
Original Article

The effects of organizational intangible factors on successful enterprise resource planning systems implementation and organizational performance: A China experience

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Abstract This study determines the relative impact of intangible factors on successful enterprise resource planning system (ERPS) implementation, and the subsequent effect on organizational performance. An ERPS is business software and hardware that provides standardized procedures, integrates processes and associated work, and disseminates information throughout an organization. A total of 261 survey returns were obtained from senior executives with ERPS experience in China (PRC), supplemented by follow-up qualitative interview data from 16 senior executives. Structural equation model analysis revealed that intangible factors (such as strategic alignment and leadership commitment) and corporate culture had the greatest impact on 'successful ERPS implementation'. Contrary to expectations, Chinese employee values/culture had no negative impact. Furthermore, this study supports previous findings from ERPS implementation studies in that the evidence for the conversion of non-financial to financial outcomes remains inconclusive.

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Introduction

Among the many information technology (IT) resources available to the firm, enterprise resource planning systems (ERPS) have been implemented extensively in recent years to maintain competitive positioning. ERPS are modular (for example, financial and accounting, human resource management, customer relations, logistics, sales and distribution, and production modules) end-to-end business software and hardware for standardizing procedures, integrating processes and associated work, and disseminating information throughout an organization (Dery *et al*, 2005). ERPS implementation is more than a technological challenge. It is a socio-technological endeavour requiring the successful navigation of numerous organizational and cultural issues that determine its success. The overall (and often unsuccessful) objective of implementing an ERPS is to integrate the organization's business processes and operations for improved business results.

The belief that ERPS can lead to significant cost reduction, while increasing efficiency and profitability, may have contributed to the global proliferation of ERPS. However, converting this conceptual value into concrete value is conclusive. For example, past experience (Seddon, 2005) has shown that between 60 and 90 per cent of implementations fail to achieve the projected return on investment. Despite recent studies showing improving ERPS implementation success rates, failure to achieve the anticipated benefits persists in 40–70 per cent of cases (Scott and Vessey, 2002; Xue *et al*, 2006; Basoglu *et al*, 2007).

Previous studies have discussed critical success factors (CSFs) for successful ERPS implementation (Nah *et al*, 2001; Somers and Nelson, 2001; Umble *et al*, 2003; Zhang *et al*, 2003; Sun *et al*, 2005; Finney and Corbett, 2007) which can be categorized into tangible and intangible factors. Tangible factors are easily measurable, like costs in dollar terms, number of cars produced per day, and number of tons of steel used. For example, in a successful ERPS implementation they may be: the cost of implementation within agreed completion time; vendor support agreements; staff numbers required to integrate hardware and software; percentage of data accuracy; percentage of business processes improvement; and level of performance control and project evaluation. Intangible factors are more difficult to measure – leadership commitment, trusting culture, career development opportunities, team effectiveness, level of knowledge-sharing, strategy and innovation (Hecker and Birla, 2008). In ERPS implementation, critical intangible factors can be: top management support, clear goals and objectives, effective communication and feedback, supportive and innovative organizational culture, training and education, user involvement, alignment, collaboration and knowledge-sharing, team rewards, team performance management and change readiness. Previous studies have



generally investigated tangible antecedents and financial outcomes, as these are easily measurable, while the relative impact of intangible antecedents on successful implementation and organizational performance are often ignored. Furthermore, with the substantial increase in ERPS investment in China, perhaps as a consequence of increased foreign direct investment and its position as the world's manufacturing hub, there is a sense of urgency to explore this gap. This requires a research focus on intangible organization and cultural factors contributing to successful ERPS implementation, and its subsequent impact on both financial and non-financial performance. The findings on the relative impact of intangibles can be leveraged to provide insights into managing ERPS implementation more effectively in China. It is our intention to examine the relative impact of key intangible factors (independent variables) on successful ERP implementation and its mediating effect between these intangible factors and organizational performance (dependent factors) in China.

The Adoption of ERPS in China

The uptake of ERPS, introduced into China at the beginning of the 1980s, was initially slow. Since then, sales have substantially increased. In 2006, total ERPS sales (including Western and Chinese-made systems) reached 4 billion yuan (around US\$570 million) and around 3000 enterprises in China (3.8 per cent) have adopted ERPS (e-work, 2004, 2006). Subsequent research reports that overall 12 per cent of firms were totally dissatisfied with their ERPS performance and only 8 per cent reported total satisfaction. Over half of firms in China (local and foreign) were dissatisfied (e-work, 2006; Xue *et al*, 2006) (Figure 1).

Western ERPS, such as SAP and Oracle, were developed as fully integrated systems including modules ranging from financial/accounting, HR, production

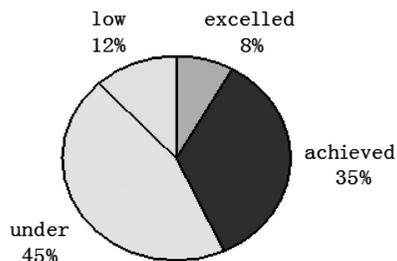


Figure 1: ERPS performance in China.

Source: e-work, 2006.

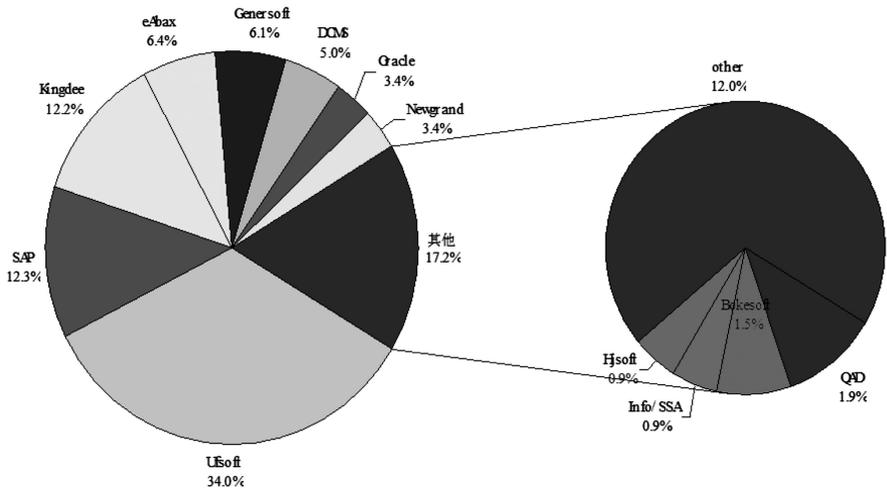


Figure 2: Market share of ERPS vendors in China.
 Source: <http://www.analysys.com.cn> (2007).

and customer relations to supply chain management; these tended to be purchased by state-owned enterprises and large foreign firms (Zhang *et al*, 2003). The Chinese ERPS were originally based on accounting and financial needs, with other modules added as required. Although the Western ERPS were considered more efficient and highly integrated, purchasing and maintenance costs were higher than Chinese systems. Furthermore, as accounting regulations in China differ from the West, local Chinese vendors had the advantage of integrating the fast-changing government management and accounting regulations easily to satisfy the market requirements of local firms (Wang *et al*, 2005; Liang *et al*, 2007). In 2006, over 80 per cent of ERPS were supplied by Chinese domestic vendors (Figure 2).

Critical Intangible Success Factors for ERPS Implementation in China

A review of key studies is provided in Table 1. The key common intangible factors are: top management commitment; clear goals and objectives; vendor support; team composition and collaboration; change management culture; monitoring and evaluation; effective communication; user involvement; training, education and career development; organizational culture; and performance measures and rewards. A review of these factors infers three



Table 1: The CSFs and its importance from the literature

| <i>Author: importance</i> | <i>Somers and Nelson (2001)</i> | <i>Nah et al (2001)</i> | <i>Zhang et al (2003)</i> | <i>Umble et al (2003)</i> |
|-------------------------------|-------------------------------------|--|--------------------------------------|--|
| 1 (very important) | Top management support | ERP teamwork and composition | Effective project management | Clear understanding of strategic goals |
| 2 | Project team competence | Change management programme culture | User involvement | Commitment by top management |
| 3 | Inter cooperation | Top management support | Top management support | Excellent project management |
| 4 | Clear goals and objectives | Business plan and vision | Vendor support | Organizational change management |
| 5 | Project management | Business process reengineering | Education and training | A great implementation team |
| 6 | Inter communication | Project management | Company-wide commitment | Data accuracy |
| 7 | Management of expectations | Monitoring and evaluation of performance | Reengineering business process | Extensive education and training |
| 8 | Project champion | Effective communication | Data accuracy | Focused performance measures |
| 9 | Vendor support | Software development | Suitability of software and hardware | Multi-site issues |
| 10 (general important) | Careful package selection | Testing and trouble shooting | Organizational cultures | — |

Abbreviations: CSF, critical success factors; ERP, enterprise resource planning.



major categories: organizational culture, strategic alignment and leadership commitment, and HR practices.

