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FACTORS AFFECTING SUCCESSFUL IMPLEMENTATION OF ERP SYSTEMS TOWARDS ORGANIZATIONAL PERFORMANCE – FOCUSED ON SMES IN VIETNAM

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ABSTRACT

Many researchers have exerted efforts to seek explanations of the existence of factors influencing the successful implementation of Enterprise Resource Planning (ERP) systems. However, little attention has been given to the effect of ERP implementation upon the organizational performance enhancement and specifically in the context of Vietnamese small and medium-sized enterprises (SMEs). An empirical study was conducted to investigate the dimensions of ERP system implementation and identify the relationship between this construct and organizational performance in SMEs in Vietnam. Results revealed that the ERP system implementation was significantly associated with the exogenous variables proposed, and that individual impact showed the strongest effect. We further found that, although not having a direct effect, ERP implementation could help enhance the performance of enterprises in the target population through indirect effects. Besides, business sector was found to have moderating effect in the conceptual framework.

KEYWORDS: *ERP implementation, organizational performance, IS Success Model, SMEs, Vietnam.*

1. Introduction

For the past few years, Information Technology (IT) and Information Systems (IS) play an important role in business environment. In regards to growing global competition, numerous state-of-the-art information systems have been developed. Most of these new systems are Enterprise Resource Planning (ERP) systems. More broadly called enterprise system, ERP systems, designed to console both the functional and operational processes of the value chain of a firm, are commercial software packages that "promise the seamless integration of all the information flowing through the company–financial and accounting information, human resource information, supply chain information, customer information" (Davenport, 1998; Ranganathan and Brown, 2006). ERP systems attempt to integrate all business processes into one enterprise wide solution to enhance data homogeneity and integration of modular applications (Morris and Venkatesh, 2010). Thereupon, a signified benefit of ERP systems is to streamline the workflow across various departments, ensure a smooth transition and quicker completion of processes, and enable all the inter-departmental activities to be properly tracked and none of them to be "missed out" provided that processing all business acts in accordance with information processing (Rajesh 2011).

Successful implementation of ERP systems yields advancements in planning, making decision, improves the firm performance and creates opportunities for growth. ERP system acts as an effective tool that enhances firm performance and sustains a continuous competitive advantage (Li et al., 2006). However, many failed ERP system implementations may be attributed to the selection of an inappropriate ERP system or lack of the support from stakeholder-related.

Notwithstanding the fact that ERP solutions have been introduced into the business environment in Vietnam for approximately 15 years, the success rate of ERP implementation is still very low and several years behind developed countries. A survey carried out by the Vietnam Chamber of Commerce and Industry (VCCI) reported that by the middle of 2006, only 1.1% of the Vietnamese enterprises applied and successful implemented ERP solutions. According to the Vietnam E-commerce 2014 report, the rate of enterprises using ERP packages was 17% (VECITA, 2014)**Error! Reference source not found.**. The number of failed ERP system implementations in Vietnamese most prevailed over successful ones. Those small figures about the status of implementing ERP systems implied that the status of ERP solutions in Vietnam is still relatively limited.

Whilst hesitancy has long existed about the business value of ERP systems, to the best of our knowledge, there is no research in the ERP systems literature that has interrogated the successful implementation of ERP systems on the organizational performance in Vietnamese SMEs, which occupied 97% in total more than 300 thousand active enterprises and played a crucial role for Vietnam's economic development (Statistical Yearbook, 2014). Thus, this study intends to figure out w*hich success factors influence the ERP system implementation* and *how the implementation of ERP systems can impact on the performance of SMEs in Vietnam.* Answering these issues fills the gap in the literature on the business value of ERP systems.

In the following sections, the related literature is reviewed, research model and hypotheses are then presented followed by the research methodology chosen to conduct the study. Next, data analysis and findings are described in results section. Finally, conclusions along with the implications of the study, the limitations and suggestions for future research are highlighted.

2. Literature Review

This section discusses about the related studies on ERP implementation. It is composed of three parts: the first part is about the ERP system business value and the second part shows the general theories of the relation between this concept and organizational performance. Lastly, the status of applying ERP in SMEs in the country-specific case has been summarized.

2.1 ERP System Business Value

The acronym ERP was invented in the 1990s by the Gartner Group as an extension of Material Requirements Planning (MRP), later Manufacturing Resource Planning (MRPII) and computer-integrated manufacturing (Gould, 2002). However, the roots of ERP systems forerun from the 1960s on centralized computing systems like Inventory Control Packages and the late 1980s on enterprise information systems like MRP and MRP II (Rashid et al., 2002). Without replacing these terms, ERP attained to represent a larger whole that reflects the progression of application integration beyond manufacturing. When implementing, ERP system distributes a unified database that encompasses all data for the software modules across an entire organization. As a result, users in different departments all see the same information and can update it. Moreover, that computer security is included within an ERP system results in protecting against both outsider and insider crime. Besides above advantages, ERP systems, however, have their drawbacks that need to be overcome such as cost, expertise, flexibility and changes, especially customization that is problematic.

ERP systems are adopted by organizations to support an integrated, packaged solution to their information needs. To date, prior research studies have documented mixes evidence on addressing the best critical factors for ERP projects' success. Factors which are unique to ERP implementation consist of understanding corporate cultural change, business processes reengineering (BPR), and using business analysts on the project team (Sumner, 2000). DeLone and McLean (2004) determined the factors that may impact on the success of the ERP system under six main categories namely system quality, information quality, system usage, user satisfaction, individual effect and organizational impact (DeLone and McLean, 2004). However, Ifinedo stated that individual impact and organizational impact are irrelevant in the context of ERP systems (Ifinedo, 2007). Nevertheless, the result of implementing ERP does not always prove successful. Many studies were investigated in order to determine factors relating to the failure of ERP systems at the various stages of ERP implementation life cycles. Several companies had installed ERP systems, yet had to abdicate their implementation. It is depicted that a load given of failure factors are poor technology planning, user involvement and training, overruns of budget and schedule, and adequate skills availability (Wright and Wright 2002).

