The mediating effect of organizational culture and knowledge sharing on transformational leadership and Enterprise Resource Planning systems success: An empirical study in China

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Abstract

Senior leadership has been identified as a critical factor in fostering Enterprise Resource Planning (ERP) systems success, however, the specific impact mechanism of transformational leadership on ERP success is still largely unknown. Based on organizational culture theory and knowledge based view, this study developed a theoretical model to explore the mediating effect of organizational culture and knowledge sharing on transformational leadership and ERP success. Data was collected from 115 IS executives and 413 ERP end users in 115 organizations in China. Partial Least Squares (PLS) analysis results suggest that transformational leadership is directly related with all the four types of organizational culture – development culture, group culture, hierarchical culture and rational culture, and is indirectly related with knowledge sharing and ERP success. Specifically, development culture has direct impact on ERP success, while hierarchical culture, group and rational culture are indirectly related with ERP success, mediated by explicit and tacit knowledge sharing. The research findings can provide guidelines for the top executives to facilitate appropriate organizational culture, so as to foster ERP knowledge sharing and achieve business benefits with the assimilation of ERP systems.

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1. Introduction

With the globalization of the economy and increasing uncertainty of market environment, competition in the marketplace has become increasingly fierce and dynamic. To survive and thrive in such conditions, many firms have turned to information technology (IT) to make their operational, tactical and strategic processes more efficient and effective, and Enterprise Resource Planning (ERP) systems have emerged as one of the most critical information technologies powering businesses since the 1990s (Agourram, 2009; Jacobson, Shepherd, D’aquila, & Carter, 2007; James & Wolf, 2000). Since ERP systems can provide cost-effective functionalities for building knowledge platforms through systematic acquisition, storage, and dissemination of organizational knowledge, they are regarded as one of the most significant levers for organizations to derive competitive advantage (Hendricks, Singhal, & Stratman, 2007; Purvis, Sambamurthy, & Zmud, 2001).

ERP systems are defined as commercial packaged software that enables the integration of transactions-oriented data and business processes throughout an organization (Markus & Tanis, 2000). As integration software, ERP systems represent a complete or near-complete re-architecting of an organization’s portfolio of transactions-processing applications in all functional areas such as finance, human resources, planning of manufacturing, sales and marketing, and help the different parts of the organization share data and knowledge as well as reduce cost, so as to improve the management of business processes (Aladwani, 2001; Davenport, 1998).

With price tags ranging from $3 million to over $100 million per ERP implementation, ERP systems have become the most significant IT investment for most companies with serious financial consequences (Ross & Vitale, 2000). According to a recent report by the market research firm AMR, the worldwide ERP market is expected to grow from $28.8 billion to $47.7 billion from 2006 to 2011, at the annual rate of 11% (Jacobson, Shepherd, D’aquila, & Carter, 2007). Millions of dollars are devoted into ERP systems and several years are needed for the host organizations to adapt and assimilate system functionalities and capabilities (Hendricks et al., 2007; Ross & Vitale, 2000). Therefore, ERP systems are usually adopted and implemented in multiple phases with different tasks and challenges in each of the phases (Markus & Tanis, 2000). However, because of the large-scale and complexity of system functionalities, many ERP projects have failed and led companies to financial difficulties (Xue, Liang, Boulton, & Snyder, 2005). Extant studies estimated that between 1.5% and 6.0% of an organization’s annual revenue was spent on ERP systems with a significant proportion
of the implemented systems not succeeding (James & Wolf, 2000; Sun, Yazdani, & Overend, 2005).

Improving the chances of ERP success has been a focus of research in the past decades, and studies have identified critical success factors for ERP adoption, implementation, and use. On the one hand, senior leadership has been recognized as one of the most significant factors in the extant literature (Elbashir, Collier, & Sutton, 2011; Law & Ngai, 2007; Rai, Brown, & Tang, 2009; Umble, Haft, & Umble, 2003). Somers and Nelson (2004) argued that sustained top management support was needed in each specific phase of ERP lifecycle. In empirical studies, Neufeld, Dong, and Higgins (2007) found a positive relationship exists between senior leadership and IT acceptance, while Wang, Chou, and Jiang (2005) indicated that senior leadership has positive impact on team cohesion and overall performance during ERP implementation. In the context of ERP implementation, Ke and Wei (2008) theoretically analyzed the relationship between transformational leadership, organizational culture and ERP success, and posited that transformational leadership has indirect effect on ERP success by fostering organizational culture along the dimensions of learning and development, participative decision making, power sharing, support and collaboration, and tolerance for risk and conflicts. However, the proposed model has not been validated by empirical study, thus cannot provide reliable guidelines for practice.

On the other hand, knowledge sharing has been considered as another significant factor in driving ERP success. ERP systems usually comprise of integrated modules across multiple business functions and even organizational boundaries, and a systematic acquisition, storage, and dissemination of organizational knowledge is significant in building intensive knowledge platform and providing cost-effective functionalities (Hendricks et al., 2007; Purvis et al., 2001). Sambamurthy and Subramani (2005) posited that advantages for a firm arise from cooperative social contexts that are conducive to the creation, coordination, transfer, and integration of knowledge distributed among its employees, business units as well as business partners, and organizations need to overcome cultural barriers and initiate appropriate culture to best facilitate knowledge sharing (Jones, 2005; Jones, Cline, & Ryan, 2006).

Although the existing literature has examined the link between transformational leadership and organizational culture (Ogbonna & Harris, 2000; Sarros, Cooper, & Santora, 2008; Schein, 2004; Xenikou & Simosi, 2006), the link between organizational culture and knowledge sharing (Jones, 2005; Jones et al., 2006), and their relationship with ERP success (McGinnis & Huang, 2007; Schultz & Leidner, 2002), little research has focused on understanding the influence mechanism of organizational culture and knowledge sharing between transformational leadership and ERP success, there is still a missing link between these four constructs. In addition, most of extant studies focus on adoption and implementation phase, yet ignore the ERP assimilation phase. In multi-case study, Liu, Feng, Hu, and Huang (2011) pointed out that individuals’ understanding of ERP systems and their ability to use ERP for non-routine tasks is important for organizational level ERP assimilation, and the potential business value of ERP systems cannot be fully realized until they are extensively assimilated in various business processes they are implemented in and supporting. Thus top executives need to pay attention to the ERP utilization at the individual level after the system implementation was completed.

Drawing on the extant literature, in this study, we focus on ERP assimilation phase, and posit that the top executives need to exhibit transformational leadership traits to facilitate appropriate organizational culture and foster individual’s ERP knowledge sharing intention, further, to enhance business efficacy and effectiveness with ERP systems.

The objectives of this study are three folds. Firstly, we want to explore the mediating effect of four typologies of organizational cultures (development culture, group culture, hierarchical culture and rational culture) on transformational leadership style and knowledge sharing. Secondly, we’d like to explore the mediating effect of two types of ERP knowledge sharing (ERP explicit knowledge sharing and tacit knowledge sharing) on organizational culture and ERP success. Finally, we want to explore the relationship between ERP explicit knowledge sharing and tacit knowledge sharing.

This paper is organized as follows. We first review the literature on transformational leadership, organizational culture, knowledge sharing and ERP success. Secondly, we develop our research model and articulate the corresponding five hypotheses. The research methodology is then presented to clarify the construct operationalization and data collection procedure, followed by the section of data analysis results and hypotheses testing. Finally we provide research conclusions and implications.