Another intangible factor – Employee values/Chinese culture – was added as a fourth category. Since the majority of employees in this study were Chinese and national cultural dimensions have distinct characteristics and behaviours (Hofstede, 2001; House *et al*, 2001), the relative impact of national culture as compared with other antecedents in this study, namely strategic alignment and leadership, organizational culture and HR practices, may influence the success or failure of ERPS implementation. This construct is considered important because employees' national values may impact on HR policies and practices (for example, collective reward systems, and conflict avoidance and harmony in Chinese values) (Hofstede, 2001; House *et al*, 2001; Bjorkman and Fan, 2002; Smith *et al*, 2002; Chan *et al*, 2004). Furthermore, success or failure in implementation is closely linked with benefits to the organization. Since concrete benefits are still elusive (Seddon, 2005; Xue *et al*, 2006; Basoglu *et al*, 2007), the mediating effect of 'successful implementation' and organizational performance is of significant interest. The benefits of organizational performance in this study will be based on the balanced scorecard principles (Kaplan and Norton, 2005) of financial and non-financial benefits. Although CSFs may be similar to other IT projects in previous studies, there is a lack of attention given to the 'relative impact' of intangible factors on ERPS implementation. Our findings can be used to deepen understanding of the optimal application of intangible resources in ERPS implementation and organizational performance in China.

Studies on CSFs for ERPS implementation in China (Reimers, 2003; Zhang *et al*, 2003; Li *et al*, 2005) report similar results as in the West, but with additional intangible factors such as government regulations, hierarchical structures (Soh *et al*, 2000), and cultural and HR elements (Davison, 2002; Zhang *et al*, 2003). In Chinese organizations, top management influence (Liang *et al*, 2007) and cultural values (Zhang and Li, 2006) are considered important, along with a charismatic leadership style to influence team, and consequently organizational performance (Huang and Palvia, 2001; Hong and Kim, 2002).

ERPS implementation challenges are not unique to China. Rajapakse and Seddon (2005) identified four key challenges in adopting ERPS in developing countries in Asia: (1) costs relative to national *per capita* incomes – ERPS being more expensive for organizations in most Asian countries than in the West; (2) limited national infrastructure restricts effective adoption, for example lack of skills to implement ERPS and limited telecommunications infrastructure; (3) the level of integration provided by the ERPS is too complex compared to the expectations of individuals and organizations; and (4) differences in organizational and local employees' cultural values may inhibit ERPS adoption. This last challenge was of particular interest.



The Link between ‘Successful ERPS Implementation’ and Organizational Performance

The effective execution of CSFs can enhance ERPS implementation and the relative impact of these factors can be measured. Areas such as effectiveness of planning and coordination, management decision-making, improvement in labour productivity, business processes and supply-chain, and quality output can be indicators of success or failure (Xin, 2004).

Despite the identification of CSFs, ERPS success or failure and discussion of associated ERPS benefits (McAfee, 2002; Gefen and Ragowsky, 2005; Cotteleer and Bendoly, 2006; Hendricks *et al*, 2007), translating ERPS value into organizational performance value is still unclear. Furthermore, as performance benefits may be both tangible (financial) and intangible (non-financial) (Nah *et al*, 2001; Hong and Kim, 2002; Murphy and Simon 2002; Sun *et al*, 2005; Finney and Corbett, 2007), then measuring such gains in organizations remains a significant challenge. This study explores linkages between successful implementation and performance benefits, based on the ‘balanced scorecard’ approach (Kaplan and Norton, 2001, 2005). Hence, ‘successful ERPS implementation’ was adopted as a mediating variable to assess the relative impact of intangible factors on organizational performance.

The Conceptual Framework

Our conceptual framework (Figure 3) is based on four key intangible independent antecedent variables: (1) local HR practices, (2) strategic alignment and leadership commitment, (3) innovation, collaboration, knowledge-sharing and trusting corporate culture, (4) Chinese values/culture. The mediating variable is perceived ‘successful ERPS implementation’. The dependent variable is organizational performance, as measured with balanced scorecard categories. Although ‘successful ERPS implementation’ is the mediator, there may be certain direct effects on organizational performance from independent variables.

The key research questions considered were:

1. What is the relative impact of intangibles on the success of ERPS implementation?
2. What are the mediating effects of ‘successful ERPS implementation’ in terms of financial and non-financial measures?

The Four Intangibles in This Study

The four intangibles were: human resource practices; strategic alignment and leadership commitment; trusting and sharing corporate culture; employees’

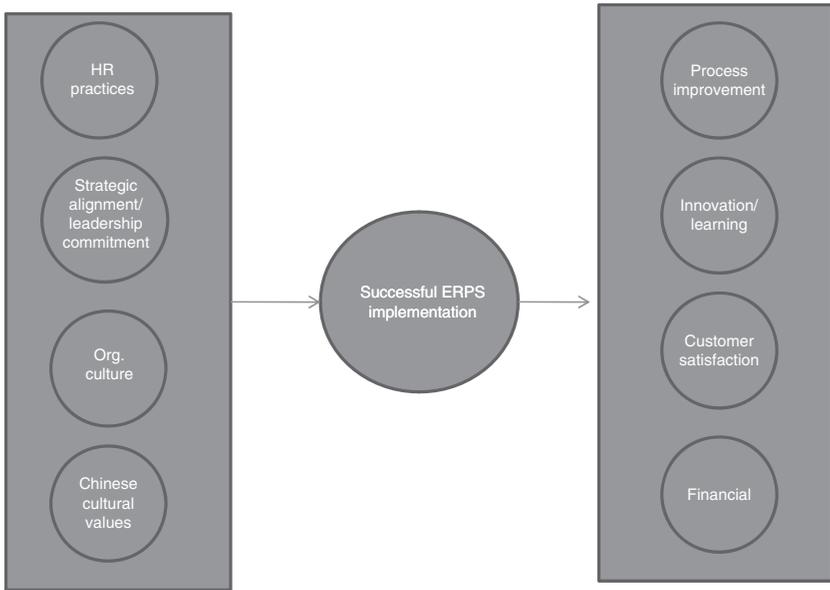


Figure 3: The conceptual model for the impact of intangibles on successful ERP implementation and organizational performance.

Independent variables = HR practice, strategic alignment/leadership commitment, organizational culture and Chinese culture/values

Mediating variable = implementation of ERPS

Dependent variable = organizational performance (base on the Balanced scorecard framework)

Financial = financial + customer; Non-financial = Process improvement + innovation/learning.

culture. These were related to ERPS implementation, and not associated with operational performance issues. Although one could speculate that the effects of these factors might be similar to other IT implementation projects, there is a lack of empirical evidence for the purposes of this study.

Human Resource Practices

The application of positive human resources practices may significantly influence firm capability; such practices include: equitable reward policy, high quality and scope of ERPS training, collaborative networks for team work, career development opportunities, formal and informal performance appraisal feedback, and positive management of employee engagement (Trice and Beyer, 1993; Becker *et al*, 2005; Jaw *et al*, 2007; Huselid *et al*, 2008).



Consequently, the alignment of positive HR practices with corporate ERPS strategy is expected to influence successful ERPS adoption and implementation. For example, Chan *et al* (2004) and Huselid *et al* (1997) have argued that rigorous hiring and retention procedures, performance-based rewards, extensive training and development programmes, planned succession policies and employee involvement contribute to high organizational performance. It is expected that:

Hypothesis 1 (H1): Alignment of positive HR practices with corporate goals (ERPS strategy) will have a positive effect on ‘successful ERPS implementation’ in China.

Strategic Alignment and Leadership Commitment

Strategic alignment and leadership commitment can influence the success of ERPS implementation. Leadership commitment such as empowering leadership style, leadership engagement with HRM practices, integration of trust in teams, and effective leadership communication (Madapus and D’Souza, 2005; Wang *et al*, 2008) and strategic alignments, such as alignment of goals with talent and performance, alignment of competencies and capabilities, leadership vision and change readiness, and involvement of employees in planning and innovation, can greatly enhance a firm’s performance and competitive advantage (Hitt *et al*, 2001; Chen 2009). Barney and Clark (2008), using resource-based theory, argue that strategic alignment of corporate goals with organizational capabilities and resources is critical for competitive advantage. Furthermore, studies on China (Soh *et al*, 2000; Wang, 2003; Zhang *et al*, 2003; Loh and Koh, 2004) have also highlighted the importance of strategic alignment and leadership commitment. Thus, it is expected that:

Hypothesis 2 (H2): Strategic alignment and leadership commitment will have a positive effect on ‘successful ERPS implementation’ in China.