2.2 ERP implementation and organizational performance

In developing countries, ERP systems are typically implemented as part of an enterprise's effort to renovate and discriminate itself, not to replace legacy systems. ERP systems are adopted by enterprises to support an integrated, packaged solution to their information needs. Aside from the fact that enterprises anticipate significant benefits from the implementation of their ERP systems, problems within the implementation process can restrain an enterprise from realizing those predicted benefits or even recovering the cost of the implementation effort. To address these issues, numerous of studies have been explored. Poston and Grabski (2001) stated that ERP adoption elicits to efficiency increase in terms of a decline in employee numbers and in the quotient of employees to revenues for each year after the ERP implementation. Also, ERP implementation helps enterprises gain a competitive advantage. Additionally, Wier et al. (2007) claimed that

joint adoption of ERP systems and non-financial performance incentives (NFPI) will gain better firm performance than either ERP or NFPI alone. However, the literature debates that the numerousness of the ERP studies are relied on findings from large enterprises, there is a little attention given to come across on ERP in SMEs.

2.3 Status of applying ERP in SMEs in Vietnam

SMEs in Vietnam collaborated in approximately all sorts of industries, in view of that they have diversion in their range and significance. SMEs are business establishments that have registered their business pursuant to law and are classified into three levels: micro, small and medium in line with the sizes of their total capital (correlative to the total assets identified in the balance sheet) or the number of employees (under the Decree No. 56/2009/ND-CP dated 30th June 2009 by The Vietnamese Government). The definition for each sector is described concretely in Table 1.

According to data released by the General Statistics Office, most active businesses in Vietnam are SMEs as defined in the Government's Decree No. 56/2009/ND-CP. Table 2 dedicates that the number of SMEs increases steadily from 2008 to 2013. The structure of active enterprises by labor size for a total of micro, small and medium enterprises accounted for about 97.67% through the survey period, and the SMEs contribute 47% GDP and nearly 40% of the state budget (Statistical Yearbook, 2014). Conjointly, SMEs are the growth engine in Vietnam in such a way that small business plays the same role in developed markets like the U.K, U.S. As shown in the report of Vietnam E-commerce and Information Technology Agency of Vietnam Ministry of Industry and Trade, most enterprises have implemented information system business in varying degrees, and additionally, information system investment mainly concentrates on performance and delivers clear business results (VECITA, 2014).

In the early 2000s, ERP solutions were first entered upon the Vietnamese companies which were prospecting for ways to help their business more efficient and effective. Vietnamese enterprises including SMEs consider that ERP systems enable them to straighten out their business process and increase their competitive strength in the market. Whereas choosing a business software application in general and an ERP solution in particular is not quite simple, Vietnam's SMEs suffer more problems than most in this regard. ERP is a relatively new marvel in Vietnam, in consequence of that buyers often have hazards in evaluating the market for these systems and related services. Though being introduced in Vietnam business environment long ago, the success rate of ERP implementation in Vietnamese enterprises is still not very high. Therefore, the urgency of Vietnam's SMEs is to well-organize and successfully implement an ERP system to be aggressive and effective.

3. Research Model and Hypotheses

This section discusses about the conceptual framework and the hypotheses development for the proposed model.

3.1 Research Model

Figure 1 depicts how the successful implementation of ERP systems affects performance of enterprises, and through which path business entity, sector and age of enterprises exert moderating effects in this study. In this study, we propose the research model grounded on agitating the selected literature of ERP systems. We posit that the ERP implementation construct constituting of five latent variables revised from the IS Success Model is antecedent of enterprise performance. The research model suggests that the implementation of ERP system influences on both organizational capabilities and competitive advantage which in turn boost organization's performance. Especially, the research model also suggests that organizational capabilities and competitive advantage have the mediating effects on the relationship between ERP implementation and organizational performance.

3.2 Hypotheses

Implementing an ERP system often sets up an organization's largest IS investment and in many cases the largest corporate project (Sumner, 2000). This is far more regular in SMEs in developing economies where many of the operational and managerial systems have yet to be automated and legacy systems are not as conserved as in the business environment in developed countries. ERP systems provide the mechanism by which organizations can process, deliver and seize a wide array of key performance indicators in (near) real-time (Markus and Robey, 1998), and through which managers can coordinate and control their decisions across the enterprise (Dechow and Mouritsen, 2005). Thus, a successfully ERP system implementation magnifies organizational capabilities. Besides, ERP systems offer major changes in culture and behavior models which are the main sources of economic advantages (Hunton et al., 2003). We, for that reason, expect a significant relationship between ERP implementation to these structures. Accordingly, we propose the following hypothesis:

Hypothesis H1: Implementation of ERP system has a significant relationship with organizational capabilities.

Hypothesis H2: Implementation of ERP system has a significant relationship with competitive advantage.

Powell (2001) suggested that competitive advantage induces the improvement of performance, not the converse, and hence, tests of direct relationship with performance that do not separately consider competitive advantage represent methodological mistakes (Powell, 2001). Thus, among the possible relationships between organizational capabilities, competitive advantage and performance, a direct relationship between competitive advantage and organizational capabilities likely subsists. To provide further empirical evidence, the hypothesis for the study is developed as follows:

Hypothesis H3: Organizational capabilities have a significant relationship with competitive advantage.

Many researchers have argued that ERP has an impact on the firm performance, for instance, Hunton et al. (2003) has investigated the influence of ERP adoption on firm performance by comparing firms which did and did not use ERP systems. They claimed that both turnover and ROI of the ERP system users significantly sharpened, however, the results differ according to the firm size (Hunton et al., 2003). Therefore, in both theoretical and practical perspective, it is important to know the impact of ERP systems on an organization. The following hypothesis is proposed.

Hypothesis H4: Implementation of ERP system has a significant relationship with organizational performance.