2. Literature review

2.1. Transformational leadership

Leadership theory has developed significantly during the last century, from the earlier leader trait theory to the later leader behavior theory. A paradigm shift occurred in the mid-1970 with new theories of leadership emerged under the labels of transformational and transactional leadership.

Burns (1978) was the first author to propose transformational and transactional leadership and used them to describe political leaders. Bass (1985) adopted this classification in organizational research and divided senior leadership style into these two types. He argued that in organizations, “transformational leaders mostly consider how to marginally improve and maintain the quantity and quality of performance, how to substitute one goal for another, how to reduce resistance to particular actions, and how to implement decisions” (p. 27), while, “transactional leaders attempt and succeed in raising colleagues, subordinates, followers, clients, or constituencies to a greater awareness about the issues of consequence” (p. 17).

Drawing from Bass's definition, transactional leadership involves an exchange relationship between leaders and followers so that followers receive wages or prestige for complying with a leader's wishes. In contrast, transformational leaders can broaden and elevate the interests of their employees, and are able to stir their employees to look beyond their own self-interest for the good of the group by generating awareness and acceptance of the purposes and mission of the group (Bass, 1998; Bass, Avolio, Jung, & Berson, 2003; Yukl, 2006). When followers equate their own success with that of their organizations' and identify with the organizations’ values and goals, they become more willing to cooperate in order to make a positive contribution to the work context (Podsakoff, MacKenzie, & Bommer, 1996). Thus transformational leadership is more likely to result in higher levels of performance among individuals by influencing followers' goals and beliefs (Yukl, 2006).

While other types of leadership style and classification schemes have been proposed, the transformational–transactional dichotomy has been the dominant scheme in organizational leadership literature. In an empirical study, Bass and Avolio (1995) developed the Multifactor Leadership Questionnaire (MLQ) to measure transformational and transactional leadership, and refined the transformational leadership into five sub-dimensions including idealized attributes, idealized behaviors, inspirational motivation, intellectual stimulation and individualized consideration. Further, they found that transformational scales were strongly associated with the contingent rewards scale of transactional leadership. Based
on MLQ scales, Avolio, Bass, and Jung (1999) proposed a six-factor model using a reduced set of items producing the best fit to the data when compared to a series of nested models.

In a recent study, Rafferty and Griffin (2004) re-examined the theoretical model developed by Bass (1985) and identified five sub-dimensions of transformational leadership including vision, inspirational communication, intellectual stimulation, supportive leadership, and personal recognition. Confirmatory factor analysis provided support for the five factor structure of transformational leadership measures. The definitions of the five sub-dimensions and definitions are described in Table 1.

2.2. Organizational culture

The concept of culture has been the subject of considerable academic debate in the last 25 years and there are various approaches to define and study culture. Schein (2004) defined organizational culture as “the tacit, unwritten rules for getting along in the organization; the ropes that a newcomer must learn in order to become an accepted member; the way we do things around here”. While Deal and Kennedy (1999) focused on espoused values and defined culture as the articulated, publicly announced principles and values that the group claims to achieve, such as “product quality” or “price leadership”. From linguistic paradigms perspective, Hofstede and Hofstede (2005) defined culture as the shared cognitive frames that guide the perceptions, thought, and language used by the members of a group and taught to new members in the early socialization process.

By synthesizing and analyzing previous definitions, Schein (2004) proposed a three-level framework of organizational culture that ranges from the very tangible overt manifestations that one can see and feel to the deeply embedded, unconscious, basic assumptions, in between the two levels are various espoused beliefs, values, norms, and rules of behavior, as depicted in Fig. 1.

The level of underlying assumptions represents the belief systems that individuals have towards human behavior, relationships, reality, and truth. The middle level of espoused beliefs and values represents a manifestation of culture that signify espoused beliefs identifying what is important to a particular cultural group, and these values answer the question as to why people behave the way they do. While the third level of artifacts represents the most visible manifestations and creations of culture (Schein, 2004).

Within the three levels of organizational culture, artifacts are easy to observe but difficult to decipher, and basic assumptions are invisible and preconceived thus are not easily studied. To understand the culture characteristics of an organization, one must attempt to get at its shared basic assumptions, and the middle level of espoused beliefs and values may be particularly useful in explaining how top leadership transforms the beliefs and values that get a group move in dealing with its internal and external problems (Schein, 2004).

The three-level framework has provided a qualitative description of organizational culture. Majority studies conceptualized organizational culture from level of values and quantitatively divided organizational culture into different typologies. Drawing on Competing Values Framework (CVF), Quinn and Spreitzer (1991) divided organizational culture typology based on competing values model.

Table 1

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<th>Sub-dimensions</th>
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<tr>
<td>Vision</td>
<td>Expressing an idealized picture of the future based around organizational values</td>
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<tr>
<td>Inspirational</td>
<td>communication</td>
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<tr>
<td>Supportive leadership</td>
<td>Expressing positive and encouraging messages about the organization, and statements that build motivation and confidence</td>
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<tr>
<td>Intellectual</td>
<td>stimulation</td>
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<tr>
<td>Personal recognition</td>
<td>Enhancing employees’ interest in, and awareness of problems, and increasing their ability to think about problems in new ways</td>
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The four types of organizational culture vary in the values and concerns that they address. The development culture in the upper right quadrant emphasizes flexibility and change, and maintains a primary focus on the external environment. Core values in development culture include growth, stimulation, creativity and resource acquisition; the group culture in the upper left quadrant emphasizes flexibility and maintains a primary focus on the internal organization. Core values in group culture focus on belonging, attachment, cohesiveness, trust and participation; the hierarchical culture in the lower left quadrant focuses on the logic of the internal organization and emphasizes on stability. Core values in hierarchical culture include uniformity, security, order, rules, control, coordination, regulations and efficiency; while rational culture in the lower right quadrant focuses on internal stability and external environment. Core values in rational culture include planning,
productivity, efficiency and the successful achievement of prede-

Although different cultural typologies are proposed, Quinn and Spreitzer (1991)’s cultural typology is widely used in empirical
studies, since it has a strong theoretical foundation of CVF and has fairly short, validated measurement instruments for organiza-
tional culture. Table 2 lists a comparison between Quinn and Sprei-

Table 2
Comparison between culture typologies.

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<tr>
<td>Development culture</td>
<td>Adaptability</td>
<td>Innovative culture</td>
<td>Adaptive culture</td>
<td>Adhocracy culture</td>
</tr>
<tr>
<td>Group culture</td>
<td>Involvement</td>
<td>Community culture</td>
<td>Humanistic culture</td>
<td>Clan culture</td>
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<tr>
<td>Hierarchical culture</td>
<td>Consistency</td>
<td>Bureaucratic culture</td>
<td>Not defined</td>
<td>Hierarchy culture</td>
</tr>
<tr>
<td>Rational culture</td>
<td>Mission</td>
<td>Competitive culture</td>
<td>Achievement culture</td>
<td>Market culture</td>
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From Table 2 we can see all of the cultural typologies proposed in extant literature correspond with development culture, group culture, hierarchical culture and rational culture proposed in Quinn and Spreitzer (1991)’s study. Thus in this study, we use Quinn and Spreitzer (1991)’s typology to measure organizational culture quantitatively.