Corporate Culture (Innovation, Knowledge Sharing, Teams and Trust)

Positive corporate culture is crucial to attaining a high-performance culture (Trice and Beyer, 1993; Kalliath *et al*, 1999; Goffee 2003). Previous studies have concluded that knowledge-sharing and collaborative teams can increase levels of IT use, operational and service performance (Nelson and Coopridge, 1996) and IT assimilation in value-chain activities and business strategies (Armstrong and Sambamurthy, 1999).



Intangibles such as knowledge-sharing and other organizational culture variables must be exploited effectively to optimize both tangible and intangible IT assets (Finney and Corbett, 2007). Soh *et al* (2000), Loh and Koh (2004) and Zhang *et al* (2003) concluded that the main corporate culture barriers to ERPS implementation in China appear to be hierarchical control, bureaucratic policies, top-down decision-making, lack of empowerment, knowledge-sharing, openness and trust, and poor performance management. Several studies (Soh *et al*, 2000; Nah *et al*, 2001; Davison, 2002; Reimers, 2003) argue that corporate culture is significant in ERPS implementation, indicating the importance of positive corporate culture characteristics. It is expected that:

Hypothesis 3 (H3): Positive corporate cultural practices will have a positive effect on ‘successful ERPS implementation’ in China.

Chinese Employee Culture/Values

National culture can characterize corporate practices and individual behaviour (Hofstede, 2001; House *et al*, 2001). Confucianism can have a significant impact in the Chinese workplace. For example, respect for elders reflects in promotion by seniority (with implications for performance management systems) (Ralston *et al*, 1992; Huo *et al*, 2002), while harmony is seen in conflict avoidance (with implications for innovation) and respect for authority reflects in high power distance and acceptance of hierarchy (with implications for collaboration, restructuring and change) (Ralston *et al*, 1992; Cunningham and Rowley, 2007; Jaw *et al*, 2007). Evidence suggests that positive HR practices, for example performance rewards and collaborative team work (Davison, 2002; Reimers, 2003; Zhang *et al*, 2003; Loh and Koh, 2004) may be incompatible with Chinese values. It is expected that:

Hypothesis 4 (H4): Chinese culture/values will have a negative effect on ‘successful ERPS implementation’ in China.

‘Successful ERPS Implementation’ and Organizational Performance Measurement

There are particular key indicators of successful ERPS implementation, for example improvements in productivity, process, communication and decision-making, employee satisfaction and control and feedback. (Merchant, 1989; Crowe *et al*, 1997; Beretta, 2002). The positive outcome of these determinants can affect organizational performance.



Traditional organizational performance measurements are based on financial results. However, these are historical and while they may help estimate future growth, they are a weak proxy for future performance. A more robust measure is the balanced scorecard system, whereby a fuller range of potential growth factors and strengths can be included (Kaplan and Norton, 2001, 2005). Although ERPS benefit is inconclusive, recent studies (Nicolaou and Bhattacharya, 2006; Wiedner *et al.*, 2006) are more positive. However, outcome performance is still focused on financial performance; with continued investment in ERPS, management must expect positive financial results. Hence, it is expected that:

Hypothesis 5 (H5): ‘Successful ERPS implementation’ will have a positive effect on organizational financial performance (based on financial figures and customer market share).

Since organizational performance measures are focussed on financial figures, non-financial gains are often downplayed (Wiedner *et al.*, 2006; Hendricks *et al.*, 2007). This could result in a higher perceived value of financial contribution. Hence, it is expected that:

Hypothesis 6 (H6): ‘Successful ERPS implementation’ will have a higher positive effect on organizational financial performance (based on financial figures and customer market share) than non-financial performance (based on level of employee innovation/learning and process improvement).

Design and Method

This was a triangulation study using a survey methodology followed by qualitative interviews. Fifteen firms were randomly selected for the qualitative interviews, to explore perceptions relating to both complementarities and incompatibilities with the quantitative findings.

The survey instrument was constructed using items from existing surveys for each independent variable, mediating variable and dependent variables. These items were translated into Chinese using the back-translation method. A panel of four university management professors and four CEOs with ERPS implementation experience in China determined the appropriateness and clarity of items in this survey; two items were dropped following their assessment. A Likert scale was used on all items.

Sampling Approach

The companies surveyed were from various locations in China, with the majority from Shanghai, Guangzhou, Xiamen, Beijing, Tianjin, Kunming and Chengdu.



Firms of all sizes were encouraged to participate, the only requirement being that they had implemented an ERPS at least three years ago; this duration qualifier was intended to provide a better insight into factors affecting performance.

The survey used a relationship sampling approach, considered necessary in China because personal contacts (*guanxi*) significantly facilitate company access (Easterby-Smith and Malina, 1999). Access was acquired through the researchers' previous contacts; snowballing techniques were then used to obtain contacts of contacts. A total of 380 firms were approached.

The anonymous questionnaire and covering letter explaining the research purpose (in Chinese) and return envelope were forwarded to the CEO. The letter also requested that the questionnaire be completed only by either the chief operation officer, or a senior manager. The survey was translated into Chinese from the original English using back-translation.

Fifteen firms were randomly selected from the original 380 who agreed to a follow-up interview. A total of nine executives and six senior managers were interviewed; two executives and one senior manager were from joint-venture firms, the remainder from Chinese firms.

Measures

The survey questionnaire was structured into six parts with four independent variables: Local HR practices; corporate culture; strategic alignment and leadership; and Chinese values. The mediating variable was effectiveness of ERPS implementation. The dependent variable was organizational performance. The two factors in organizational performance were financial and non-financial (operational) performance.

The items for local HR practices were selected from Huselid *et al* (1997): hiring and retention procedure, performance-based rewards, and extensive training and development programmes. Planned succession policy and employee involvement were considered important practices contributing to high organizational performance. The items for corporate culture, for example pride in quality output, open and transparent communication and shared vision and values, were considered crucial to a high-performance culture and adopted from Kalliath *et al* (1999). Items for strategic alignment were from Bjorkman and Fan (2002). In addition, items such as alignments of HR departments with strategic planning, leadership and strategic goals, and competencies and capability with rewards were included. Items for Chinese values were adopted from Ralston *et al* (1992).

Items for 'successful ERPS implementation' (for example, strategic planning and coordination, productivity increase) were from Xin (2004). Delaney and Huselid (1996) provided items for organizational performance; as financial



and performance data are sensitive and difficult to acquire from firms, they obtained data from senior executives through their perceived performance of the firm. Such results are considered comparable to real data. The total items used for organizational performance here also reflect the balanced scorecard approach, based on four components: financial, customer satisfaction, process improvement and employee innovation/learning.

All items were assessed using a Likert scale ranging from strongly disagree (1) to strongly agree (7); or not important (1) to extremely important (7). Demographic data such as number of employees, ownership, industry type and location were also collected.

A semi-structured questionnaire was used for the interviews; open-ended questions were based on factors relating to the independent (four intangible antecedents), mediating ('successful ERPS implementation') and dependent (financial and non-financial outcomes) variables. See Table 5 for a sample of responses.

Data Analysis

Data obtained were statistically analysed. Reliability indexes were collected for each variable. Pearson correlations were first calculated to show the relationships of all variables.

Structural equation modelling (SEM) was used to formulate theoretical constructs and the path model used to obtain the relative effects of the different variables on ERPS implementation and organizational performance. The postulated model was obtained based on the criteria of assessment of fit provided by AMOS, for example chi-square index, degree of freedom, ratio of chi-square and degree of freedom, root mean square error of approximation (RMSEA), normed-goodness-of-fit index (NFI), comparative fit index (CFI), relative fit index (RFI), incremental fit index (IFI) and Tucker-Lewis index (TLI). In addition, parameters were estimated and all non-significant paths dropped until a satisfactory model was achieved. Finally, chi-square difference tests were employed to examine the invariance between the Chinese and foreign joint-venture groups in terms of measurement weights, structural weights, structural covariance, structural residuals and measurement residuals.

Content analysis was used to determine the fit between the interview responses and results of the quantitative analysis.

Results

Of the initial 380 contacts of contacts, 263 returns were obtained, 199 from Chinese, 61 from foreign joint-venture and three from solely foreign firms. All

participants were Chinese. One joint-venture return and one solely foreign return were discarded as incomplete. A final 261 returns were used.

Survey Results

Results of measurement models

Following the psychometric scale assessment procedure recommended by Anderson and Gerbing (1988), all 261 firms were used to conduct confirmatory factor analysis, exploratory factor analysis (EFA) and reliability analysis for each construct. Given the large number of indicators, EFA was used to evaluate the proposed dimensionality for each construct. After deleting items with serious cross-loadings, we conducted confirmatory factor analysis to calculate the factor loadings, reliability and average variance extracted (AVE). Table 3 shows the correlations and reliabilities of the six variables used. The results demonstrate that all variables had high reliability indexes ranging from 0.826 to 0.953. No significant difference was noted with participants from various groups (Chinese, joint-venture and solely foreign firms) based on chi-square testing (Table 2).