Organizational resources and capabilities are key factors for competitive advantage and its sustainability (Barney, 1991). As illustrating dynamic routines that can be manipulated into unique configurations to drive product and service differences, organizational capabilities contribute to performance outcomes (Teece et al., 1997). In addition, competitive advantage provides chances to develop their own economic performance and ability to compete with the rivals. We, on the grounds of that belief, expect organizational capabilities and competitive advantage would have a positive impact on performance. Thus, we present the following hypotheses:

Hypothesis H5: Organizational capabilities have a significant relationship with organizational performance.

Hypothesis H6: Competitive advantage has a significant relationship with organizational performance.

Besides, as of moderating effect, prior studies have discussed the impact of some environment characteristics such as timing and nature of system transformation, change and knowledge management, organizational culture, etc., on ERP implementation (Andreas and Somnath, 2006; Zafar et al., 2006). However, still there exits the gap in the context of SMEs literature. We hence suggested the following hypothesis:

Hypothesis H7: Entity, Sector and Age of the enterprise have moderating effects on implementation of ERP systems that affects organizational performance.

4. Research Methodology

This section discusses on how the data have been collected and the methodologies were employed to examine the research model.

4.1 Data collection and sampling

To collect the data, we conducted an online survey using Google Docs on enterprises which applied ERP systems in their business operating process. The target population in this study is enterprises announcing the implementation of ERP systems for the first time during the period 2007-2013. With regards to ERP implementation, this is appropriate since several studies have confirmed that only after some years of use do organization's performance benefits typically accrue from the implementation of ERP solutions (Nicolaou and Bhattacharya, 2006). As our unit of analysis is the "firm", the initial sample consisted of 762 enterprises in total which were selected and contacted through the database derived from Vietnam Chamber of Commerce and Industry (VCCI). Of the 762 enterprises contacted, 437 enterprises agreed to answer the survey. After collecting, 21 uncompleted questionnaires being not valid due to missing and inconsistent information were excluded, leaving 416 valid answers which yielded a complete response rate of 54.6%.

As suggested, to generate reliable results the minimum necessary sample size used in factor analysis should be equal to or greater than five times of the number of variables being analyzed (Gorsuch 1983), but should be at least 100 (Kline 1979). With respect to having 34 variables, the minimum sample size required to run EFA in this research is N = 170 (5*34). 416 usable responses would resultantly be suitable for performing in the final analysis.

4.2 Measurement Instruments

The data used to test the hypotheses were obtained through a web-based survey using a four-part questionnaire. While part one involved a set of questions used to operationalize the implementation of ERP system, part two dealt with enterprise capability and competitive advantage and part three covered the firm performance. Items were rated on a 7-point rating scale, bouncing from 1 = "strongly disagree" to 7 = "strongly agree". The last part using nominal scale was to screen the general information of the enterprises taking part in the survey. The operational definition of research variables are summarized in Table 3.

All measures were adapted from prior scales, including: implementation of ERP systems (IoE), organizational capabilities (Oca), competitive advantage (Cad) and organizational performance (Operf). The implementation of ERP systems was conceptualized as a five-dimensional construct. The measurement included five items for each scale. Nevertheless, some items were removed as they showed a weak loading or loaded in two different factors. Overall, 22 items were applied to measure. These measurement items were largely derived from DeLone and McLean (2004) and developed from prior studies.

To measure competitive advantage we revised Barney's instrument (1991), and Mata et al. (1995) which were used to measure information technology usage. Organizational capabilities construct was redrawn based on the instrument developed by Law and Ngai (2007), and Shang and Seddon (2002). Competitive advantage was measured by four items and a similar number for organizational capabilities. For organizational performance measurement, four items were used and reformed from Ellinger et al. (2008).

In conjunction with the hypothesized variables, each equation incorporated three moderating variables (entity, sector and age). As all the measures used in this research are from existing literature and the three moderators are particularly appropriate in the context of an investigation of ERP implementation as mentioned above, it was judged to be unnecessary to run a pilot study.

4.3 Data analysis method

In this research, we proposed a structural equation model to investigate the relationships among ERP implementation and organizational performance based on a hypothetical research model. The analysis of the measures was done in several steps by using three statistical software: SPSS 21, AMOS 21.0.0 and Microsoft Excel 2013. To begin with, we used SPSS to input survey data and produce a basic profile summary and description in order to ascertain the level of sample representative. After that, we processed the reliability analysis, standard deviation of measurement instruments and conducted Exploratory Factor Analysis to examine the scales for reliability. Finally, the fit of the measurement model, followed by reliability and validity assessments and research hypotheses were assessed by the maximum likelihood method through AMOS utilizing Confirmatory Factor Analysis and Structural Equation Modeling to examine the measurement and structural model. Within this phase, Excel was performed to calculate the composite reliability and variance extracted to test the convergent validity.

For a good model fit, the Chi-square statistic must be not significant. However, the Chi-square statistic is very sensitive to sample size, and despite the fact that this measure of fit works well for smaller sample sizes (75 to 200 cases), for sample sizes with more cases the Chi-square is almost always significant (Kenny, 2003). For this reason, further measures of fit have been conducted for a more indicative fit to be execute. The model fit was evaluated by examining the RMSEA, GFI, AGFI, CFI and IFI (Hu and Bentler, 1999). This study also examined the TLI and normalized Chi-square, also called relative Chi-square (the comparison between Chi-square $\chi 2$ and the degrees of freedom), as listed as CMIN/DF in AMOS.

5. Results

This section discusses the analysis results using the three methods including Exploratory Factor Analysis, Confirmatory Factor Analysis and Structural Equation Modelling.

5.1 Sample characteristics

With the exclusion of 21 that were not filled out properly or completely, a total of 416 responses were analyzed. The sample features of the sample are showed in Table 4.

Actually, most of the respondents were limited liability and joint-stock companies which occupied 48.55% and 34.86% respectively of our sample. This rate is reasonable as these entities are the most popular forms of investment vehicle in Vietnam. Out of 416, more than 50% are in the sector of industry composed of manufacturing and construction. There was little difference in the distribution of enterprises for both age and size among groups except group of less than 50 employees which is more likely to apply separate software packages more than a complicated software required high-level structure of enterprises.