2.3. Knowledge sharing

Knowledge sharing has become a popular topic since the last
decades. Knowledge-based view argues that knowledge is the
foundation of a firm’s competitive advantage, and, ultimately, the
primary driver of a firm’s value (Kearns & Sabherwal, 2006; Kraaijenbrink, Spender, & Groen, 2010). Since organizational knowledge largely resides within individuals, the willingness of individuals in an organization to share with others the knowledge they have acquired or created is critical in utilizing and realizing the potential value of knowledge (Gibbert & Krause, 2002).

By distinguishing knowledge traits, Bock, Zmud, Kim, and Lee (2005) further classified knowledge sharing into explicit knowledge sharing and tacit knowledge sharing. Drawing from literature in knowledge management, explicit knowledge is formal and systematic, and can be achieved through readings of project manuals and team discussions, while tacit knowledge is highly personal, context-specific, subjective, and can be represented in the form of metaphors, drawings, non-verbal communications and practical expertise. It is usually difficult to articulate tacit knowledge through a formal use of language since it is expressed in the form of human actions such as evaluations, attitudes, points of view, commitments and motivation (Koskinen, Pihlanto, & Vanharanta, 2003).

2.4. Transformational leadership and organizational culture

The topics of leadership and organizational culture have attracted considerable interest from both academics and practitioners in the past decades. Earlier studies have posited the relationship between leadership style and organizational culture. Culture arises when individual assumptions lead to shared experiences that solve organizational problems of external survival and internal integration, and it is the leader that initiates this process by imposing his or her beliefs, values, and assumptions at the outset. Leaders begin the culture creation process and play a significant role in managing and changing organizational culture (Schein, 2004).

Specifically, transformational leaders are more likely to be needed to unfreeze the organization and launch the change pro-
grams, and a significant function that distinguishes transformational leadership from transactional leadership is its concern for culture. Transactional leadership tends to operate within the existing culture, while transformational leaders frequently work towards changing the organizational culture in line with their vision. Thus excellent leaders are more likely to exhibit transformational leadership traits that enable them to alter aspects of their culture in order to improve their organizational performance (Bass et al., 2003).

Empirical studies also indicated a positive relationship be-
tween transformational leadership and organizational perfor-
ance. In one study, Ogbonna and Harris (2000) validated the mediating effect of organizational culture on transformational leadership and organizational performance. In another study, Xenikou and Simosi (2006) reported that the achievement and adaptive cultural orientations had a direct effect on performance, while transformational leadership and humanistic cultural orientation had an indirect positive impact on performance through achievement cultural orientation. Most recently, Sarros et al. (2008) found that transformational leadership is indirectly related with organizational climate for innovation, mediated by a competitive, performance-oriented organizational culture.

2.5. Organizational culture and knowledge sharing

Organizational culture is considered as a critical factor fostering knowledge sharing. Bock et al. (2005) posited that changing people’s behaviors is generally considered to be the most severe challenge facing firms that desire to increase their members’ knowledge-sharing behaviors, and three types of organizational climate were identified as being particularly conducive to knowledge sharing. The first type of organizational climate is fairness that focuses on building trust between members and serving to overcome the public good dilemma associated with knowledge sharing. The second type of organizational climate is innovativeness that emphasizes learning, open information flows, and reasoned risk-taking. While the third type of organizational climate is affiliation that reflects the caring and pro-social behavior critical to inducing an organization’s members to help one another.

In the context of ERP implementation, Jones et al. (2006) examined the impact of organizational culture on knowledge sharing during ERP implementation, and indicated that ERP requires firms to reengineer business processes as well as adjust organizational structures, and organizations need to enact initiatives to overcome cultural barriers and bring about changes in the underlying organizational culture to support the integrated, cross-functional nature of ERP systems.

Jones et al. (2006) further suggested that the requirements for knowledge sharing do not stop with the implementation, but is also necessary in ERP assimilation phase to achieve ERP success. Thus researchers also need to investigate knowledge sharing from a tacit and explicit knowledge perspective so as to yield additional insight on the way organizational culture affects the sharing of these specific types of knowledge.
2.6. ERP success

Drawing from innovation diffusion theory (IDT) perspective, a typical ERP systems lifecycle is usually described in terms of three phases: ERP adoption, ERP implementation and ERP assimilation (Swanson & Ramiller, 2004; Wu & Chuang, 2010), and the focus of ERP research so far has been on the adoption and implementation phase (Nah, Zuckweiler, & Lau, 2003; Umble et al., 2003). Most of extant studies assess ERP success by whether the system is implemented on-time and/or within budget, but ignore that the ultimate goal of using ERP systems is to create business value and enhance business performance. It is until recently that research on ERP assimilation has emerged as a second wave (Liang, Saraf, Hu, & Xue, 2007; Liu, Feng, Hu, & Huang, 2010a, 2010b; Zhang, Lee, Huang, Zhang, & Huang, 2005; Zhu, Li, Wang, & Chen, 2010). This is primarily because the potential business value of ERP systems cannot be fully realized until they are extensively assimilated in various business processes and the effective application of ERP systems in support of organizational business processes and value-chain activities is more relevant to benefit realization (Purvis et al., 2001; Liang et al., 2007).

By emphasizing the significance of post-implementation success of ERP systems, Shang and Seddon (2002) measured ERP success from dimensions of operational, managerial, strategic, IT infrastructure and organizational benefits. Zhu et al. (2010) argued that the ERP systems directly affect the operational and managerial processes, thus benefits resulting from amelioration in those processes can better characterize the direct advantages that ERP systems bring to the organization, whereas the strategic and organizational benefits reflect the long-term gains of the organization and it is hard to differentiate them from other factors such as market environment and business strategy in achieving competitive advantages for an organization. IT infrastructure was also excluded from the measures since the benefits from IT are not representative of the post-implementation success of ERP (Zhu et al., 2010).

Based on Zhu et al. (2010) and Shang and Seddon (2002)'s studies, we focus on ERP assimilation phase and measure ERP success from the improvement of operational and managerial benefits.

2.7. The missing link in the literature

Although extant literature has explored the relationship between transformational leadership and organizational culture, the relationship between organizational culture and knowledge sharing, and their impact on ERP success, few studies have been conducted in the context of ERP assimilation, and there is still a missing link between the four factors. Ke and Wei (2008) have theoretically analyzed how transformational leadership affects ERP implementation by fostering the desired organizational culture along the dimensions of learning and development, participative decision making, power sharing, support and collaboration, and tolerance for risk and conflicts. However, their study ignored the role knowledge sharing plays between organizational culture and ERP success. Besides, the proposed theoretical model has not been validated with empirical data.

Drawing on the extant literature, in this study, we propose a theoretical model to examine the mediating effect of organizational culture and knowledge sharing between transformational leadership and ERP success, as described in the following section.

3. Theoretical model and hypotheses

In ERP assimilation phase, most of the radical customizations and business process reengineering are complete (Luo & Strong, 2004), and the system is considered officially “rolled out” for routine usage. However, having the system up and running does not automatically produce the expected benefits to both business operations and the financial performance. Organizations are faced with a new set of challenges in the assimilation phase.