The implementation of EFA assesses dimensionality for the focal constructs adopted. Based on the EFA results, the underlying dimensions are re-confirmed as consistent with theoretical expectations for most constructs, except performance and Chinese cultural values.

The EFA revealed that only two factors emerged instead of the four adopted from the balanced scorecard framework. This suggests that respondents failed to distinguish differences among the four component domains and aggregated the four domains of performances into two. Similarly, nine factors appeared in the EFA process judged by the eigenvalue as well as the Screen Plot for the Chinese cultural value scale. The results indicate that the first four factors, as

Table 2: Results of chi-square difference tests in multi-group analysis

| <i>Model</i> | $\Delta\chi^2$ | ΔDF | <i>P</i> | <i>NFI Delta-1</i> | <i>IFI Delta-2</i> | <i>RFI rho-1</i> | <i>TLI rho2</i> |
|------------------------|----------------|-------------|----------|--------------------|--------------------|------------------|-----------------|
| Measurement weights | 13 | 13 | 0.391 | 0.004 | 0.004 | -0.002 | -0.002 |
| Structural weights | 20 | 20 | 0.443 | 0.006 | 0.006 | -0.004 | -0.004 |
| Structural covariances | 26 | 28 | 0.357 | 0.008 | 0.008 | -0.004 | -0.005 |
| Structural residuals | 30 | 28 | 0.540 | 0.008 | 0.008 | -0.006 | -0.006 |
| Measurement residuals | 49 | 49 | 0.451 | 0.014 | 0.015 | -0.008 | -0.009 |

Abbreviations: IFI, incremental fit index; NFI, normed-goodness-of-fit index; RFI, relative fit index; TLI, Tucker-Lewis index.



indicators of Chinese cultural values, accounted for 56 per cent of the total variations. See the Appendix for the CFA results and standardized factor loadings in the confirmatory factor analysis; the measurement models are robust, as all composite reliabilities (CR) and AVE, except one factor for organizational culture, are bigger than the thresholds (0.707 for CR and 0.50 for AVE) suggested in the literature (Fornell and Larcker, 1981; Bagozzi *et al*, 1991).

Owing to the model's complexity, possible second-order factors were treated as latent factors with summated first-order indicators. Congeneric models were used to calculate factor score weights and estimate composite scores for each indicator (Joreskog and Sorbom, 1989). This analytic approach ensured the various contributions of each item in the scale, while substantially reducing the unnecessary hierarchical structures among the measurement scales. To reduce random errors and keep the model as parsimonious as possible, the partial disaggregate approach was adapted to composite measurement scales. This approach is a compromise between the most aggregated approach, in which all items are summated to form a composite for a construct, and the most disaggregated, in which all items are used to measure the corresponding latent variable (Bagozzi and Heatherton, 1994; Bagozzi and Foxall, 1996).

The implementation of confirmatory factor analysis for the seven constructs in the model resulted in the following fit statistics: chi-square = 340.687; DF = 109; $P = 0.000$; TLI = 0.932; CFI = 0.944; RMSEA = 0.065. The adequacy of the measurement model is evaluated on the criteria of overall fit with data, convergent validity and discrimination validity.

Although the chi-square statistic is significant, it is not uncommon given the large number of multi-dimensional constructs and a relatively large sample size (Bagozzi *et al*, 1991). The TLI and CFI all exceeded the recommended cut-off value of 0.90. The values of the RMSEA were below 0.08. Hence, the confirmatory factor analysis indicated that the measurement model fitted the data reasonably well.

Two approaches were employed to assess convergent validity. First, exploratory factors for the multi-dimensional constructs were implemented. Each scale item loaded highly on its hypothesized factor. Some cross-loadings were deleted. Second, the standardized factor loadings obtained from the confirmatory factor analysis were examined. The loadings for each of the seven constructs all exceeded 0.5. All T -test results showed that all factor loadings were highly significant ($P < 0.01$). Furthermore, the CR of all constructs exceeded the proposed 0.60 threshold (Bagozzi and Yi, 1988). These findings suggest that the measures adopted in the study proved to have adequate convergent validity.

To assess discriminant validity, the process recommended by Bagozzi *et al* (1991) was used; this compares the chi-square values between a free and all



other possible constrained models. A chi-square difference test evaluated whether the equality constraint causes a significant decrease in model fit. Here, if the measures for the hypothesized seven latent variables have discriminant validity, the seven-factor measurement model should achieve better fit than all possible combinations of six-factor measurement models. Given the seven constructs, there are 21 possible combinations. For instance, one possible six-factor measurement model is to put the strategic alignment and local HR practice items together, and allow the remaining items to form the other five factors. If the scales for the seven-factor model lack discriminant validity, at least one of the 21 possible models would achieve a better or similar fit and the chi-square test difference test would be statistically insignificant. Based on model comparisons, the chi-square value for the unconstrained (free) model was significantly lower than any of the 21 constrained models ($P < 0.001$), thus indicating the refined measures all have adequate discriminant validity. Having established the psychometric properties of the measurement model, the causal relationships and significances involved in the conceptual model (Figure 3) were evaluated.

Results of the structural models

The second step in the two-step SEM procedure advocated by Anderson and Gerbing (1988) examines the structural weights in the proposed conceptual model (Figure 3). The results of this show model fit as well as all the path coefficients (Table 4). Model 1 in Table 4 displays all the path coefficients, while Model 2 indicates the trimmed model, in which only the significant paths were retained. The final model is presented in Figure 4.

As Figure 4 shows, the ERPS implementation best practice programme has a direct positive effect on non-financial organizational performance measured by organizational learning, innovation, human resource management and customer satisfaction ($\beta = 0.21$, $P < 0.001$). There is no statistically significant link between ERPS implementation and organizational performance calibrated by financial outcomes. It means that ERPS implementation has not made a significant contribution to performance financially to the surveyed participants in China. The strategic alignment and leadership variable is the only construct with direct significant contribution to both financial and non-financial performance ($\beta = 0.420$, $P < 0.001$ and $\beta = 0.363$, $P < 0.001$ respectively). Organizational culture provided a direct impact ($\beta = 0.240$, $P < 0.001$) in ERPS implementation and financial performance ($\beta = 0.253$, $P < 0.001$). Local human resource practice has a direct positive effect on non-finance performance ($\beta = 0.214$, $P < 0.001$). Surprisingly, Chinese cultural value has no impact.

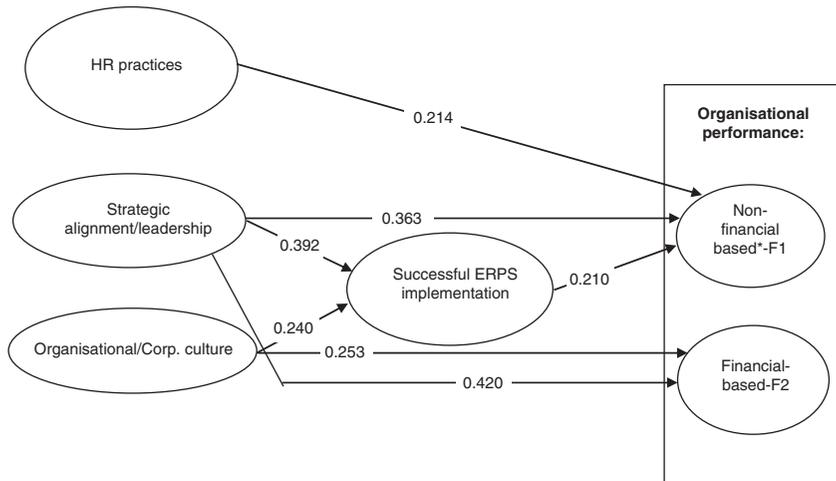


Figure 4: Significant direct and indirect impact of independent (intangible factors) and mediating variable (successful ERPS implementation) on organizational performance.

*(Non-financial Performance - F1 - is measured by organizational learning, innovation, process improvement and customer satisfaction; Financial Performance - F2 - is measured by profit and market share).

Notes: Based on the conceptual framework. Only significant relationships shown in this figure.

Interview Results

Table 5 shows a sample of responses. Senior executives and managers generally agreed that ERPS provided them with a better integrated process and reporting system; information could be accessed at all levels simultaneously, resulting in greater efficiency within internal departments (for example, the integration of information between accounts, marketing and HR training), external suppliers (for example, simple transactions for procurement) and customers (for example, online real-time product range and stock transactions to satisfy customers demand for the latest brands and fashion). The majority agreed that higher financial performance from the ERPS would enable them to become more competitive; and that supportive supervisors assisting them to capture and integrate ERPS benefits were important in improving productivity.

