G4 Training(18) G6 Supervisory support(17)	Group culture	(D-2): The leader (CIO) is more like a friend. (D-1): My ideas are often rejected by the employees. (D-1): Our company pays attention to staff training and set up a positive and effective training system.
	D1Innovation & flexibility(16) D2 Outward focus (24) D3Reflexivity(3)	Development culture	(D-1): Our focus is not only on internal informationization but also on the external resources acquisition. (D-1): Our company lays great stress on innovation, advancing with the times.
	R1Clarity of org. goals (27) R2 Effort (6) R3 Efficiency (16) R4 Quality (9) R6 Performance feedback (5)	Rational culture	(D-4): The slogan of our corporate culture is "Climber" and everybody is working hard. (D-1): I have been writing work plan every month since 2007, and I also ask my staff to write work plan. (D-1): In order to raise efficiency, we must make some preparations for our meetings in advance.

4.2. Mediating effects of coordination mechanisms and organizational learning

4.2.1. Mediating effect of horizontal coordination on group culture and ERP assimilation. Group culture characterized as cooperative and trust can best facilitate knowledge sharing in ERP implementation stage [21]. In addition, an organizational culture characterized as supportive and collaborative can

reduce employees' fear and increase their openness in sharing their knowledge with other departments [23].

Our case study shows that group culture could promote ERP assimilation through more horizontal communication and adjustments among the employees and across functions and units as described by CEO from Company A (A-1): "*Everyone in our company has a very good rapport and enjoys working together. The employees understand, support and help each other, and do the job well.* The group culture of Company A effectively facilitates the learning and assimilating of ERP knowledge through more mutual communication and sharing among the employees". This sentiment is also echoed by IT manager from Company C(C-3): "*We have a united and collaborative cultural atmosphere and thus we ask for help much easier rather than begging for something. Such culture also leads to more horizontal sharing and discussion about the ERP issues and knowledge*".

The analysis of the case study showed that group culture can facilitate the assimilation and learning of ERP knowledge through horizontal communications and adjustments among the employees and across departments. Thus, we propose that:

P1. The impact of group culture on organizational ERP assimilation is mediated by horizontal coordination among the employees and across departments.

4.2.2. Mediating effect of vertical coordination on hierarchical culture and ERP assimilation. Hierarchical culture is characterized as respect for authority, rationality for procedures and rules, hierarchical structure [3, 16]. Our case study analysis found that hierarchical culture can affect ERP assimilation through vertical coordination between superior and subordinate within the organization.

Among the four case companies, only Company B shows obvious hierarchical culture characteristics. The IT department manager of Company B (B-1) explicitly mentioned the importance of hierarchical culture in affecting organizational ERP assimilation. He said: "*An ERP steering group led by one vice president has been established. I am the IT manager. Every ERP specialist who is subordinate to me takes charge of one subsidiary. The subordinate of ERP specialist is auditor who is responsible for examining and ensuring the accuracy and timeliness of the bill-inputting. The following level is operator who is in charge of bill-inputting. When the subsidiaries have some ERP-related problems, they will ask the corresponding ERP specialist for help. If the ERP specialist cannot resolve the problem, he will come to me for solution. The hierarchical structure makes it easier for us (ERP steering group) coordinate the ERP*

activities vertically". The case evidence shows that hierarchical culture plays an important role in ERP usage through vertical coordination from the superior to subordinate and from ERP department to business departments. Moreover, IT manager of Comanany B also emphasized that: "*We have strict assessment criteria to ensure the data validity and quality. The basic process is: the auditor assesses the data accuracy and timeliness of the operator and the ERP specialist conducts random inspections on the actual business. The auditor and operator can get 100RMB bonus each month only if both them are qualified.*"

When analyzing the case data, it became evident that hierarchical culture can affect ERP assimilation through vertical coordination of ERP activities within the organization. Thus, we propose that:

P2. The impact of hierarchical culture on organizational ERP assimilation is mediated by vertical coordination from superior to subordinate and from ERP department and business departments.

4.2.3. Mediating effect of organizational learning on external-oriented culture and ERP assimilation. External-oriented culture (Development and Rational culture) emphasizes the organization's ability to function well in its environment [10]. When talked about the information construction during the interview, the CIO of Company D explicitly confirmed the importance of external-oriented culture: "*Our focus is not only on internal informationization but also on the external resources acquisition. Therefore, in order to satisfy the needs of the external market, we continuously improved the ERP functions and combined the internal systems (eg., ERP systems) with some external systems(eg., Gold tax and UnionPay). In addition, we have implemented OA, CRM, BW, and BO since 2008*". It follows that such a firm is implementing ERP systems in order to satisfy an identified market need, rather than purely to achieve some technical objectives. We would therefore expect that a firm implementing ERP systems is more likely to devote more efforts to learning and extending ERP systems if it has a higher degree of external orientation. When talked about corporate culture during the interview, an ERP user of finance department from Company C (C-4) stated: "*The culture of innovation is considered as the most important part of our corporate culture. We continually refine and deepen the ERP functions on our own work position. In our financial department, we often explore some automatic ERP functions, such as reporting optimization, etc*". IT manager in Company C(C-3) expressed similar views. He said: "*Our boss always emphasizes the importance of enhancing innovation capacity. Therefore, we*

continuously improve the ERP functions since implementation in 2001, leading to more and more business processes covered by ERP systems, such as report development and overseas business, etc."