Continuous learning by individuals has been identified as one of the important activities in ERP assimilation phase (Liu et al., 2010a, 2010b). Since ERP systems integrate multiple business functions, individuals must not only be familiar with their own task and responsibility, but also collaborate closely with employees up and downstream along organizational integral business process. They need to undergo an intensive learning process to bridge the gap between what they have known and what the system requires them to know (Ke & Wei, 2008; Ravichandran, 2005). Extant literature indicates that skills and knowledge acquisition is supported by the interaction and encouragement of organizational members, and an organizational culture of support and collaboration can reduce employees’ fear and increase their openness to share their knowledge with others (Ke & Wei, 2008).

In an empirical study, Bock et al. (2005) posited that in trust-oriented culture, employees are more likely to share knowledge with their colleagues, thus to form a shared belief that emphasizes knowledge acquisition and application within the organization, which are critical drivers of ERP implementation success (Vandaie, 2008). In multi-site case studies, Jones et al. (2006) found that organizational culture that focuses on coordination, collaboration and trust can facilitate knowledge sharing in ERP implementation, specifically, a collaboration oriented culture is more likely to facilitate tacit knowledge sharing within the organization (Jones, 2005).

Transformational leadership was identified as a critical facilitator of organizational culture and exploitative learning (Bass et al., 2003; Schein, 2004). Nemanich and Vera (2009) indicated that transformational leadership has indirect impact on organizational learning, mediated by organizational learning culture that emphasizes psychological safety, openness and decision making participation. Jansen, Vera, and Crossan (2009) empirically found that leadership behaviors that facilitate improving and extending are significantly associated with exploitative learning of existing knowledge. While Tsai, Chen, and Cheng (2009) also reported a positive relationship exists between transformational leadership, employees’ positive moods and their task performance.

Drawing on the extant literature, we argue that in order to stimulate employees’ intrinsic motivation to learn systems functionalities and facilitate organizational sharing of ERP knowledge, the top executive needs to promote a trust-oriented group culture that focuses on belonging and participation by expressing concern for followers and taking account of their individual needs, and these leadership traits are largely exhibited in sub-dimension of supportiveness of transformational leadership (Rafferty & Griffin, 2004). This leads to the following hypotheses:

H1. Organizational group culture mediates the relationship between transformational leadership and ERP knowledge sharing.

H1a. Transformational leadership is positively related with organizational group culture.

H1b. Organizational group culture is positively related with ERP knowledge sharing.

ERP assimilation also requires users to develop an exploratory learning of system’s capabilities and potentials (Ke & Wei, 2008; Liu et al., 2010a; Purvis et al., 2001), to think innovatively for
new possibilities and applications of ERP systems (Jasperson, Carter, & Zmud, 2005; Liu et al., 2010a). Since its complexity, an exploratory learning of ERP systems may need a climate in which the organization accepts conflicts and risk. Ke and Wei (2008) posited that tolerance for risk culture allows the innovative ideas to be tested for their feasibility and effectiveness, thus to encourage the empowered employees to make ad hoc decisions in response to market changes and be responsible for their behaviors (Markus & Tanis, 2000). This is in correspondence with previous views. Ama-bile, Barsade, Mueller, and Staw (2005) posited that in innovative-ness oriented culture, there is a shared belief that innovative ideas are a valuable aspect of staying competitive in the market place, and employees are provided with opportunities for personal development. These behaviors are beneficial to enhance individuals' motivation to explore new system functions.

Transformational leadership was identified as a critical pro-moter of organizational exploratory learning. Jansen et al. (2009) argued that transformational leadership that challenges assumptions, takes risks and inspires others is ideally suited to exploratory innovations. Through inspirational communication and intellectual stimulation, transformational leadership provides ideological explanations that link individuals' identities to the collective identity, and can increase followers' intrinsic motivation to engage in exploratory innovation (Jung, Chow, & Wu, 2003), to think “out of the box” and come up with creative observations (Bass et al., 2003). Based on a survey of 1158 managers, Sarros et al. (2008) indicated that transformational leadership indirectly influence organizational climate for innovation through a competitive, performance-oriented organizational culture. Most recently, Song, Kolb, Lee, and Kim (2012) found that transformational leadership was positively related with employees' work engagement and organizational knowledge creation practices.

Thus we argue that in order to improve competitive advantage with ERP systems and achieve ERP success, the top executive needs to facilitate a development culture that focuses on innovativeness, creativity, and adaptation to the external environment, thus to offer the users a vision of organizational strategic directions and inspire the users to think innovatively about how the system might enable the business to accomplish its goals and achieve business performance, and these traits are largely exhibited in sub-dimensions of vision, inspirational communication and intellectual motivation of transformational leadership. This leads to the following hypotheses:

**H2.** Organizational development culture mediates the relationship between transformational leadership and ERP success.

**H2a.** Transformational leadership is positively related with organizational development culture.

**H2b.** Organizational development culture is positively related with ERP success.

During ERP assimilation phase, new system processes and functionalities need to be designed and upgraded in support of organizational new business requirements, and individuals need to master the new systems processes and functionalities to manage daily business process efficiently and effectively. For the majority of ERP users in organizations, the prior related knowledge of ERP systems is rare, thus user training is also identified as a critical factor fostering the assimilation of ERP systems (Liu et al., 2011), and how to encourage the individuals to participate in the training process actively is another critical challenge in ERP assimilation phase.

Drawing from the research of work behavior, extrinsic motivation (rewards) is proved to be significantly related with worker participation. Lin (2007) posited that certain forms of extrinsic motivation such as monetary incentives or praise and public recognition may stimulate individual extrinsic motivation and foster their knowledge sharing intention.

In order to promote individuals' active participation in ERP systems training, the top executives need to set up appropriate evaluation mechanisms and orchestrate a system of reward mechanisms to foster a hierarchical culture that emphasizes efficiency, uniformity and coordination, thus to accommodate the new system functions and processes and resolve any misfit that might arise (Podsakoff, Bommer, Podsakoff, & MacKenzie, 2006; Sharma & Yetton, 2003; Umble et al., 2003). The required leadership traits are largely exhibited in sub-dimension of personal recognition of transformational leadership (Rafferty & Griffin, 2004). This leads to the following hypothesis:

**H3.** Organizational hierarchical culture mediates the relationship between transformational leadership and ERP knowledge sharing.

**H3a.** Transformational leadership is positively related with organizational hierarchical culture.

**H3b.** Organizational hierarchical culture is positively related with ERP knowledge sharing.

Transformational leadership is also indispensable for the top executive to promote a rational culture that focuses on accomplishment and achievement, so as to drive ERP knowledge sharing and achieve ERP success. On the one hand, Ogbonna and Harris (2000) reported that supportive leadership has positive impact on competitive culture that focuses on goal setting and accomplishment. This is consistent with Xenikou and Simosi (2006)'s finding that transformational leadership is significantly related with achievement culture that emphasizes accomplishment of objectives. On the other hand, Jones et al. (2006) posited that organizational rationality oriented culture is positively related with organizational knowledge sharing.

According to the above analysis, we posit that in ERP assimilation phase, the top executives also need to promote a rational culture, and the required leadership traits of clear goal setting and articulation are largely exhibited in sub-dimensions of vision and inspirational communication of transformational leadership (Rafferty & Griffin, 2004). This leads to the following hypotheses:

**H4.** Organizational rational culture mediates the relationship between transformational leadership and ERP knowledge sharing.