Executives noted that staff appreciated ERPS training and their participation made them proud to be involved with the firm. Managers noted how employees perceived that leadership vision, strategy, alignment and commitment were critical to success; furthermore, open communication, collaborative



teamwork and trust were also important. However, staff disliked the individual details that the system could provide on their performance outcomes. Although these senior executives felt that they had aligned the ERPS with particular corporate goals, this was not reflected in improved financial performance outcomes. That is, it was difficult to justify a positive cost benefit ratio for the ERPS. In summary, senior executives agreed that the improvement in process performance was mainly because of additional staff training, the incentive system, an open, sharing and trusting culture, leadership commitment, and the understanding of alignment strategy. Overall, content analysis results of the interview data supported the links between the variables proposed in the conceptual model.

Discussion

This research assesses the impact of firms' intangible resources of HR practices, strategic alignment, corporate culture and Chinese values on the effectiveness of ERPS implementation, and its subsequent effect on organizational performance. These factors were linked in an SEM; results indicated that the derived model fits the data well. The final model revealed that only 'strategic alignment and leadership commitment', and 'knowledge-sharing and a trusting organizational culture' have a direct positive impact ($\beta = 0.39$ and 0.24 respectively) on the effectiveness of ERPS implementation. There is no direct impact of local HR practice on the effectiveness of ERPS implementation. Hence,

H1: HR practices should have a positive effect on ERPS implementation in China – rejected.

This was unexpected because of strong evidence that HR practices play a significant role in successful IT system implementation (Jaw *et al*, 2007). This may indicate that firms in China have not adopted sufficient positive HR practices to influence successful ERPS implementation and that the relative impact of HR practices was insignificant. Since strategic alignment/leadership commitment and organizational culture showed a relatively high level of impact on ERPS implementation, this could overshadow the influence of both HR practices and Chinese values.

H2: Strategic alignment and leadership commitment will have a positive effect on ERPS implementation in China – accepted

This was compatible with findings in previous studies (Somers and Nelson, 2001; Umble *et al*, 2003: Table 1) that leadership commitment, understanding and alignment of strategic goals are critical factors for 'successful ERPS implementation'. Furthermore, the result also showed that the independent



antecedent (strategic alignment and leadership commitment) had a significantly high factor loading when compared to the other antecedents (Appendix). Hence, it may also support the premise that leadership commitment has to be well operationalized to create strategic alignment for ‘successful ERPS implementation’ (Soh *et al.*, 2000; Wang, 2003; Zhang *et al.*, 2003).

H3: Positive corporate culture will have a positive effect on ‘successful ERPS implementation’ in China – accepted

This result was compatible with previous findings (Soh *et al.*, 2000; Nah *et al.*, 2001; Davison, 2002; Reimers, 2003; Zhang *et al.*, 2003; Boersma and Kingma, 2005). Although the average factor loading of corporate culture items was marginally less than strategic alignment and leadership commitment, the impact of corporate culture on ‘successful ERPS implementation’ was significantly higher than these other antecedents (Appendix). Furthermore, corporate values such as knowledge-sharing, trust, openness and innovation must be reflected in HR practices to support successful ERPS implementation. Our results further supported the above proposition – Table 3 shows that correlation between HR practices and corporate culture ($r = 0.512$) was second highest in the matrix.

H4: Chinese culture/values will have a negative effect on ‘successful ERPS implementation’ in China – rejected

Table 3: Mean, standard deviation, Cronbach alpha reliability coefficients and correlation of constructs ($n = 261$)

| Constructs | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----------------------------|-------|-------|---------|---------|---------|---------|---------|---------|---------|
| 1. HR practice | 3.846 | 1.043 | (0.850) | — | — | — | — | — | — |
| 2. Strategic alignment | 4.466 | 1.321 | 0.340 | (0.853) | — | — | — | — | — |
| 3. IT (ERP) implementation | 4.416 | 1.274 | 0.456 | 0.434 | (0.934) | — | — | — | — |
| 4. Corporate/Org. Culture | 4.473 | 1.180 | 0.512 | 0.412 | 0.408 | (0.826) | — | — | — |
| 5. Chinese cultural values | 5.512 | 0.956 | 0.026 | 0.057 | 0.059 | 0.180 | (0.954) | — | — |
| 6. Performance F1* | 4.223 | 1.097 | 0.554 | 0.513 | 0.448 | 0.397 | 0.017 | (0.930) | — |
| 7. Performance F2** | 4.05 | 1.195 | 0.408 | 0.484 | 0.300 | 0.385 | 0.129 | 0.566 | (0.829) |

*Performance measured by organizational learning, innovation, human resource management and customer satisfaction.

**Performance measured by finance and market share.

Abbreviations: ERP, enterprise resource planning; IT, information technology; HR, human resources.

Notes: Cronbach alpha coefficients displayed in parentheses on the diagonal. Cronbach alpha of 0.707 is considered acceptable (Hair *et al.*, 1995). Correlations greater than 0.164 are significant at the 0.05 level and greater than 0.216 are significant at the 0.01 level.

All participants in this study were Chinese. Though expected that their personal values would have a negative impact on ‘successful ERPS implementation’, our findings showed the contrary. The results (Table 3) revealed little or no significant effect ($r = 0.057$) between Chinese values and ‘successful ERPS implementation’. Further confirmation appears in Table 4, model 1 (Structural Equation Estimates), where Chinese values had a small negative (-0.069) or near-zero and insignificant direct impact on non-financial performance (F1) and near-zero direct impact (0.071) on financial performance (F2). These results did not support the proposition that Confucianism and Chinese values could negatively affect ‘successful ERPS implementation’. This

Table 4: Standardized structural equation estimation

| | <i>Model 1</i> | <i>Model 2</i> |
|--|----------------|----------------|
| <i>Standardized path coefficients</i> | | |
| Strategic alignment to Performance (F1) | 0.374*** | 0.363*** |
| Strategic alignment to Performance (F2) | 0.417*** | 0.420*** |
| Organizational culture to Performance (F1) | 0.045 | |
| Organizational culture to Performance (F2) | 0.180* | 0.253*** |
| Human resource practice to Performance (F1) | 0.184* | 0.214*** |
| Human resource practice to Performance (F2) | 0.061 | — |
| Chinese cultural value to Performance (F1) | -0.069 | — |
| Chinese cultural value to Performance (F2) | 0.071 | — |
| Strategic alignment to IT (ERP) | 0.385*** | 0.392*** |
| Organizational culture to IT (ERP) | 0.188* | 0.240*** |
| Human resource practice to IT (ERP) | 0.097 | — |
| Chinese cultural value to IT (ERP) | -0.021 | — |
| IT (ERP) to Performance (F1) | 0.180** | 0.210*** |
| IT (ERP) to performance (F2) | 0.032 | — |
| <i>Model goodness of fit statistics</i> | | |
| Chi-square | 437.00 | 371.33 |
| Degree of freedom | 167 | 141 |
| <i>P</i> -value | 0.000 | 0.000 |
| Goodness of Fit Index (GFI) | 0.874 | 0.880 |
| Tucker-Lewis Index (TLI) | 0.913 | 0.918 |
| Comparative fit Index (CFI) | 0.930 | 0.932 |
| Root Mean Square Error Approximation (RMSEA) | 0.078 | 0.079 |

Abbreviations: ERP, enterprise resource planning; IT, information technology.

Notes: *denotes that the path coefficient is significant at the 0.05 level, **denotes that the path coefficient is significant at the 0.01 level and ***denotes that the path coefficient is significant at the 0.001 level.

Performance (F1): performance measured by non-finance elements (organizational learning, innovation, human resource management and customer satisfaction).

Performance (F2): performance measured by finance outcomes and market share.



suggests that ‘successful ERPS implementation’ is independent of employees’ value systems and is more related to other intangible antecedents (in this case, leadership commitment and strategic alignment).

H5: ‘Successful ERPS implementation’ will have a positive effect on organizational financial performance (based on financial figures and customer market share) – supported

Results showed a positive relationship between ‘successful ERPS implementation’ and non-financial performance ($r=0.30$) (Table 3). The impact of ‘successful ERPS implementation’ on organizational financial performance was 0.032 (Table 4, model 1 – Structure Equation estimates). Although this was positive, the impact was rather weak. This finding supported evidence (Seddon, 2005; Xue *et al*, 2006; Basoglu *et al*, 2007) that the financial benefit of ERPS implementation is still inconclusive.

H6: ‘Successful ERPS implementation’ will have a higher positive effect on organizational financial performance (based on financial figures and customer market share) than non-financial performance (based on level of employee innovation/learning and process improvement) – rejected

The study showed that ‘successful ERPS implementation’ had a higher positive impact on non-financial than financial performance (Table 4, model 2), contrary to expectations. Although Bharadwaj (2000) argues that IT, an organizational capability in the Resource-Based View approach, would bring superior financial performance, the reality differs from popular belief. Xue *et al* (2006) and e-work (2006) reported that more than half of firms in China (both local and foreign) implementing ERPS were dissatisfied with their financial performance.