Case study showed that, external-oriented culture emphasized external environment can encourage companies to deepen the existing ERP functions through exploitative learning and continuously explore new areas of business through explorative learning. Thus, we propose that:

P3. The impact of external-oriented culture on organizational ERP assimilation is mediated by organizational learning.

4.3. Cultural balance and ERP assimilation

Based on the within case analysis, it appears that Companies C and D differs from Companies A and B in multiple value orientations. In addition, Companies C and D have implemented more ERP modules, extended the ERP systems to some external systems and achieved higher level of ERP assimilation. Several literatures suggested that cultural balance within the CVF is assumed to be necessary for organizational effectiveness [14]. In ERP context, too much emphasis on any cultural type at the expense of the others can have a negative impact on ERP assimilation, when some ERP activities demand the behaviours and responses consistent with one of non-emphasized domains. It is the tension between the demands of each of these culture domains that is the key to ERP assimilation. Therefore, we propose that:

P4. Organizations with well-balanced cultures will achieve higher level of ERP assimilation than organizations with unbalanced culture.

5. Discussions

5.1. Theoretical contributions

The theoretical contributions of this study are mainly three folds. First, this study contributes to organizational culture research in ERP assimilation context. Previous studies have emphasized the role organizational culture plays in fostering IS assimilation. What is less understood is how organizational culture affect IS assimilation. Using a case study method, we proposed a theoretical model to explain the mediating effect of coordination mechanisms and organizational learning on the relationship of organizational culture and ERP assimilation, as depicted in Figure 3. This finding further extends the work of Shao et al. [47] by suggesting that internal-oriented culture of CVF affects ERP assimilation by coordination mechanisms within the organization, and external-oriented culture of CVF

influences ERP assimilation by organization learning behaviour. This proposed model provides a more complete understanding of the relationship between culture and ERP assimilation and, therefore, represents the most significant contribution of this research.
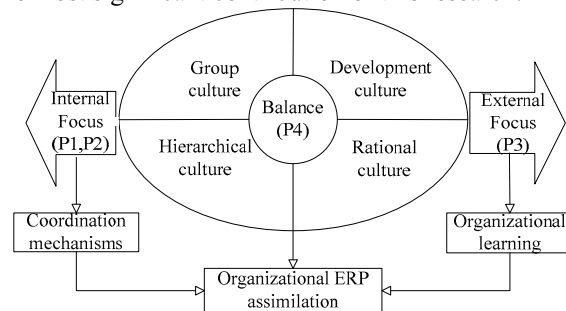

Figure 3. Research findings

Second, this study contributes to the research of coordination mechanisms by exploring the impact of organizational culture on horizontal and vertical coordination in ERP context. We found that group culture was associated with the extent of horizontal coordination, and hierarchical culture was associated with the extent of vertical coordination during the ERP assimilation stage. Although Buenger et al. [5] has signified the important role of organizational culture on the coordination mechanisms adopted by the firms, our findings extend Buenger et al. [5]'s study specifically for the IS discipline.

Finally, previous studies have examined the important role of organizational culture in IS assimilation phase. However, what specific cultural traits the organization needs to exhibit in IS assimilation context is still largely unknown. In this paper, we articulated the impact of cultural balance on ERP assimilation from the cultural balance perspective and further contribute to organizational culture studies in ERP environment.

5.2. Practical contributions

From the managerial perspective, firstly, this study provides insights for the enterprises to pay attention to the effect of organizational culture even after the implementation has completed and the system has been devoted into daily use. Furthermore, this study offers advice on how to facilitate ERP assimilation through different coordination and learning mechanisms according to the cultural type of the enterprise.

Secondly, top executives should realize that coordination mechanisms are important in the post-implementation stage. Thus, on one hand, top executives should set up definite procedures and rules, hierarchical structure, and formal communication channels so as to promote the vertical coordination of

the ERP activities. On the other hand, the managers also need to take account of employees' individual needs by expressing concern and providing personal coach, so as to promote a trust and belonging oriented group culture. This is beneficial to achieve higher level ERP assimilation through horizontal communications among the employees and across functions and units.