**H4a.** Transformational leadership is positively related with organizational rational culture.

**H4b.** Organizational rational culture is positively related with ERP knowledge sharing.

In knowledge management research fields, knowledge sharing has been considered as a critical factor driving knowledge creation, application and developing competitive advantages in the organization. From a resource based view, Kearns and Sabherwal (2006) have discussed how knowledge sharing between IT and business executives create competitive advantage. Liao, Fei, and
Chen (2007) investigated the relationships between knowledge sharing, absorptive capacity, and innovation capability and found that knowledge sharing is positively related with absorptive capacity and innovation capability. Using survey data, Wang, Lin, Jiang, and Klein (2007) found that effective knowledge transfer and sharing can lead to a better fit between ERP systems and organizational processes, further, to enhance business performance and achieve competitive advantage.

Drawing from the existing literature, we argue that in assimilation phase, knowledge sharing is important for organizational members to assimilate ERP knowledge, thus to have a deeper understanding of system functionalities and capabilities. This leads to the following hypothesis:

**H5.** ERP knowledge sharing is positively related with ERP success in assimilation phase.

Based on the above theoretical analysis and five hypotheses, we develop a research model that integrates transformational leadership, organizational culture, knowledge sharing and ERP success, as described in Fig. 3.

### 4. Research methodology

#### 4.1. Measures

The survey instrument was developed based on a comprehensive review of the existing literature. The questionnaire was then translated into Chinese, and a few revisions were made to adapt to ERP assimilation context. All the items were measured on a five-point Likert scale, anchored from 1 (strongly disagree) to 5 (strongly agree). The specific items of each construct are provided in the Appendix.

#### 4.1.1. Transformational leadership

Drawing from Rafferty and Griffin (2004)’s study, transformational leadership was measured from five dimensions including vision, inspirational communication, intellectual stimulation, supportive leadership, and personal recognition, and three reflective items are used to measure each construct. Empirical studies suggest that the five dimensions of transformational leadership are highly correlated with each other (Bass & Avolio, 1995; Rafferty & Griffin, 2004). Thus following Bono and Judge (2003)’s study, the items for each sub-dimension of transformational leadership were first averaged to form a synthesized score, then the five synthesized score in correspondence with the five leadership dimensions were used to measure transformational leadership as reflective items.

#### 4.1.2. Organizational culture

We refer to Quinn and Spreitzer (1991)’s study to measure four typologies of organizational culture including development culture, group culture, hierarchical culture and rational culture. An important assumption of CVF is that each type of culture is an ideal one. The culture in an organization is a combination of different culture orientations, although usually one type is more dominant than the others. A high rating on one dimension does not exclude high rating at the other end (Iivari & Huisman, 2007). Following Quinn and Spreitzer (1991)’s study, three reflective items are designed for each culture typology.

#### 4.1.3. Knowledge sharing

Bock et al. (2005) defined knowledge sharing as a second-order construct composed of explicit knowledge sharing and tacit knowledge sharing. Two and three reflective items were designed to measure the two constructs separately. To guarantee that each construct will have at least 2–3 items after deleting the item with low factor efficient, we added an item to measure explicit knowledge sharing, and further adjusted their scale to accommodate to the context of ERP assimilation.

#### 4.1.4. ERP success

Scales of ERP success were adapted from Shang and Seddon (2002)’s study. Zhu et al. (2010) have pinpointed the importance of ERP post-implementation phase (assimilation phase), and applied Shang and Seddon (2002)’s scale to measure ERP post-implementation success. Thus in this study, we focus on ERP assimilation phase, and measure ERP success with reflective items of operational cost saving, sales income increase, decision efficacy improvement and customer satisfaction enhancement. The respondents were asked to evaluate the improvement of business benefits from the five dimensions after using ERP systems for at least 1 year.

#### 4.2. Data collection

We used field survey to test the proposed research model. A pretest was initially conducted to examine the content validity of the questionnaire, and experts from industry and academics were invited to evaluate the specific items of the questionnaire and find if the items are clear and easy to understand. Several items of transformational leadership were adjusted since they are too long to read, while three items of organizational culture are also revised in case of their obscurity. 45 firms in Harbin, China were invited to participate in the pilot study to statistically examine the construct validity of the variables. A top executive in charge of ERP systems and his/her direct subordinate were asked to complete two questionnaires in each firm, and 72 valid questionnaires from 36 firms were received. PLS analysis results suggest that most of the items load high on corresponding construct, and one item of hierarchical culture with factor loading lower than 0.7 was deleted from the questionnaire. A field study was conducted once all the amendments were made to the final questionnaire. Initial contact was made with a large and established ERP software corporation in Zhengzhou of

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**Fig. 3.** Research model.
Henan province using personal contacts. We contacted with the top executive of the software company to search for 200–400 client organizations. The objective sampling organizations need to have used ERP software for at least 1 year, also, have a professional IS executive responsible for the ERP systems. Based on the requirements, 300 firms from diverse locations of Henan province were selected. We contacted these organizations using e-mail facilities or mobile phones, and approximately 120 organizations agreed to participate in this research. The survey was disseminated to the organizations and a research team consisting of four doctoral students and eight employees visited the 115 organizations separately to explain the purpose of the research and to provide directions for completing the questionnaire. Data collection was conducted from August 19th, 2010 to August 25th, 2010.

Common method bias has been considered as a potential problem in behavioral research. Podsakoff, MacKenzie, Lee, and Podsakoff (2003) argued that one way of controlling for common method bias is to collect the measures of these variables from different sources. Thus we collect data of transformational leadership and ERP success from IS executives while data of organizational culture and knowledge sharing from ERP end users. Participants were 115 IS executives and 413 ERP end users from the 115 organizations. In each investigated organization, the IS executive was asked to evaluate the leadership style of his or her direct superior leader, also, to evaluate ERP success from operational cost, sales income, productivity, user satisfaction and competitive advantage at the organizational level. Averagely two to four employees were asked to evaluate organizational culture and knowledge sharing at the individual level. Totally 88 and 343 valid questionnaires were collected from IS executives and ERP end users in 88 organizations, with one questionnaire at organizational level and four questionnaires at individual level for each organization. This amounts to a valid response rate of 76.5% at organizational level and 83% at individual level separately.

Since our analysis is at organizational level, 343 data from individual respondents was then averaged to match with the 88 data from IS executives. After removing the data that has only one valid individual respondent, we finally obtained 75 data for analysis at individual level. From Table 3 we can see that most of the sample organizations are small and middle sized enterprises (SMEs) from retail industry. This is consistent with the previous findings. In developing countries such as China, the government has launched the policy of using IT technologies to speed up industrialization and SMEs are encouraged to implement ERP systems to support their business operations and achieve market competitive advantage. With the variety of products increases and the retailer size expands, ERP systems have become indispensable for supporting retailers to sell the right product to the right customers at the right time and price. As an emerging market entity, SMEs from retailing industry play a major role in the national economy. The enterprise needs to manage a growing variety of products, and a powerful IT such as ERP system was required to satisfy diversification of customer requirements (Chien, Hu, Reimers, & Lin, 2007; Zhu & Kraemer, 2005; Zhu, Li, Qian, Chen, & Chen, 2008; Zhu et al., 2010).

5. Data analysis and hypothesis testing

5.1. Statistical analysis technique

For analyzing both the measurement and structural models of this study, the structural equation modeling (SEM) method was employed as it was capable of allowing the incorporation of both unobserved (i.e. latent) and observed variables in the same model, and being able to handle errors of measurement within exogenous variables in a better manner. Additionally, SEM is able to process multiple dependent variables, which is not feasible in a traditional regression analysis method (Chin, Marcolin, & Newsted, 2003; Gefen, Straub, & Boudreau, 2000).