The positive and significant relationship between ERPS implementation and non-financial performance may reflect how ERPS implementation has a positive influence on how people learn and work in the firm, which may result in changing relationships among employees; team cohesiveness; learning and sharing opportunities; and a beneficial effect on corporate culture in general. ‘Successful ERPS implementation’ may not have an immediate impact on financial performance, but the positive corporate culture and HR practices resulting from ‘successful ERPS implementation’ may eventually provide the link to positive financial outcomes. However, this is an area requiring further longitudinal research.

Finally, our results have contributed some insights into the direct effect of strategic alignment and leadership commitment on both financial and non-financial performance (Table 4, model 2, $\beta = 0.42$ and 0.36 respectively). Furthermore, the total effect (via the mediating effect of ‘successful ERPS



implementation') of strategic alignment and leadership commitment on non-financial performance is higher than organizational culture (β value, $0.39 \times 0.21 = 0.08$ and $0.24 \times 0.21 = 0.04$ respectively). This further supports the relative importance of strategic alignment and leadership as an important intangible factor in ERPS implementation and organizational performance.

The qualitative interview data complemented some of the survey findings. For example, 'After training, it has eased my fear and has enabled me to work better' and 'we get a lot of training and support' could reflect that positive HR practices are important in 'successful ERPS implementation'. 'The new ERPS has enabled me to perform my work more efficiently and effectively and my result is in alignment with our corporate goals', 'the staff member is proud of this firm because our firm has adopted the most advanced ERPS implementation in China', and 'Our leader communicated his vision and strategy alignment consistently to everyone. He also showed his passion and support to everyone with the ERPS implementation' could reflect that leadership commitment and strategic alignment are important in 'successful ERPS implementation'. 'I have learnt a lot about the system and how it integrates and shares all the information. I can even suggest new ways to make continuous improvement', 'we are aware that sharing successes and failures is important in this firm' and 'innovation is encouraged and new ideas are readily accepted and rewarded' could reflect that innovative and open organizational culture are important in 'successful ERPS implementation' (Table 5). These anecdotal comments suggest that positive HR practices, leadership commitment and strategic alignment, plus supportive organizational culture, may generate greater motivation and commitment from employees regarding ERPS implementation. Although this study did not show any positive relationship between 'successful ERPS implementation' and financial performance, the positive relationship between 'successful ERPS implementation' and non-financial performance is still a significant contribution regarding the mediating effect of 'successful ERPS implementation' between intangible antecedents and organizational performance. Future longitudinal studies could explore the conversion of non-financial to financial benefits with 'successful ERPS implementation'.

Conclusion

This study revealed that strategic alignment and leadership commitment, as an intangible antecedent, had the greatest impact on 'successful ERPS implementation', followed by organizational culture. Strategic alignment and leadership commitment, mediated by 'successful ERPS implementation', had the greatest impact on organizational non-financial performance. These are significant findings since there have been limited empirical studies exploring the



Table 5: Samples of anecdotal evidence from interviews (back-translated)

Positive comments:

- I have learnt a lot about the system and how it integrates and shares all the information. I can even suggest new ways to make continuous improvement.
- The new ERPS has enabled me to perform my work more efficiently and effectively and my result is in alignment with our corporate goals.
- Supportive supervisors assisting me to capture the benefits of the IT (ERP) system was an important factor in lifting my productivity.
- HR practices such as collaborative teamwork, knowledge sharing in teams and team reward were particularly useful for ERP implementation.
- The IT (ERP) system can provide us with the latest information on brands, stock, price and delivery so that our customers can have better service.
- Our leader communicated his vision and strategy alignment consistently to everyone. He also showed his passion and support to everyone with the ERPS implementation.

Negative comments:

- The system is somewhat slow at times.
- I only know the process part. I have no knowledge about the financial performance – whether we make a profit or loss monthly.
- Although the system can provide us with integrated information, there is no incentive or motivation to share information between different departments and shops.

relationship between these intangible factors (strategic alignment and leadership commitment, organizational culture, HR practices and Chinese values), successful implementation of ERPS implementation (as the mediator) and organizational performance (financial and non-financial). The relative impact of these intangibles on ‘successful ERPS implementation’ could provide management with greater insight into resource allocation for more effective ERPS implementation. Furthermore, management could direct more effort in converting non-financial to financial benefits with ERPS implementation to achieve desired outcomes from their investment. Although HR practices did not show significant impact on ‘successful ERPS implementation’, its direct effect on non-financial performance could be of significant interest because of the potential conversion to financial benefits in the organization. Since past studies have revealed that financial benefits from ERPS implementation are inconclusive, findings in this study are not unexpected. Inclusion of tangible and intangible factors for ERPS implementation could be considered in future empirical studies to further explore this. Chinese employees’ values did not show significant impact, which could indicate that local employee culture is not a significant intangible factor on ERPS implementation. Hence, management could focus attention more on other intangible factors, technical and organizational factors in ERPS implementation and organizational performance.



Limitations and Future Research

While the study extends the understanding of how intangibles impact on 'successful ERPS implementation' and organizational performance, this link between financial and non-financial organizational performance cannot be established without further longitudinal studies. Another limitation is our small sample size (261 returns), because of difficulties in obtaining data from chief or top management executives in Chinese firms. Although measures were taken to significantly minimize the effect of this restriction, like the use of Bayesian estimates analysis and the inclusion only of indicators with high reliability (MacCallum and Austin, 2000), caution is still required in generalizing the resulting model. Finally, the existing model has directed the intangible CSFs in ERP implementation into four groups of antecedents. Future studies could further expand this into more detailed groups of antecedents to provide a deeper understanding of successful ERP implementation on organizational performance.

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References

- Anderson, J.C. and Gerbing, D.W. (1988) Structural equation modelling in practice. *Psychological Bulletin* 103(3): 411–423.
- Armstrong, C. and Sambamurthy, V. (1999) Information technology assimilation in firms. *Information Systems Research* 10(4): 304–327.
- Bagozzi, R. and Yi, Y. (1988) On the evaluation of structural equation models. *Journal of the Academy of Marketing Science* 16(1): 74–94.
- Bagozzi, R., Yi, Y. and Phillips, L. (1991) Assessing construct validity in organizational research. *Administrative Science Quarterly* 36: 421–458.
- Bagozzi, R.P. and Foxall, G.R. (1996) Construct validation of a measure of adaptive-innovative cognitive style in consumption. *International Journal of Research in Marketing* 13: 201–213.
- Bagozzi, R.P. and Heatherton, T.F. (1994) A general approach to representing multifaceted personality constructs. *Structural Equation Modeling* 1(1): 35–67.
- Barney, J. and Clark, D. (2008) *Resource-Based Theory*. Oxford, UK: Oxford University Press.
- Basoglu, N., Daim, T. and Kerimoglu, O. (2007) Organizational adoption of enterprise resource planning systems. *Journal of High Technology Management Research* 18(1): 73–97.
- Becker, F., Huselid, M. and Beatty, R. (2005) *Differentiated Workforce*. Boston, MA: Harvard Business School.
- Beretta, D. (2002) Unleashing the integration potential of ERP systems. *Business Process Management Journal* 8(3): 254–277.
- Bharadwaj, A. (2000) A resource-based perspective on information technology capability and firm performance. *MIS Quarterly* 24(1): 169–196.
- Bjorkman, I. and Fan, X. (2002) Human resource management and the performance of Western firms in China. *International Journal of Human Resource Management* 13: 853–864.
- Boersma, K. and Kingma, S. (2005) Developing a cultural perspective on IT (ERP). *Business Process Management Journal* 11(2): 123–136.
- Chan, L., Shaffer, M. and Snape, E. (2004) In search of sustained competitive advantage. *International Journal of Human Resource Management* 15: 17–35.
- Chen, J. (2009) An exploratory study of alignment ERP implementation and organizational development activities in a newly established firm. *Journal of Enterprise Information Management* 22(3): 298–316.
- Cotteleer, M. and Bendoly, E. (2006) Order lead-time improvement following enterprise-IT implementation. *MIS Quarterly* 20: 643–667.
- Crowe, M., Beeby, R. and Gammack, J. (1997) *Contracting Systems and Information*. New York: McGraw-Hill.
- Cunningham, L. and Rowley, C. (2007) Human resource management in Chinese small and medium enterprises. *Personnel Review* 36(3): 415–439.
- Davison, R. (2002) Cultural complications of IT (ERP). *Communications of the ACM* 45(7): 109–111.
- Delaney, J. and Huselid, M. (1996) The impact of human resource management practices on perceptions of organizational performance. *Academy of Management Journal* 39(4): 949–969.