5.2 Evaluation and refinement of measurement scales

5.2.1 Descriptive statistics and data checking

For describing the sample, and later on, determining the extent to which the sample represents the population, we conducted descriptive statistics analysis. If measurement data distribution with either a high skew or kurtosis is not a normal distribution, or otherwise non-normality which has random effects on specification or estimation (Hall and Wang, 2005), we could get bias in the estimation process which led to an inaccurate model. We used the mean score of each measurement scale to examine the normality in the multivariate distribution. Table 5 provides a summary of the descriptive analysis of the measured variables.

The results shown that skewness was in the range of -0.38 ~ -0.07, and kurtosis was -0.36 ~ 0.12. The mean and standard deviations were within the expected ranges. Thus, the univariate normality is evidenced in the dataset which may result in the fact that we can execute the maximum likelihood estimation in testing the structural model in this study.

5.2.2 Exploratory Factor Analysis

In order to confirm whether the proposed factor structures are explicitly consistent with the actual data and/or obtain proof for the structural validity of the scale of ERP implementation towards organizational performance, Exploratory Factor Analysis (EFA) was applied. It is recognized that most individuals report on the factor pattern matrix which has factor loadings that represent the unique contribution of each variable to the factor. It is simply a rule of thumb method that "...factor loadings greater than approximately 0.30 are considered to meet the minimal level; loadings of approximately 0.40 are considered more important; and if the loadings are approximately 0.50 or greater, they are considered practically significant" (Hair et al., 2005).

EFA using principal component method with rotation of Varimax and an eigenvalue of 1-point cutoff was tested to check the number of factors. The results provided that eight components were extracted without forced extraction. As displayed, all items were well loaded with factor loadings more than 0.5. These findings showed that those domains had a good construct. The factor structures, by way of explanation, gained through the EFA matched the one proposed in the research model. All Eigenvalues were greater than 1 and the percentage of cumulative variance explained by these components was 71.26% meaning that factors could explain 73.84% the variance of observed variables which was acceptable.

5.2.3 Reliability analysis

Cronbach's Alpha reliability analysis was then performed to test the reliability of our measurement scales. The scales are reliable and the internal consistency of the constructs is considered to be acceptable when the value of Cronbach's Alpha is above 0.70 (George and Mallery, 2003) and many researchers supported this recommendation (e.g., Hair et al., 2005). Coefficients of Cronbach's Alpha ranged from 0.804 to 0.909, satisfying the recommended threshold (see Table 6). Therefore, our items have good internal consistency in each scale, in short, the data is meaningful in statistics and has the necessary reliability.

5.3 Confirmatory factor analysis

To check the validity of the measurement model, confirmatory factor analysis (CFA) was conducted. After running first estimates there were some fit indices that did not fall within the acceptable range, we used modification indices as remedies to discrepancy between the proposed and estimated model or, in others words, improving the model empirically by drawing covariance between error terms. CFA was executed by removing individual observed variables lower than standardized regression weights of 0.7 in order to earn a high level of fitness. The composite reliability (CR) and average variance extracted (AVE) were assessed to investigate the convergent validity based on the criteria that the recommended threshold is over 0.7 for CR and 0.5 for AVE (Fornell and Larcker, 1981; Chin, 1998). The results are shown in Table 7.

According to the analysis, CR values were found to be 0.780 ~ 0.897 and AVE values were 0.551 ~ 0.686, over the threshold for all variables. Besides, as exhibited, all loadings of the measures in our research model are significant on their standardized weights at the level of 0.01. Therefore, the analysis could be reflected to have reliability and convergent validity. In addition, we verified the discriminant validity of our instruments to identify whether the constructs differ from each other. Based on the correlation matrix of independent variables, we compared the average variance extracted of each construct to the square of the correlation of this construct on every other construct. Table 8 helps us see the confirmation of the discriminant validity: the smallest AVE value of the constructs (0.551) is greater than the square of the highest correlation 0.513 (0.716^2), in other words, each construct shares higher variance with its own measures than with other measures. We conclude that there is the discriminant validity in our model.

5.4 High-order confirmatory factor analysis

We then deployed the second-order CFA, a high-order CFA with two dimensions, in which the index when building the measurement model changes according to the direction of the arrow between measurement variables and factors (called Reflective Indicators).

Our study employs the second-order factor model, which is composed of a high-order factor where ERP implementation, consisting of five lower-order factors (service quality, information quality, user fulfillment, individual impact and organizational impact), is the higher level. The results of the analysis using the Reflective Indicators are shown in Figure 2.

The high-order factor model exploited certain constructs with higher accuracy than the first-order model. The developed Second-order Factor Model's adoption is acceptable in case of being found to have an excellent fitness. ERP implementation was found to satisfy the goodness-of-fit in an overall sense. Therefore, lower-order factors were measured, and items were computed to investigate the high-order factor analysis.

5.5 Structural model analysis

As the construct validity is adequate by the discriminant validity and the measurement model reliability is satisfied, a structural equation modelling (SEM) were explored to test the hypotheses. The statistic of 2.549 of relative Chi-square is within the acceptable range. The RMSEA value 0.061 is well below the recommended threshold value of 0.08. The GFI and AGFI scores (0.925 and 0.895) indicate a close fit and the IFI, TLI and CFI are all greater than 0.9, showing a good fit between the structural and the data. All of these indices are acceptable, as shown in Table 9, suggesting that the overall structural model provides a good fit with the data which means that implementation of ERP system, organizational capabilities, competitive advantage and organizational performance have statistically significant causal relationships and suitable for testing the hypothesized relationship.

Accordingly, we assessed all the hypotheses formulated earlier to identify whether significant relationships between variables exist in our proposed model. The results are presented in Table 10.