Two diverse methodological approaches are proposed to calculate SEM. The first one is the covariance structure analysis technique using programs such as, AMOS or LISREL. The other is Partial Least Squares (PLS) technique employing programs; for instance, PLS-Graph and SmartPLS (Temme, Kreis, & Hildebrandt, 2006; Ringle, Wende, &Will, 2005). PLS is appropriate for both reflective and formative construct analysis, and is able to accommodate smaller data sample models without requirements of normality distribution of the data (Chin et al., 2003). As the sample size collected in this study is relatively small, we chose the PLS approach for data analysis.

5.2. Measurement model

The measurement model was assessed to analyze internal consistency reliability, convergent validity and discriminant validity. Internal consistencies are considered as acceptable if each construct’s composite reliability, Cronbachs alpha score and item loadings has exceeded 0.7, implying that all the measures consistently represent the same latent construct (Chin et al., 2003).

Convergent validity was examined by checking the average variance extracted (AVE). AVE was calculated by averaging the percentage of variance extracted of each construct from its indicators, and it was reported that AVE should be 0.5 or greater to suggest adequate convergent validity (Pavlou & Fygenson, 2006).

Table 4 describes the item loadings, composite reliability, Cronbachs alpha and AVE of each construct.

As Table 4 illustrates, except for one item of hierarchical culture, item loadings of all the other constructs are greater than 0.8, with most of the loadings exceeding 0.9, and the t-test results are all significant at the 0.01 level, indicating that all the measures consistently represent the same latent construct. The composite reliability and Cronbachs alpha of each construct is greater than 0.85, while the average variance extracted (AVE) of each construct
is greater than 0.75, suggesting a good reliability and convergent validity (Pavlou & Fygenson, 2006).

Discriminant validity refers to the degree to which items differentiate between constructs, and it is assessed by applying the following two criteria: (1) The square root of the average variance extracted of each latent variable from its indicators should exceed that construct’s correlation with other constructs; (2) The items should load more highly on constructs they are intended to measure than on other constructs (Chin et al., 2003; Limayem & Cheung, 2008). In this study, we analyzed the correlation between each two latent constructs as well as the cross-loadings, as shown in Tables 5 and 6 separately.

As shown in Tables 5 and 6, the square root of the average variance extracted (AVE) of each latent construct is greater than that construct’s correlation with other constructs. In this study, we analyzed the correlation between each two latent constructs as well as the cross-loadings, as shown in Tables 5 and 6 separately.

As shown in Tables 5 and 6, the square root of the average variance extracted (AVE) of each latent construct is greater than that construct’s correlation with other constructs. In this study, we analyzed the correlation between each two latent constructs as well as the cross-loadings, as shown in Tables 5 and 6 separately.

5.3. Structural model

PLS is applied to test the research model in our study since it has a less critical requirement of the sample size to validate the model compared to alternative structural equation modeling techniques. The sample size requirement is either 10 times of the larger measurement number within the same construct or 10 times of the larger construct number affecting the same construct (Chin et al., 2003; Gefen et al., 2000). Since the largest construct number affecting ERP success is three in the research model, our sample size can satisfy the requirements of PLS.

The PLS structural model and hypotheses are assessed by examining path coefficients and their significance levels. In this study we use Smart-PLS software, which is a Java-based Graphical User Interface (GUI) program and provides a clear and user-friendly data output interface (Ringle, Wende, & Will, 2005). To estimate the statistical significance of the parameter estimates, two resampling methods are available in SmartPLS-bootstrapping and blindfolding. Temme et al. (2006) suggested that in order to derive valid standard errors or t-values, applying bootstrapping is superior to blindfolding. Therefore, the bootstrapping procedure with resampling method is used in our study to estimate the statistical significance of the parameter estimates. Path analysis results in SmartPLS are described in Fig. 4.

As shown in Fig. 4, the path coefficient between transformational leadership and development culture, transformational lead-

Table 5
Correlations between each two constructs.

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Transformational leadership</th>
<th>Develop culture</th>
<th>Group culture</th>
<th>Hierarchical culture</th>
<th>Rational culture</th>
<th>Knowledge sharing</th>
<th>ERP success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformational leadership</td>
<td>0.882</td>
<td>0.928</td>
<td>0.928</td>
<td>0.928</td>
<td>0.928</td>
<td>0.928</td>
<td>0.928</td>
</tr>
<tr>
<td>Develop culture</td>
<td>0.426</td>
<td>0.757</td>
<td>0.712</td>
<td>0.731</td>
<td>0.689</td>
<td>0.691</td>
<td>0.336</td>
</tr>
<tr>
<td>Group culture</td>
<td>0.366</td>
<td>0.692</td>
<td>0.712</td>
<td>0.731</td>
<td>0.689</td>
<td>0.691</td>
<td>0.336</td>
</tr>
<tr>
<td>Hierarchical culture</td>
<td>0.401</td>
<td>0.800</td>
<td>0.741</td>
<td>0.731</td>
<td>0.689</td>
<td>0.691</td>
<td>0.336</td>
</tr>
<tr>
<td>Rational culture</td>
<td>0.337</td>
<td>0.595</td>
<td>0.580</td>
<td>0.689</td>
<td>0.691</td>
<td>0.336</td>
<td>0.336</td>
</tr>
<tr>
<td>Knowledge sharing</td>
<td>0.337</td>
<td>0.595</td>
<td>0.580</td>
<td>0.689</td>
<td>0.691</td>
<td>0.336</td>
<td>0.336</td>
</tr>
<tr>
<td>ERP success</td>
<td>0.635</td>
<td>0.322</td>
<td>0.262</td>
<td>0.377</td>
<td>0.276</td>
<td>0.336</td>
<td>0.336</td>
</tr>
</tbody>
</table>

The bold values represent the square root of the average variance extracted (AVE) of each latent construct.
ership and hierarchical culture, transformational leadership and group culture, and transformational leadership and rational culture are all significant at $p$ level of 0.01, thus provide support for Hypotheses H1a, H2a, H3a and H4a.

In terms of the relationship between organizational culture and knowledge sharing, path analysis suggests that rational culture and hierarchical culture are positively related with knowledge sharing, and the path coefficients are all significant at $p$ level of 0.01. These analysis results can provide support for Hypotheses H3b and H4b. However, group culture is not related with knowledge sharing. Thus Hypothesis H1b is not supported.

The path coefficient between development culture and ERP success is 0.203, and is significant at $p$ level of 0.01. The result can support Hypothesis H2b, indicating that innovativeness and creativity oriented development culture can directly enhance ERP success. In addition, knowledge sharing is also a critical driver in achieving ERP success since it has direct positive impact on ERP success, and this result can provide support for Hypotheses H5.

Jones et al. (2006) suggested to further explore organizational culture’s impact on explicit knowledge and tacit knowledge sharing, so as to yield insight on the way cultural barriers affect the sharing of these specific types of knowledge. Thus in this study, we divide organizational knowledge sharing into explicit knowledge sharing and tacit knowledge sharing, and examine the mediating effect of organizational culture on transformational leadership and the two types of knowledge sharing. Fig. 5 shows the path analysis results of the structural model.