- Dery, K., Grant, D., Hall, R. and Wailes, N. (2005) Managing enterprise resource planning systems. *Strategic Change* 14(5): 239–243.
- Easterby-Smith, M. and Malina, M. (1999) Cross-cultural collaborative research: Toward reflexivity. *Academy of Management Journal* 42: 76–86.
- e-work. (2004) Research report on IT (ERP) of manufacturing in China. (in Chinese) <http://www.e-works.net.cn/ewk2004/ewkArticles/458/Article32303.htm>, accessed 23 August 2005.
- e-work. (2006) IT (ERP) marketing enters the replace time. (in Chinese) http://www.ccw.com.cn/cio/research/qiye/hm2006/20061228_232748.asp, accessed 28 December 2006.
- Finney, S. and Corbett, M. (2007) ERP implementation and analysis of critical success factors. *Business Process Management Journal* 13(3): 329–347.
- Fornell, C. and Larcker, D.F. (1981) Evaluating structural equation models with unobservable variables and measure error. *Journal of Marketing Research* 18: 39–50.
- Gefen, D. and Ragowsky, A. (2005) Multilevel approach to measuring the benefits of ERP systems in manufacturing firms. *Information Systems Management* 22(1): 18–25.
- Goffee, R. (2003) *The Character of a Corporation*. London: Harper Collins.
- Hair, J., Anderson, R., Tatham, R. and Black, W. (1995) *Multivariate Data Analysis*, 4th ed. New Jersey, NJ: Prentice Hall.
- Hecker, L. and Birla, R. (2008) Intangible factors leading to success in research. *Journal of Cardiovascular Translational Research* 1(1): 85–92.
- Hendricks, K., Singhal, V. and Stratman, J. (2007) The impact of enterprise systems on corporate performance: ERP, SCM and CRM system implementation. *Journal of Operations Management* 25(1): 65–103.
- Hitt, M., Bierman, L., Shimizu, K. and Kochhar, R. (2001) Direct and moderating effects of human capital on strategy and performance in professional service firms. *Academy of Management Journal* 44: 13–38.
- Hofstede, G. (2001) *Cultures' Consequences*. London: Sage.
- Hong, K. and Kim, Y. (2002) Critical success factors for IT (ERP) implementation. *Information and Management* 40(1): 25–41.
- House, R., Javidan, M. and Dorfman, P. (2001) Project Globe – an introduction. *Applied Psychology* 50(4): 489–505.
- Huang, Z. and Palvia, P. (2001) ERP implementation issues in advanced and developed countries. *Business Process Management Journal* 7(3): 276–284.
- Huo, P., Huang, H. and Napier, N. (2002) Divergence or convergence. *Human Resource Management* 41(1): 31–44.
- Huselid, M., Becker, F. and Beatty, R. (2008) *The Workforce Scorecard*. Boston, MA: Harvard Business School.
- Huselid, M., Jackson, S. and Schuler, R. (1997) Technical and strategic human resource management effectiveness as determinants of firm performance. *Academy of Management Journal* 40(1): 171–186.
- Jaw, B., Ling, Y., Wang, C. and Cheng, W. (2007) The impact of culture on Chinese employees' work values. *Personnel Review* 36(5): 763–780.
- Joreskog, K. and Sorbom, D. (1989) Model search with Tetrad II and Lisrel. *Sociological Methods and Research* 19(1): 93–106.
- Kalliath, T., Bluedorn, A. and Gillespie, D. (1999) Confirmatory factor analysis of the competing values instrument. *Educational and Psychological Management* 59(1): 143–157.
- Kaplan, R. and Norton, D. (2001) *The Strategy-Focused Organization*. Boston, MA: Harvard Business School.
- Kaplan, R. and Norton, D. (2005) The balanced scorecard. *Harvard Business Review* 84(3): 100–109.
- Li, P., Chen, S. and Zhang, H. (2005) The Empirical Study of IT (ERP) implementation performance in China enterprise (in Chinese). *Modern Finance and Economics* 25(6): 34–38.



- Liang, C., Yao, W. and Ong, C. (2007) IT (ERP) implementation. *International Journal of Information Technology and Management* 6(1): 35–47.
- Loh, T. and Koh, S. (2004) Critical elements for a successful enterprise resource planning implementation in small- and medium-sized enterprises. *International Journal of Production Research* 42(17): 3433–3455.
- MacCallum, R. and Austin, J. (2000) Applications of structural equation modeling in psychological research. *Annual Review of Psychology* 51(1): 201–226.
- Madapus, A. and D'Souza, D. (2005) Aligning ERP systems with international strategies. *Information System Management* 22(1): 7–17.
- McAfee, A. (2002) The impact of enterprise information technology adoption on operational performance. *Production and Operations Management* 11(1): 33–53.
- Merchant, K. (1989) *Reward Results*. Boston, MA: Harvard University Press.
- Murphy, K. and Simon, S. (2002) Intangible benefits valuation in ERP projects. *Information Systems Journal* 12: 301–320.
- Nah, F., Lau, J. and Kuang, J. (2001) Critical factors for successful implementation of enterprise systems. *Business Process Management Journal* 7: 285–296.
- Nelson, K. and Cooperider, J. (1996) The contribution of shared knowledge to IS group performance. *MIS Quarterly* 20(4): 409–432.
- Nicolaou, A. and Bhattacharya, S. (2006) Organizational performance effects of ERP systems usage. *International Journal of Information Systems* 7: 18–35.
- Rajapakse, J. and Seddon, P. (2005) ERP adoption in developing countries in Asia. paper presented at 28th Information Systems Seminar; 6–9 August, Kristiansand, www.hia.no/iris28/Docs/IRIS2028-1028.pdf, accessed 3 March 2009.
- Ralston, D., Gustafson, D., Elsass, P. and Cheung, F. (1992) Eastern values: Managers in the United States, Hong Kong and the People's Republic of China. *Journal of Applied Psychology* 77: 664–671.
- Reimers, K. (2003) Implementing IT (ERP) in China. *Communications of the Association for Information Systems* 11: 225–365.
- Scott, J. and Vessey, I. (2002) Managing risks in enterprise systems implementation. *Communications of the ACM* 45(4): 74–81.
- Seddon, P. (2005) Are IT (ERP) systems a source of competitive advantage? *Strategic Change* 14: 283–293.
- Smith, P., Peterson, M. and Schwartz, S. (2002) Cultural values, sources of guidance, and their relevance to managerial behaviour. *Journal of Cross-Cultural Psychology* 33(2): 188–208.
- Soh, C., Sia, S. and Tay-Yap, J. (2000) Cultural fits and misfits. *Communications of the ACM* 43(4): 14–19.
- Somers, T. and Nelson, K. (2001) *The Impact of Critical Success Factors Across the Stages of IT (ERP) Resource Planning Implementations*, Proceedings of 34th Hawaii International Conference on System Sciences, Maui, Honolulu, HI: HICSS, pp. 23–34.
- Sun, A., Yazdani, I. and Overend, J. (2005) Achievement assessment for ERP systems implementation based on critical success factors. *International Journal of Production Economics* 98(2): 189–203.
- Trice, H. and Beyer, J. (1993) *The Culture of Work Organization*. Englewood Cliffs, NJ: Prentice-Hall.
- Umble, E.J., Haft, R.R. and Umble, M.M. (2003) Enterprise resource planning. *European Journal of Operational Research* 146: 241–257.
- Wang, C., Xu, L., Liu, X. and Qin, X. (2005) IT (ERP) research, development and implementation in China. *International Journal of Production Research* 43(18): 3915–3932.
- Wang, E., Shih, S., Jiang, J. and Klein, G. (2008) The consistency among facilitating factors and ERP implementation success. *Journal of Systems and Software* 81(9): 1609–1621.



Wang, H. (2003) Analysis of the mature degree of IT (ERP) system implementation in domestic business enterprises (in Chinese). *Scientific Management Research* 21(3): 60–64.

Wiedner, B., Boothe, P., Matolcsy, Z. and Ossimitz, M. (2006) The impact of ERP systems on firm and business process performance. *Journal of Enterprise Information Management* 19(1): 13–29.

Xin, H. (2004) The IT (ERP) challenge in China. *Information System Journal* 14: 153–167.

Xue, Y., Liang, H., Boulton, W.R. and Snyder, C.A. (2006) IT (ERP) implementation failures in China. *International Journal of Production Economics* 100(1): 279–295.

Zhang, L., Lee, M.K.O., Zhang, Z. and Banerjee, P. (2003) *Critical Success Factors of IT (ERP) Implementation Success in China*, Proceedings of 36th Hawaii International Conference on System Sciences; 3-6 July, Maui. Honolulu, HI: HICSS, pp. 236–245.

Zhang, L. and Li, Y. (2006) Theory and practice of systems methodology in ERP implementation. *Systems Research and Behavioural Science* 23(2): 219–235.

