

The Effect of Enterprise Resource Planning on Competitive Advantage: The Mediating Role of Supplier Relationship Management

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Abstract. Today, many companies have used the enterprise resources planning (ERP) system which allows the integration of all functions related to the operation of the company either internally or externally. The implementation of ERP enables the supplier and the company to establish a mutual benefit relationship. An excellent relationship between supplier and company allows the supplier to access the right information regarding the material requirements. This supplier relationship, moreover, enables the supplier to plan and deliver the materials required and, in the end, to create a competitive advantage for the company. This study examines the effect of enterprise resource planning (ERP) system on the competitive advantage and the mediating role of supplier relationship management. The study used 59 samples executive level of the export-oriented manufacturer in the region of East Java, Indonesia. Data collection used questionnaires designed on a five-point Likert scale. Data analysis used the partial least square technique with smartPLS software. The empirical result revealed that the ERP system used by the corporate affects the improvement of the supplier relationship management significantly. The ERP system used by the company has a direct impact on strengthening the competitive advantage. Furthermore, supplier relationship management also affects the competitive advantage directly and significantly. To sum up, the ERP system influences the competitive advantage, directly and indirectly, as indicated by the path coefficient of 0.865. An exciting finding suggests that supplier relationship management mediates the effect of ERP on the competitive advantage. These results provide a significant implication for the supply chain theory and practice. The export-oriented manufacturer, therefore, may refer to this result in enhancing the competitive advantage.

Introduction

In recent years, there has been an increasing interest in the role of supply chain management in enhancing the competitive advantage of an organization. The reason is that the organization should go international for either acquiring raw materials or selling their finished product. The supply chain management, consequently, plays an essential role in achieving superior competitive advantages in terms of lower cost, shorter lead-time, and higher quality. The supply chain management also becomes more complicated due to the broader coverage regarding geographical location and the culture of the organization involved in the network. The export-oriented manufacturer domiciled in the region of East Java, Indonesia, are also facing the same constraint as they are looking for imported raw materials. In the context of the supply chain management, many studies suggested several factors which contributed to enhancing the competitive advantages of an organization such as the implementation of enterprise resource planning (ERP) system and the establishment of the supplier relationship management (SRM).

Many researchers have examined that ERP system has an impact on the competitive advantage [1-7]. The ERP system can provide an integrated information and a more efficient administrative system for the company. ERP system enables the organization to integrate the related units in such a way that the process becomes more efficient and has a shorter lead-time for **instance** faster new products development than **that carried out by** the competitor. The studies also have been conducted

over a different sector of industry and countries, and they have a conclusion in common that ERP creates and enhances the competitive advantage.

Other researchers also reveal that supplier relationship management (SRM) affects the competitive advantage of an organization [8-10]. Those researchers indicate that SRM plays an essential role in cost reduction and creates a competitive advantage for the companies. The manufacturer enjoy the benefits from the relationship such as having shorter lead time, lower cost, and higher quality. Therefore, it is essential for a manufacturer to establish an excellent relationship with suppliers.

Furthermore, we also found from the literature review that the ERP system also influences the SRM. The use of ERP in SRM can lower production costs and produce higher product quality. An appropriate relationship with suppliers supported by ERP systems will be highly helpful in improving the competitive advantage [11-13].

All previous studies have primarily concentrated on the direct impact of the ERP system and SRM on the competitive advantage of an organization. However, to the best of our knowledge, there is no study presenting the mediating role of the SRM over ERP system and competitive advantage relationship. This paper examines the influence of ERP on the competitive advantage with the mediating role of the SRM. Based on this research gap, four research questions are raised as follows: first, whether ERP system affects competitive advantage; second, whether SRM influences competitive advantage; third, whether ERP system affects SRM; and fourth, whether SRM has a mediating effect on ERP system and competitive advantage relationship.