An interesting finding of the empirical model is that explicit knowledge sharing is positively related with ERP success, yet tacit knowledge sharing has indirect impact on ERP success, mediated by explicit knowledge sharing. The above findings signify the importance of transformation of tacit ERP knowledge into explicit knowledge in achieving ERP success.

---

### Table 6

<table>
<thead>
<tr>
<th>Construct</th>
<th>Transformational Leadership</th>
<th>Development Culture</th>
<th>Group Culture</th>
<th>Hierarchical Culture</th>
<th>Rational Culture</th>
<th>Knowledge Sharing</th>
<th>ERP Success</th>
</tr>
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<tbody>
<tr>
<td>Vision</td>
<td>0.84</td>
<td>0.32</td>
<td>0.22</td>
<td>0.38</td>
<td>0.27</td>
<td>0.40</td>
<td>0.58</td>
</tr>
<tr>
<td>IC</td>
<td>0.91</td>
<td>0.37</td>
<td>0.26</td>
<td>0.29</td>
<td>0.24</td>
<td>0.24</td>
<td>0.60</td>
</tr>
<tr>
<td>IS</td>
<td>0.91</td>
<td>0.38</td>
<td>0.34</td>
<td>0.35</td>
<td>0.24</td>
<td>0.20</td>
<td>0.49</td>
</tr>
<tr>
<td>SL</td>
<td>0.86</td>
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<td>0.39</td>
<td>0.23</td>
<td>0.34</td>
<td>0.34</td>
<td>0.63</td>
</tr>
<tr>
<td>PR</td>
<td>0.90</td>
<td>0.43</td>
<td>0.38</td>
<td>0.43</td>
<td>0.37</td>
<td>0.57</td>
<td>0.31</td>
</tr>
<tr>
<td>DEV1</td>
<td>0.96</td>
<td>0.69</td>
<td>0.67</td>
<td>0.72</td>
<td>0.77</td>
<td>0.59</td>
<td>0.37</td>
</tr>
<tr>
<td>DEV2</td>
<td>0.46</td>
<td>0.96</td>
<td>0.71</td>
<td>0.69</td>
<td>0.77</td>
<td>0.59</td>
<td>0.37</td>
</tr>
<tr>
<td>DEV3</td>
<td>0.31</td>
<td>0.87</td>
<td>0.73</td>
<td>0.64</td>
<td>0.74</td>
<td>0.48</td>
<td>0.18</td>
</tr>
<tr>
<td>GRO1</td>
<td>0.30</td>
<td>0.71</td>
<td>0.91</td>
<td>0.62</td>
<td>0.69</td>
<td>0.52</td>
<td>0.15</td>
</tr>
<tr>
<td>GRO2</td>
<td>0.36</td>
<td>0.65</td>
<td>0.90</td>
<td>0.52</td>
<td>0.64</td>
<td>0.46</td>
<td>0.21</td>
</tr>
<tr>
<td>GRO3</td>
<td>0.34</td>
<td>0.70</td>
<td>0.92</td>
<td>0.77</td>
<td>0.70</td>
<td>0.58</td>
<td>0.25</td>
</tr>
<tr>
<td>HIE1</td>
<td>0.40</td>
<td>0.70</td>
<td>0.71</td>
<td>0.96</td>
<td>0.75</td>
<td>0.67</td>
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</tr>
<tr>
<td>HIE2</td>
<td>0.35</td>
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<td>0.65</td>
<td>0.96</td>
<td>0.72</td>
<td>0.69</td>
<td>0.36</td>
</tr>
<tr>
<td>RAT1</td>
<td>0.30</td>
<td>0.80</td>
<td>0.67</td>
<td>0.77</td>
<td>0.91</td>
<td>0.67</td>
<td>0.30</td>
</tr>
<tr>
<td>RAT2</td>
<td>0.29</td>
<td>0.75</td>
<td>0.76</td>
<td>0.66</td>
<td>0.93</td>
<td>0.56</td>
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<td>RAT3</td>
<td>0.34</td>
<td>0.67</td>
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<td>0.69</td>
<td>0.93</td>
<td>0.68</td>
<td>0.26</td>
</tr>
<tr>
<td>EKS</td>
<td>0.33</td>
<td>0.57</td>
<td>0.53</td>
<td>0.72</td>
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<td>IKS</td>
<td>0.34</td>
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<td>0.61</td>
<td>0.68</td>
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</tr>
<tr>
<td>PS1</td>
<td>0.59</td>
<td>0.31</td>
<td>0.24</td>
<td>0.36</td>
<td>0.27</td>
<td>0.27</td>
<td>0.93</td>
</tr>
<tr>
<td>PS2</td>
<td>0.63</td>
<td>0.29</td>
<td>0.22</td>
<td>0.31</td>
<td>0.24</td>
<td>0.24</td>
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</tr>
<tr>
<td>PS3</td>
<td>0.55</td>
<td>0.30</td>
<td>0.23</td>
<td>0.35</td>
<td>0.28</td>
<td>0.32</td>
<td>0.54</td>
</tr>
<tr>
<td>PS4</td>
<td>0.63</td>
<td>0.30</td>
<td>0.18</td>
<td>0.34</td>
<td>0.28</td>
<td>0.30</td>
<td>0.92</td>
</tr>
</tbody>
</table>

The bold values represent the item loadings of the construct that they are intended to measure.

Fig. 4. Structural equation model analysis results (** represents $p < 0.01$, * represents $p < 0.05$, ns represents not significant).
6. Discussions

6.1. Theoretical implications

The theoretical contributions of this study are mainly three folds. Firstly, this study is among the first to examine the joint effect mechanism of transformational leadership, organizational culture and knowledge sharing on ERP success. Previous studies have signified the role senior leadership plays in fostering ERP success. However, what specific leadership traits the top executive needs to exhibit and how does senior leadership impact ERP success are still largely unknown. We proposed a theoretical model to examine the impact mechanism of transformational leadership on ERP success, mediated by organizational culture and knowledge sharing. The proposed model can extend the existing studies of senior leadership in ERP assimilation phase.

Secondly, this study fills in the research gap between organizational culture and ERP success. Although culture theory has been used to explain an extensive range of social behaviors and outcomes such as firm effectiveness and firm performance, few studies have been conducted in ERP context, and what is the specific relationship between organizational culture and ERP success is still unexplored. ERP systems require firms to reengineer business processes and adjust organizational structures, and this may contradict existing organizational culture. Since employees have adapted to their traditional business process and formed a fixed schema, they would not like to think outside the fixed schema and accept the new business processes. And the top executives also need to take account of employees’ individual needs by expressing concern and providing personal coaching, so as to promote a trust and belonging oriented organizational culture changes in support of both ERP explicit and tacit knowledge sharing.

Thirdly, this study contributes to the research of knowledge sharing in ERP context by considering knowledge characteristics and exploring the impact of organizational culture on tacit and explicit knowledge sharing. Previous studies have signified the positive relationship between organizational culture and knowledge sharing, however, none studies have investigated knowledge sharing from a tacit and explicit knowledge perspective. Based on Competing Values Framework and knowledge based view, we found that group culture and rational culture have direct impact on tacit knowledge sharing, while hierarchical culture indirectly impacts explicit knowledge sharing.