Thirdly, top executives should not focus exclusively on one cultural type, but that they should focus on four types of organizational culture from both internal organization and external environment. This requires top executives emphasize four cultural domains simultaneously in ERP assimilation stage, thus to form a strong, well-balanced culture, and achieve higher level of ERP assimilation.

At last, external-oriented culture that focuses on external environment are also needed to foster an explorative and exploitative learning of ERP systems' capabilities. This requires the top executives to articulate an idealized picture of the future with regards to ERP systems, thus to encourage the followers to think innovatively for new systems applications and learn ERP systems hard, finally, to improve operational and managerial benefits with ERP systems.

5.3. Limitations and future directions

Our case study is an exploratory case study, and our findings need to be considered in the light of certain limitations. First, more case firms and empirical studies with much broader participation and larger sample size are certainly needed to test and validate the findings and propositions of this study. We are limited by the number of firms that agreed to participate in this study and the number of managers and employees who were available for interviews when we visited their companies. Second, we investigate the mediating variables between organizational culture and ERP assimilation in a single country setting with its unique social, economic, and political characteristics. Thus, it necessitates caution when extending the findings to other countries. Finally, future research is needed to identify other mediating factors in the culture-ERP assimilation relationship, as they would help expand our current understanding of "how" and "why" an organization's culture has an impact on the assimilation level of ERP systems.

6. Conclusions

Using a multi-case study method, this study investigated how organizational culture affects ERP assimilation. By synthesizing data from four in-depth case studies, we found that group culture and hierarchical culture influence ERP assimilation through horizontal coordination and vertical coordination respectively, whilst external-oriented culture (development culture and rational culture) influences ERP assimilation through organizational learning behaviour. Moreover, we found that cultural balance is of great significance in achieving higher level ERP assimilation. Our findings extended current research regarding organizational culture in IS assimilation context and provided some guidelines for the firms to facilitate appropriate organizational culture in assimilation stage. As an exploratory case study, this research establishes an important foundation for further exploring the role of organizational culture in ERP assimilation phase, and creates multiple opportunities to validate the findings and extend the proposed model.

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8. Appendix

Table A1. Profiles of the case firms

Firm	Basic information of the enterprise	ERP vendor	ERP experiences
A	Type: Joint venture Industry: Pharmaceutical Annual sales: 3 billion RMB Num. of employees: 1000	Oracle ERP	Company A is headquartered in Shanghai. Each province had its ERP and HeNan province used UFIDA U8 before 2011. The headquarters made the decision to implement Oracle ERP financial management on a national scale. Oracle ERP implementation was finished in Nov. 2011. Modules: Financial Accounting and control, Fixed Assets.
B	Type: Oversea investment Industry: Refractory Annual sales: 1.8 billion RMB Num. of employees: 1200	UFIDA U8	Company B began to implement ERP in 2008. However, due to inconsistent data and other reasons, their first attempt to implement UFIDA U8 failed. Therefore, the enterprise reimplemented the Ufida U8 and succeeded for the second time in 2011. Modules: Finance, Manufacturing, Purchase, Inventory, Sales, Cost.
C	Type: Joint venture Industry: Automobile Annual sales: 16 billion RMB Num. of employees: 20000	SAP ECC6.0	Company C gradually implemented ERP, PDM, KOA, CRM, SRM system since 1994. The first generation ERP (MRP) was used between 1997 and 2002. The company began to implement SAP ERP and finished in May 2002. CRM system was also put into use in 2006. Modules: Finance, Purchase, OA, PDM, KOA, CRM, SRM, HRM, etc.
D	Type: Private Industry: Food Annual sales: 3.5 billion RMB Num. of employees: 10000	SAP ECC6.0	Company D began the construction of information and implemented Hejia ERP in 2001. In early 2006, the company decided to purchase SAP ECC 5.0. The SAP ECC 5.0 was come into use in April 2007. In recent years, Company D has implemented EKP, CRM, BW, SFA, etc. Modules: Finance, Sales, OA, EKP, CRM, BW, SFA, SAP HRM, etc.

Table A2. Profiles of interviewees

No.	Gender	Position	Work experience in the firm (years)	Length of interview (minutes)
A-1	Male	CEO	5	50
A-2	Male	IT professional	2	40
A-3	Female	A user from finance department	2	20
B-1	Male	IT Manager	4	90
B-2	Male	Manager of finance department	3	40
B-3	Male	IT professional	3	25
B-4	Male	IT professional	2	20
B-5	Female	IT professional	1	20
C-1	Male	Senior IT professional	7	105
C-2	Male	IT professional	14	30
C-3	Male	IT Manager	15	50
C-4	Male	A user from finance department	6	30
C-5	Male	IT professional	9	30
D-1	Male	CIO	7	125
D-2	Male	IT Manager	8	30
D-3	Male	Senior IT professional	6	25
D-4	Male	Manager of finance department	7	30