Besides the fact ERP implementation had no direct effect on organizational performance, the other relationships were hypothesized to be positive. The implementation of ERP systems was found to have positive effects on both organizational capability (H1) and competitive advantage (H2), and had a higher level of individual impact compared to service quality, information quality, user fulfillment and organizational impact. It can be inferred that individual impact, which refers to participation in the system development and implementation processes by representatives of the target users, has the highest impact on organizational capabilities and competitive advantage.

Implementation of ERP system was found not to have a direct effect on organizational performance (H4). In contrast to the proposed hypothesis, the result was not significant. Due to the fact that the time of completion of an ERP system arbitrates the time-to-benefit, that is, the long-term time horizon that is required by an organization to adjust to the new system and train its users in order that anticipated benefits can manifest, there may not have impact from the ERP implementation because organizational performance, after the adoption and use of an ERP system, would be adequately greater than its own performance prior to the adoption of the ERP system.

Organizational capabilities and competitive advantage, which significantly related to implementation of ERP system, were found to have positive effects on organizational performance (H5, H6). In addition, organizational capability and competitive advantage occur simultaneously and affect each other (H3). This supports the research of Aral and Weill (2007) who proposed that investments in specific IT system explain performance differences along dimensions consistent with their strategic purpose and a system of organizational capabilities strengthens the performance effects of IS system and broadens their impact beyond their intended purpose (Aral and Weill, 2007).

Moreover, the squared multiple correlation (SMC) values, which are similar to in regression analysis, show that this model accounts for 39.9% of the variance in organizational capabilities, 35.7% of the variance in competitive advantage, and 57.0% of the variance in organizational performance.

The Bootstrap method was then utilized to investigate the mediating effect of exogenous variables on the endogenous variables, as shown in Table 11. Organizational capabilities construct was found to have mediating effects from implementation of ERP system to competitive advantage which intervened in the relationship between organizational capabilities and performance. Interestingly, full mediation occurred between ERP implementation and performance. The relationships were statistically significant at the 0.01 level. This is identical to the results of the hypothesis test where individual impact was considered as the most basic criteria of implementing ERP system which then enhance the organizational performance through indirect effect.

Hypothesis H7 of this study is about the moderating effects of types, business sector and age of enterprises. The moderators are considered as matrix variables. 416 respondents were categorized into "≤ 10 year-age" group and "> 10 year-age" group. Enterprise type was categorized into LLCs and non-LLCs, and business sector was industry group, comprising manufacturing and construction enterprises, and non-industry group.

By using the nested model comparison method, which regards disparity in the population parameter over ±1.96 (α = 0.05) and ±2.58 (α = 0.05) as significant, business sector was $\chi 2 = 230.947$ and the degree of freedom 140, p =0.000 and thereby their significance was verified. The value of the point for two groups was 2.095 (α = 0.05), and ERP implementation had a different impact on competitive advantage by business sector of enterprises. Type and age of enterprises were found not to impact on the relationships between ERP implementation and either competitive advantage or organizational capability.

To summarize, the results of scale measurement and fit indices implied that our data are reliable and our proposed model is well fitted to the data. Almost the hypotheses developed for our model were supported by the presented findings (see Figure 3).

6. Discussion and Conclusions

This study empirically tested the effects of ERP system implementation on organizational performance across SMEs in Vietnam based on path analysis from AMOS 21 program. The overall explanatory power of our research model has an R-square of 57.0% for the organizational performance, suggesting that the proposed research model is capable of explaining a relatively high proportion of variation. In this report, we initially investigated the effect of the second-order construct, ERP implementation, on five first-order latent constructs. It is generally accepted that individual impact has the strongest effect on ERP implementation. This finding suggests that individual impact plays an important role to implement ERP systems which affects the organizational performance.

To a greater extent, ERP implementation is expected to improve organizational capabilities, competitive advantage and organizational performance. The results reveal that ERP implementation has a significant and positive effect on organizational capabilities and competitive advantage which would ultimately lead to the performance. While the relationship is relatively strong, it provides support for the claim that ERP implementation encourages the competitive advantage. The enterprise's ability to achieve organizational capability also directly influences competitive advantage.

Noticeably, this study also examines the mediating and moderating effects of the model. Organizational capabilities and competitive advantage play a crucial intervening role in the influencing of ERP implementation and performance of enterprises surveyed. It is suggested from this finding that only if enterprises make sure what they do to successfully implement ERP systems can they enhance the organizational performance. Business sector of enterprises has moderating effect on the relationship between ERP implementation and the outcome. Thus, providers of ERP packages should recognize the importance of designing solutions relied on sector-based enterprises.

To conclude, the results shed light on some important issues related to organizational performance which have not been addressed by previous studies. This study is one of the few so far that includes ERP implementation as a second-order construct while determining the relation to firm performance. Our findings provide useful insights for both researchers and practitioners.

As with all empirical studies, there are some limitations in this work that needs to be addressed. First, we only examine organizational capabilities and competitive advantage whereas, some other dimensions of business strategy that have been confirmed to have impact on organizational performance were not mentioned in this study. Second, as contextual factors are essential to researches on performance, only studying the moderator role of 3 features, this study does not mention other characteristics or some elements such as implementing time, organizational learning culture, etc., in current research framework. Therefore, the results may get the discrepancy which are caused from different business groups that influences the firm performance. Lastly, the sample size was relatively small compared with the total active SMEs in Vietnam. Using larger sample, further research, perhaps, could yield further critical insights into an under-researched area in the ERP literature.