Appendix

Table A1: CFA results and standardized factor loading for measures models

Standardized factor loading

Factor one for performance, F1: $\chi^2(4) = 11.2, P < 0.024, GFI = 0.971, CFI = 0.984, TLI = 0.960, RMSEA = 0.110, CR = 0.94, AVE = 0.71$

| | |
|---|-------|
| 1. Efficiency of organization’s processes and data transfer | * |
| 2. Ability to attract essential employees | 0.892 |
| 3. Ability to retain essential employees | 0.943 |
| 4. Satisfaction of customers or clients | 0.659 |
| 5. Good relations between management and other employees | 0.734 |
| 6. Relations among employees in general | 0.562 |

Factor two for performance, F2: $\chi^2(1) = 1.827, P < 0.176, GFI = 0.994, CFI = 0.998, ILI = 0.985, RMSEA = 0.07, CR = 0.91, AVE = 0.65$

| | |
|--|-------|
| 1. Quality of services, programmes or products | 0.650 |
| 2. Development of new products, services or programmes | * |
| 3. Marketing | * |
| 4. Growth in sales | 0.928 |
| 5. Profitability | 0.823 |
| 6. Market share | 0.811 |

Strategic alignment and leadership: $\chi^2(1) = 1.74, P < 0.187, GFI = 0.992, CFI = 0.997, ILI = 0.990, RMSEA = 0.071, CR = 0.87, AVE = 0.69$

| | |
|--|-------|
| 1. Leader has made an explicit effort to align business and HR strategies (eg training, reward, performance and change management) | 0.827 |
| 2. Leadership support, commitment, involvement, feedback are shown | 0.823 |
| 3. Team commitment and collaboration are critical for successful ERP Implementation and change. | 0.824 |

HRM practice: A three-factor CFA model: $\chi^2(39) = 74.145, P < 0.001, GFI = 0.925, CFI = 0.962, ILI = 0.946, RMSEA = 0.070$



**Table A1** *continued**Standardized factor loading**Factor one:* CR = 0.98, AVE = 0.51

| | |
|--|-------|
| 1. A formal information sharing programme (eg a newsletter) | 0.630 |
| 2. A formal job analysis and career development | 0.788 |
| 3. Non-entry level jobs filled from within in recent years | * |
| 4. Administered attitude surveys on a regular basis | 0.739 |
| 5. Participate in Quality of Work Life (QWL) programmes, Quality Circle (QC) and/or labour management participation teams | 0.807 |
| 6. Have access to company and team incentive plans, profit-sharing plans and/or gain sharing plans | 0.680 |
| 7. Had a high number of hours of training over the past 12 months. | 0.685 |
| 8. Have access to a formal grievance procedure and/or complaint resolution | * |
| 9. Has autonomy in his/her daily activities | 0.624 |

Factor two: CR = 0.78, AVE = 0.77

| | |
|--|-------|
| 1. Performance appraisals are used to determine their compensation | 0.811 |
| 2. Receive formal performance appraisals | 0.935 |
| 3. Merit or performance rating alone | * |
| 4. Seniority if merit is equal | * |

Factor three: CR = 0.79, AVE = 0.64

| | |
|--|-------|
| 1. Seniority of employees who meet a minimum performance requirement | 0.993 |
| 2. Seniority only | 0.553 |

Organizational culture: A four-factor CFA model: $\chi^2(83) = 154.794$, $P < 0.000$, GFI = 0.883, CFI = 0.946, ILI = 0.931, RMSEA = 0.076.

Factor one: CR = 0.91, AVE = 0.67

| | |
|---|-------|
| 1. Is generally considered to be a coordinator, an organizer or an efficient expert. | 0.892 |
| 2. Is generally considered to be a producer, a technician or a hard-driver. | 0.682 |
| 3. Is loyal and traditional. Commitment runs high. | 0.823 |
| 4. Has a commitment to innovation and development. There is an emphasis on being first with products and services. | 0.900 |
| 5. Has an emphasis on task and goal accomplishment. A production and achievement orientation is shared. | 0.777 |
| 6. Is participative and comfortable. High trust and openness exist. | * |
| 7. Is competitive and confrontational. Emphasis is placed on beating the competition. | * |

Factor two: CR = 0.80, AVE = 0.51

| | |
|--|-------|
| 1. The success of the organization is based on its development of human resources, teamwork and concern for people. | 0.691 |
| 2. The success of the organization is based on its having unique or the newest products. It is a product leader innovator. | 0.860 |
| 3. The success of the organization is based on the basis of efficiency. | — |
| 4. Dependable delivery, smooth scheduling and low-cost production are critical | 0.809 |
| 5. The success of the organization is based on the basis of market penetration and market share. Being number one relative to the competition is a key objective. | 0.819 |
| 6. This organization is characterized by teamwork, consensus and participation. | 0.786 |

**Table A1** continued*Standardized factor loading*

- | | |
|--|---|
| 7. This organization is characterized by security of employment, longevity in position and predictability. | * |
| 8. This organization is characterized by hard-driving competitiveness, production and achievement. | * |

Factor three: CR = 0.84, AVE = 0.64

- | | |
|---|-------|
| 1. This organization is a very dynamic and entrepreneurial place. People are willing to stick their necks out and take risk | 0.707 |
| 2. Is generally considered to be an entrepreneur, an innovator or a risk taker. | 0.839 |
| 3. Emphasizes dynamism and readiness to meet new challenges. Trying new things and trial-and-error learning are common. | 0.846 |

Factor four: CR = 0.73, AVE = 0.47

- | | |
|---|-------|
| 1. It is a very formalized and structural place. Established procedures generally govern what people do. | 0.774 |
| 2. It is very production oriented. A major concern is with getting the job done, without much personal involvement. | 0.670 |
| 3. Is generally considered to be a mentor, sage, or a father or mother figure. | 0.607 |
| 4. Has formal rules and policies. Maintaining the smooth running of an organization is important. | * |
| 5. Emphasizes permanence and stability. Expectations regarding procedures are clear and enforced. | * |

IT (ERP) implementation: $\chi^2(30) = 75.4, P < 0.000, GFI = 0.923, CFI = 0.977, TLI = 0.965, RMSEA = 0.091, CR = 0.99, AVE = 0.73$

- | | |
|--|-------|
| 1. IT (ERP) has improved team collaboration | 0.830 |
| 2. IT (ERP) has improved internal communication and coordination | 0.819 |
| 3. IT (ERP) has strengthened strategic planning | 0.903 |
| 4. IT (ERP) has reduced variance in suppliers lead time | 0.878 |
| 5. IT (ERP) has improved the labour productivity | 0.848 |
| 6. IT (ERP) has streamlined business processes | 0.843 |
| 7. IT (ERP) has improved management decision making | 0.868 |
| 8. IT (ERP) has enhanced the efficiency of supply chain management | 0.884 |
| 9. IT (ERP) has supported business strategies | 0.840 |
| 10. IT (ERP) has reduced costs and improve quality and speed | 0.826 |

Chinese cultural values: A four-factor CFA model: $\chi^2(98) = 149, P < .001, GFI = 0.889, CFI = 0.956, ILI = 0.946, RMSEA = 0.059.$ *Factor one: CR = 0.97 AVE = 0.59*

- | | |
|---|-------|
| 1. Resistance to corruption | 0.725 |
| 2. Patriotism | 0.635 |
| 3. Sincerity | 0.866 |
| 4. Keeping oneself disinterested and pure | 0.784 |
| 5. Having a sense of shame | 0.757 |
| 6. Courtesy | 0.807 |

**Table A1** continued*Standardized factor loading**Factor two: CR = 0.94 AVE = 0.55*

| | |
|------------------------------------|-------|
| 1. A sense of cultural superiority | 0.651 |
| 2. Being conservative | 0.855 |
| 3. Protecting your 'face' | 0.821 |
| 4. Having few desires | 0.600 |

Factor three: CR = 0.94 AVE = 0.54

| | |
|-------------------------|-------|
| 1. Tolerance of others | 0.635 |
| 2. Harmony with others | 0.846 |
| 3. Humbleness | 0.801 |
| 4. Benevolent authority | 0.623 |

Factor four: CR = 0.80 AVE = 0.54

| | |
|---|-------|
| 1. Moderation, following the middle way | 0.728 |
| 2. Ordering relationships by status and observing order | 0.923 |

Overall model fit: $\chi^2(109) = 340.687$; $P = 0.000$; CFI = 0.944; TLI = 0.932; RMSEA = 0.065.

*Items excluded from further analysis due to either the low factor loadings or high cross-loadings.

Notes: Composite Reliability (CR) = $(\sum \lambda_i)^2 / ((\sum \lambda_i)^2 + \sum \epsilon_i)$.Average Variance Extracted (AVE) = $(\sum \lambda_i^2) / ((\sum \lambda_i^2) + \sum \epsilon_i)$.

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