Finally, this study emphasizes the importance of ERP assimilation phase since “the success of ERP systems cannot be achieved after it is assimilated within the organization (Liang et al., 2007)”. Data was collected in firms that have used ERP software for at least 1 year and statistical analysis can support most of our hypotheses. The research findings can provide a comprehensive understanding of the interface between three types of human behaviors (transformational leadership, organizational culture as well as knowledge sharing) and ERP systems.

6.2. Practical implications

From a practical perspective, this study provides insights for the top management team to pay attention to ERP knowledge sharing even after the implementation has completed and the system has been devoted into daily use. Top executives should realize that knowledge sharing is also important in ERP assimilation phase after the system is devoted into daily use, and changing people’s beliefs and behaviors is one of the most severe challenges facing firms that desire to increase their members’ knowledge-sharing behaviors.

In order to promote appropriate organizational culture, a top executive who exhibit strong transformational leadership traits is needed to take charge of ERP assimilation. The top executive needs to be able to conduct strategic and tactical actions, thus to facilitate the organizational culture changes in support of both ERP explicit knowledge sharing and tacit knowledge sharing.

Explicit knowledge is formal and can be achieved through readings of project manuals. Thus in order to promote explicit knowledge sharing, the top executive needs to set up new policies, to clarify individuals’ new roles and responsibilities with regards to ERP systems, also, to set up appropriate evaluation mechanisms and provide rewards for employees’ achievement. These leader traits are beneficial to promote a type of order-oriented hierarchical culture and facilitate explicit knowledge sharing.

Tacit knowledge is highly personal and could be represented in the form of non-verbal communications, and group culture and rational culture is positively related with ERP tacit knowledge. This requires the top executives to set up clear missions and organizational objective, thus to promote an organizational culture that focuses on accomplishment and achievement. In addition, the top executives 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 organizational culture. This is beneficial to achieve ERP success since followers are more likely to equate their own success with the organizations’ success and pursue the achievement of organi-
izational long-term goals under rational and group organizational culture.

Instead of group and rational culture, a development culture that focuses on innovation and creativity is also needed to foster an exploratory 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 use ERP systems flexibly and efficiently, finally, to improve operational and managerial benefits with ERP systems.

7. Conclusions

Drawing from leadership theory, organizational culture theory and knowledge based view, this study developed a theoretical model to examine the joint impact mechanism of transformational leadership, organizational culture and knowledge sharing on ERP success. Field survey method was used to test the proposed research model and totally 431 valid questionnaires were collected from IS executives and ERP end users in 88 organizations, with one questionnaire at organizational level and four questionnaires at individual level for each organization. PLS analysis indicates that development culture has direct positive impact on ERP success. While hierarchical culture, group culture and rational culture is indirectly related with ERP success, mediated by knowledge sharing. Specifically, trust-oriented group culture and achievement-oriented rational culture is directly related with tacit knowledge sharing while control-oriented hierarchical culture is directly related with explicit knowledge sharing. Further, tacit knowledge sharing is indirectly related with ERP success, mediated by explicit knowledge sharing. The empirical results highlight the significance of transformational leadership in promoting desired organizational culture and facilitating individuals’ tacit and explicit knowledge sharing intention, thus to achieve business benefits through the assimilation of ERP systems.

There are some limitations in this study. First of all, this study averaged the items for each sub-dimension of transformational leadership to form a synthesized score, and used the five synthesized score to measure transformational leadership as reflective items. Future studies can use the five sub-dimensions of transformational leadership as independent latent variables and examine their specific impact mechanism on ERP success, to further explore which specific sub-dimension of transformational leadership is more likely to promote the four types of organizational culture and foster the two types of knowledge sharing. Secondly, data collection was mostly conducted in Henan province of China, and the generalizability of the research findings may be restricted by the locations. Future studies need to extend the sample size and collect data from other locations in China to further validate our research results. In addition, since our study was conducted in China, future studies need also consider some national context factors such as Chinese specific “guanxi” culture into the model.

Acknowledgements

The authors would like to express their gratitude to the editor, associate editor, and the anonymous review team for their constructive and insightful comments. This research was partially funded by a Grant from the Chinese National Natural Science Foundation (Contract #71028003). The authors would also thank the top executive, the IS executives and ERP end users in the field study for their time and contribution.

Appendix A. Scales and items

### Transformational leadership

<table>
<thead>
<tr>
<th>Sub-dimension</th>
<th>Items</th>
</tr>
</thead>
</table>
| Vision        | 1. The top executive has a clear understanding of where we are going  
                2. The top executive has a clear sense of where he/she wants our unit to be in 5 years  
                3. The top executive can clearly articulate the strategic vision and objectives |
| Inspirational communication | 1. The top executive says things that make employees proud to be a part of this organization  
                                    2. The top executive says positive things about the work unit  
                                    3. The top executive encourages people to see changing environments as situations full of opportunities |
| Intellectual stimulation | 1. The top executive challenges me to think about old problems in new ways  
                                   2. The top executive has ideas that have forced me to rethink some things that I have never questioned before  
                                   3. The top executive has challenged me to rethink some of my basic assumptions about my work |
| Supportive leadership | 1. The top executive considers my personal feelings before acting  
                                    2. The top executive behaves in a manner which is thoughtful of my personal needs  
                                    3. The top executive sees that the interests of employees are given due consideration |
| Personal recognition | 1. The top executive commends me when I do a better than average job  
                                   2. The top executive acknowledges improvement in my quality of work  
                                   3. The top executive personally compliments me when I do outstanding work |

### ERP post-implementation success

| PS1: Operational cost in our firm is reduced after the ERP system was devoted into daily use |
| PS2: Sales income in our firm is increased after the ERP system became operational |
| PS3: Managerial decision efficiency in our firm is improved after the ERP system was devoted into daily use |
| PS4: Customer satisfaction in our firm is enhanced after the ERP system became operational |

### Organizational culture

<table>
<thead>
<tr>
<th>Sub-dimension</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development</td>
<td>1. Our firm is a very dynamic and</td>
</tr>
</tbody>
</table>
### Scales and items (continued)

<table>
<thead>
<tr>
<th>Sub-dimension</th>
<th>Items</th>
</tr>
</thead>
</table>
| Culture           | entrepreneurial place  
2. The glue in our firm is innovation and development  
3. Our firm emphasizes on growth and acquiring new resources |
| Group culture     | 1. Our firm is a very personal place, like an extended family  
2. The glue in our firm is loyalty and tradition  
3. Our firm emphasizes on human resources |
| Hierarchical culture | 1. Our firm is a very formalized and structured place  
2. Our firm emphasizes on permanence and stability |
| Rational culture  | 1. Our firm is a very efficacy oriented place  
2. The glue is tasks and goal accomplishment  
3. Our firm emphasizes on competitive actions and achievement |

### ERP knowledge sharing

<table>
<thead>
<tr>
<th>Sub-dimension</th>
<th>Items</th>
</tr>
</thead>
</table>
| Explicit knowledge sharing | 1. I am pleased to share my work reports on ERP system with other members  
2. I would like to provide my manuals related with ERP system to other members  
3. I would be pleased to share ERP related official documents with other members |
| Tacit knowledge sharing | 1. I am pleased to communicate with other members on my personal experience of ERP system  
2. I would like to provide my expertise on ERP system with other members  
3. I would be pleased to share know how, know where and know whom knowledge on ERP system at the request of other members |

### References