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Figures

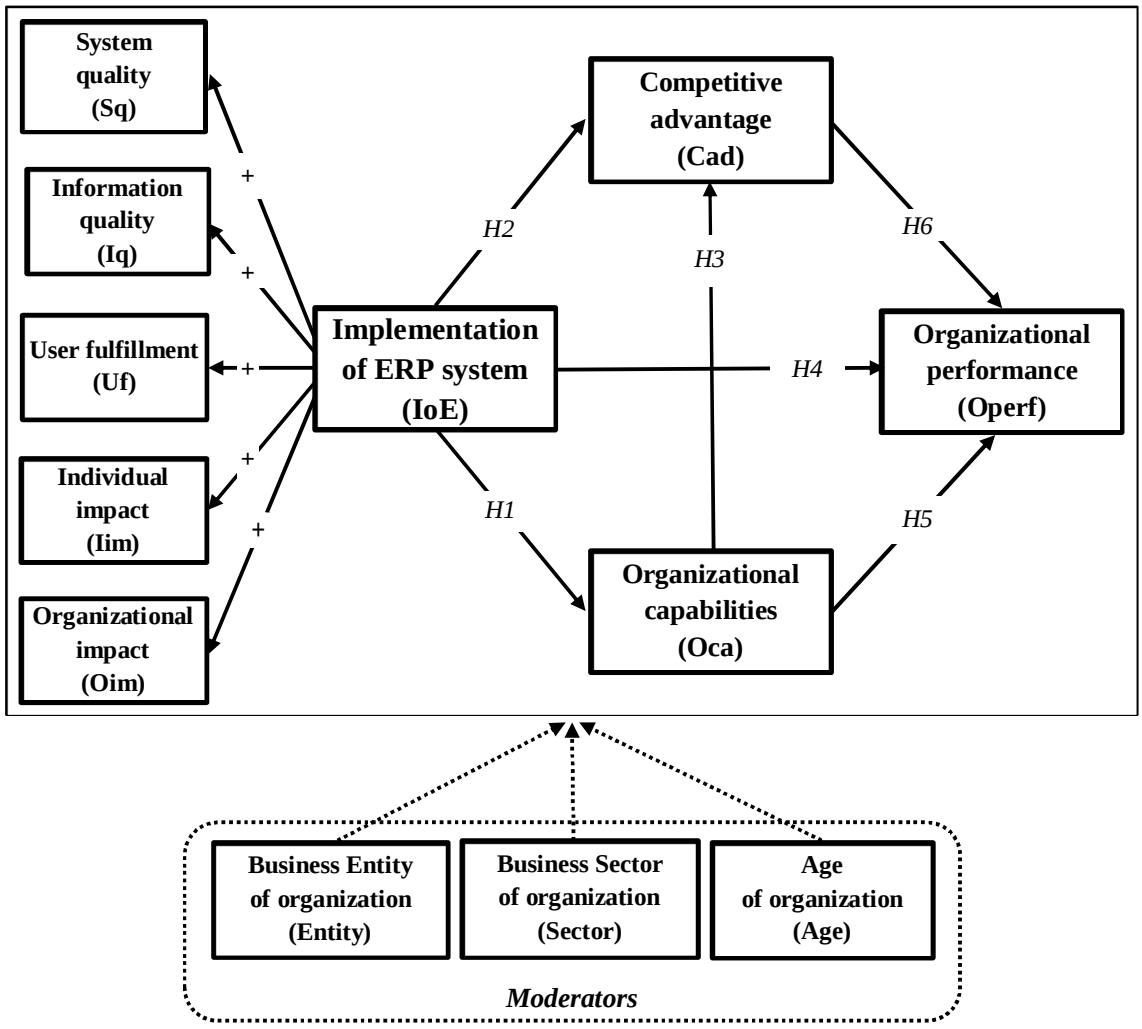
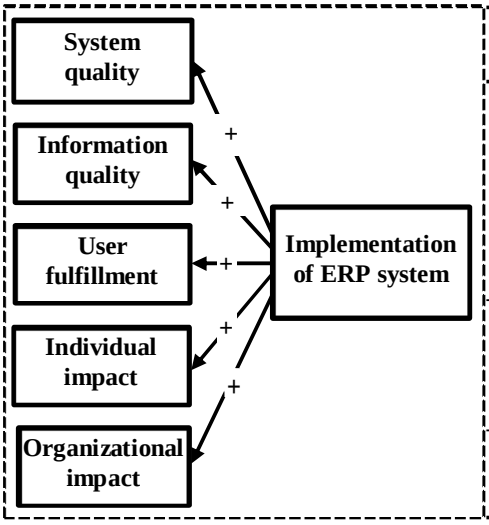


Figure 1. Conceptual Framework



Fit Indices		Research model	Level of Acceptance
Absolute Fit	χ^2/df	2.224	$1.0 \leq \chi^2/df \leq 2.0 \sim 3.0$
	RMSEA	0.054	$\leq 0.05 \sim 0.08$
	RMR	0.066	≤ 0.08
	GFI	0.906	$\geq 0.8 \sim 0.9$
	AGFI	0.883	$\geq 0.8 \sim 0.9$
Incremental Fit	IFI	0.955	$\geq 0.8 \sim 0.9$
	TLI	0.949	$\geq 0.8 \sim 0.9$
	CFI	0.955	$\geq 0.8 \sim 0.9$
Parsimonious Fit	PNFI	0.813	≥ 0.6
	PCFI	0.843	$\geq 0.5 \sim 0.6$

Figure 2. Higher-order confirmatory factor analysis

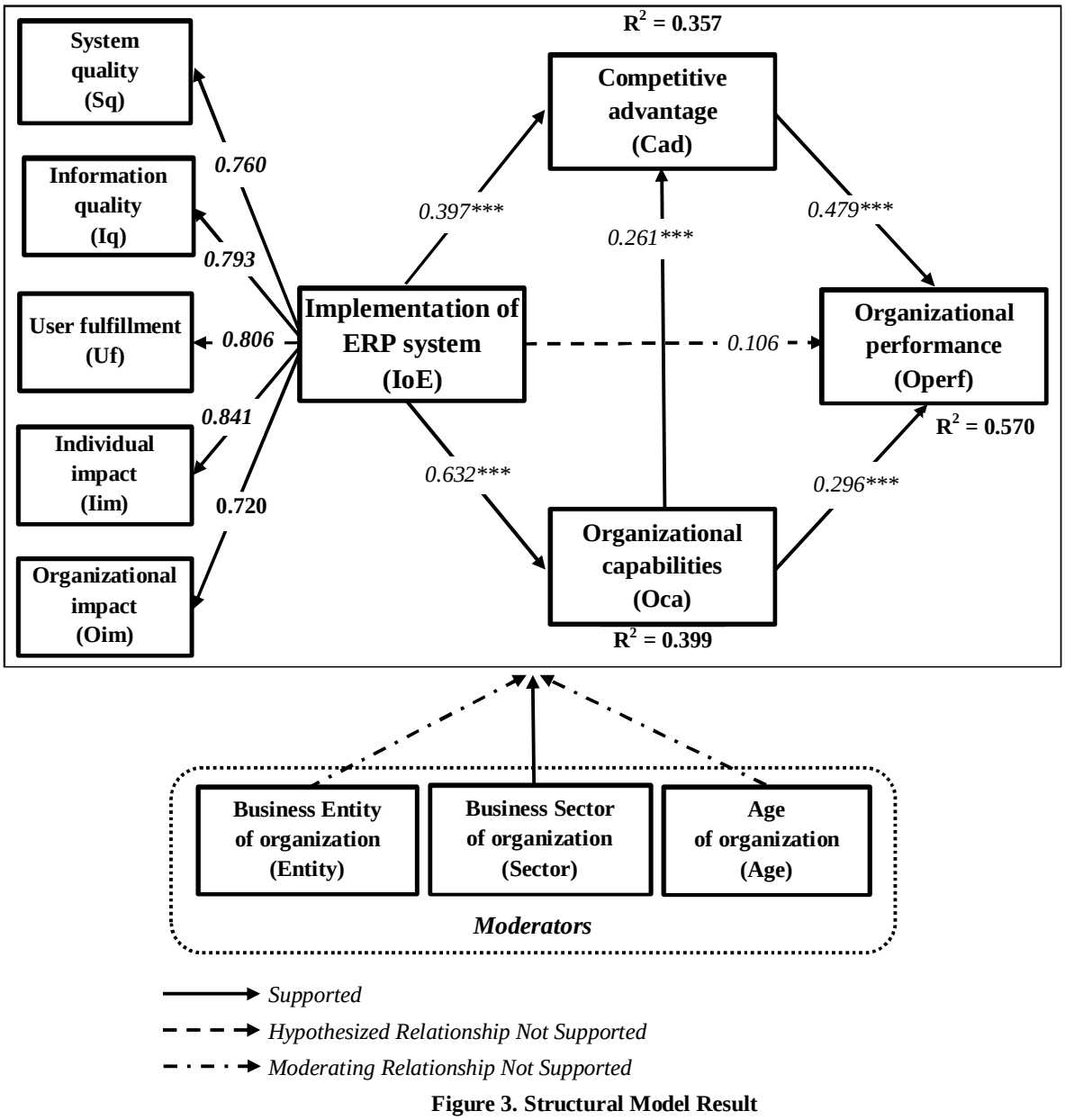


Figure 3. Structural Model Result

Tables

Table 1. Definition of SMEs per sector in Vietnam

Types of SMEs / Sector	Micro enterprises	Small-sized enterprises		Medium-sized enterprises	
	Number of laborers	Capital *(Billion VND)*	Number of laborers	Capital *(Billion VND)*	Number of laborers
Agriculture, forestry, fishery	≤ 10	≤ 20	10 - 200	20 - 100	200 - 300
Industry and construction	≤ 10	≤ 20	10 - 200	20 - 100	200 - 300
Trade and service	≤ 10	≤ 10	10 - 50	20 - 50	50 - 100

Source: Decree No. 56/2009/ND-CP dated 30th June 2009 by The Vietnamese Government

Table 2. Number of acting Vietnamese SMEs as of annual 31 Dec. by labor size

Year	Micro Enterprises	Small Enterprises	Medium Enterprises	Total
2008	127,180	68,046	4,484	199,710
2009	162,785	74,658	5,010	242,453
2010	187,580	79,085	5,618	272,283
2011	216,732	93,356	6,853	316,941
2012	225,037	93,036	6,735	324,808
2013	252,291	104,499	7,838	364,628

Source: Business performance of enterprises by Vietnamese standard industrial classification, VSIC 2007, Statistical Yearbook, 2014, the General Statistics Office of Vietnam GSO

Table 3. Constructs in the model

Construct	Operational definition	References
System quality	Technical level involvement the ERP's characteristics including data accuracy, system accuracy, system efficiency, response time and database content.	DeLone and McLean, 2004
Information quality	User perception of measuring the characteristics of the information that is produced by the ERP system.	
User fulfillment	Subjective user evaluation of numerous consequences after using ERP system.	
Individual impact	User perception of elevating in personnel performance, task effectiveness and productivity.	
Organizational impact	Dimension that measures the effectiveness of the information performance on the organization.	
Organizational capabilities	An organization's abilities to perform a set of tasks using resources in terms of product variety, information access, process advancement, and financial flexibility.	Shang and Seddon, 2002 Law and Ngai, 2007
Competitive advantage	Positional superiority to compete with the rivals based on some combination of disparity, and/or cost superiority, or through operating.	Barney, 1991 Mata et al.,1995
Organizational performance	Degree to which an organization achieves in comparison with its intended outputs based on financial criteria and market criteria.	Ellinger et al., 2008

Table 4. Summary of sample characteristics

Classification	Category	Frequency	Ratio (%)
Business entity	Private companies	9	2.16
	Limited liability	202	48.55
	Joint-stock	145	34.86
	Partnership	39	9.38
	Foreign-invested	21	5.05
Industry sector	Agriculture/Fisheries	19	4.57
	Manufacturing	103	24.76
	Construction	118	28.36
	IT/Communication	49	11.78
	Wholesale/Retail	42	10.10
	Transportation & Storage	29	6.97
	Finance/Real estate	36	8.65
	Others	20	4.81
Firm Age	1-5 years	119	28.61
	5-10 years	158	37.98
	> 10 years	139	33.41
Firm Employee	< 50	34	8.17
	50-100	112	26.93
	100-200	143	34.37
	200-300	127	30.53

Table 5. Descriptive Analysis Summary

	N	Mean	Std. Deviation	Skewness	Kurtosis
	Statistic	Statistic	Statistic	Statistic	Statistic
Sq	416	4.7981	.98372	-.371	-.279
Iq	416	4.8928	.93569	-.318	-.259
Uf	416	4.8558	.94610	-.269	-.067
Iim	416	4.6819	.91399	-.078	.123
Oim	416	4.7620	.97150	-.302	.004
Oca	416	4.6424	.86845	-.255	-.360
Cad	416	4.6226	.84097	-.385	-.132
Operf	416	4.9020	.91910	-.282	-.347
Valid N (listwise)	416				

Table 6. Cronbach's Alpha Reliability Test Result

Construct name	Construct identifier	Initial number of items	Number of items for analysis	Cronbach's alpha
System quality	Sq	5	5	0.893
Information quality	Iq	5	5	0.909
User fulfillment	Uf	5	4	0.862
Individual impact	Iim	5	3	0.804
Organizational impact	Oim	5	5	0.905
Organizational capabilities	Oca	4	4	0.890
Competitive advantage	Cad	4	4	0.889
Organizational performance	Operf	4	4	0.892

Table 7. Confirmatory factor analysis

Latent variable	Items	Std. Weights	S.E.	C.R.	P	CR	AVE
Service quality	Sq1	0.795	-	-	-	0.860	0.551
	Sq2	0.816	0.055	18.167	***		
	Sq3	0.801	0.057	17.752	***		
	Sq4	0.714	0.058	18.117	***		
	Sq5	0.737	0.061	15.976	***		
Information quality	Iq1	0.820	-	-	-	0.893	0.626
	Iq2	0.844	0.051	20.312	***		
	Iq3	0.862	0.049	20.937	***		
	Iq4	0.823	0.053	19.561	***		
	Iq5	0.732	0.056	16.631	***		
User fulfillment	Uf1	0.791	-	-	-	0.835	0.559
	Uf2	0.862	0.061	17.952	***		
	Uf3	0.788	0.060	16.548	***		
	Uf4	0.786	0.061	14.118	***		
Individual impact	Iim1	0.842	-	-	-	0.780	0.542
	Iim2	0.848	0.074	12.835	***		
	Iim3	0.792	0.079	12.982	***		
Organizational impact	Oim1	0.711	-	-	-	0.884	0.606
	Oim2	0.770	0.076	14.975	***		
	Oim3	0.877	0.082	16.958	***		
	Oim4	0.840	0.082	16.295	***		
	Oim5	0.755	0.080	16.571	***		
Organizational capabilities	Oca1	0.771	-	-	-	0.890	0.670
	Oca2	0.816	0.061	17.380	***		
	Oca3	0.865	0.062	18.543	***		
	Oca4	0.820	0.061	17.468	***		
Competitive advantage	Cad1	0.786	-	-	-	0.897	0.686
	Cad2	0.856	0.060	18.854	***		
	Cad3	0.772	0.061	16.641	***		
	Cad4	0.858	0.063	18.906	***		
Organizational performance	Operf1	0.757	-	-	-	0.884	0.656
	Operf2	0.869	0.063	18.355	***		
	Operf3	0.789	0.066	16.485	***		
	Operf4	0.876	0.065	18.520	***		

Table 8. Discriminant Validity Analysis Results

	Sq	Iq	Uf	Iim	Oim	Oca	Cad	Operf
Sq	**0.551**							
Iq	0.019	**0.626**						
Uf	0.161	0.215	**0.559**					
Iim	0.020	0.021	0.241	**0.542**				
Oim	0.486	0.482	0.173	0.009	**0.606**			
Oca	0.641	0.627	0.222	0.072	0.534	**0.670**		
Cad	0.554	0.574	0.246	0.039	0.394	0.523	**0.686**	
Operf	0.559	0.605	0.226	0.716	0.436	0.617	0.691	**0.656**

The values along the diagonal line are AVE values.

Values below AVE are correlation values

Table 9. Fitness of research model

Fit Indices		Results	Level of Acceptance	Source
Absolute Fit	χ^2/df	2.549	$1.0 \leq \chi^2/df \leq 2.0 \sim 3.0$	Carmines and McIver, 1981
	RMSEA	0.061	$\leq 0.05 \sim 0.08$	Browne and Cudeck, 1993
	RMR	0.044	≤ 0.08	Hair et al., 2005
	GFI	0.925	$\geq 0.8 \sim 0.9$	Jöreskog and Sörbom, 1984
	AGFI	0.895	$\geq 0.8 \sim 0.9$	Hair et al., 2005
Incremental Fit	IFI	0.965	$\geq 0.8 \sim 0.9$	Bentler and Bonett, 1980
	TLI	0.957	$\geq 0.8 \sim 0.9$	Bentler and Bonett, 1980
	CFI	0.965	$\geq 0.8 \sim 0.9$	Bentler and Bonett, 1980
Parsimonious Fit	PNFI	0.763	≥ 0.6	James et al., 1982
	PCFI	0.781	$\geq 0.5 \sim 0.6$	James et al., 1982

Table 10. Path Analysis Results

Hypotheses	Path			Std. Weights	C.R.	p_value	Result	R^2
H1	Oca	<---	IoE	0.632	10.114	***	Supported	0.399
H2	Cad	<---	IoE	0.397	5.783	***	Supported	0.357
H3	Cad	<---	Oca	0.261	3.945	***	Supported	
H4	Operf	<---	IoE	0.106	1.773	0.076	Not Supported	
H5	Operf	<---	Oca	0.296	4.981	***	Supported	0.570
H6	Operf	<---	Cad	0.479	8.213	***	Supported	

Table 11. Analysis of Mediating Tests

Path			Verification statistics		
Dependent	**Mediator**	**Independent**	**Indirect effect**	**p_value**	**Result**
IoE	Oca	Cad	0.165	0.010	Supported
IoE	Oca	Operf	0.456	0.010	Supported
Oca	Cad	Operf	0.125	0.010	Supported