Theoretical Review and Hypotheses Development

ERP and Competitive Advantage. The use of ERP aims to integrate business processes through the support of integrated computer information systems. This system allows companies to standardize the flow of management information. The implementation of ERP internet technology which enables the integration of the information flows and internal business functions as well as information from customers and suppliers. The development of ERP systems in large manufacturing companies requires the integration of appropriate data on the company to allow quick and appropriate decision-making in the pursuit of competitiveness. Competitive advantage is defined as the application of the strategy that creates a superior value not owned by current competitors or potential competitors [14]. Other study defines the competitive advantages of an organization as the extent to which a company can create a superior sustainable position against its competitors[15]. A company has a competitive advantage if the company can implement the strategy by creating value that is not owned by anyone else including its competitors [16]. The indicators of competitive advantage [17] consist of price, quality, delivery capability, product innovation, and time to market. ERP aims to integrate business processes through the support of an integrated computer information system [18]. ERP uses internet technology to integrate information flows and internal business functions as well as information from customers and suppliers. The development of ERP system in large manufacturing companies requires integration in work practices and information systems [19]. The ERP is measured in term of accuracy of the information, quality of the information, easiness to use, easiness to understand, user satisfaction, frequent usage, and enhancement in overall efficiency [20].

Research by [1] proves that the ERP system affects the existing Organization Performance in the Middle East and South Africa, notably Libya, where competitive advantage becomes one dimension of the organization performance. The other study conducted by [2] focuses on the success factors for ERP implementation in large organizations in Egypt which indicate that the implementation of the ERP system has a direct influence in increasing the competitive advantage. For the company which wants to create a competitive advantage; it is necessary to use the ERP system in the business process [3]. According to [4] ERP system produces accurate information and can help companies adapt to existing changes and create competitive advantage. According to [6] ERP systems can help improve overall business performance that results in a competitive advantage and increase long-term profitability. We, therefore, propose the first hypothesis as follows:

H1: ERP system influence the competitive advantage

ERP and SRM. The use of ERP in SRM can lower production costs and produce higher product quality [11]. An appropriate relationship with suppliers supported with ERP systems is highly helpful for export-oriented manufacturing. Supply chain practices may involve two or more partners from different countries, and they need proper information sharing among parties. This sharing of information is not affordable to implement without ERP in place. Reference [12] argues that the benefits of SRM depend on the extent to which the information is shared. Another research by [13] explains that lead-time which is one of the dimensions of SRM is influenced by the quality of information generated by the ERP. According to [11], the use of ERP in SRM can lower production costs and produce higher product quality. We, therefore, propose the second hypothesis as follows:

H2: ERP system affects SRM

SRM and Competitive Advantage. SRM is a systematic process to monitor and access the capabilities of suppliers in supporting the company's overall business strategy particularly in creating the value for the company. The company establishes the SRM for the reason of enhancing the efficiency of the process and enforcement of the company policy through the purchasing strategy in cooperation with the supplier. From the supplier, SRM provides an access to the supplier base to help companies improve the business value that ultimately enhances the company's competitiveness. SRM has long-term goals and short-term goals. Long-term goals include creating value for customers, increasing profits, improving the efficiency of production operations, and increasing markets [21]. On the other hand, short-term goals include increasing productivity, reducing cycle times, and reducing inventories [22]. According to [11], the SRM indicator is divided into five dimensions, namely: supplier quality improvement, supplier-based trust, production time reduction, supplier collaboration in new product development, and partnership or development with suppliers. SRM can also influence the competitive advantage of export companies. The firm needs to establish a proper relationship with suppliers. It is also supported by [8] who mentioned that the relationship of cooperation between suppliers and companies could be a strategy for increasing the competitive advantage of a company. Reference [9] also explained that supplier relationships with companies creates competitive advantages that result in profitability and differentiation for the company. Thus, our third hypothesis is as follow:

H3: Supplier relationship management affects competitive advantage.

The Mediating Role of SRM over the ERP System and Competitive Advantage Relationship. SRM allows both parties, buyer, and supplier, to cooperate in a mutually beneficial way. They gain benefits because they support each other in term of their respective goals. The cooperation between buyer and supplier need information sharing which enables both parties to understand their partner requirement. As discussed previously, the ERP system supports the establishment of supplier relationship by connecting both sides to the same information. This means that the ERP system affects the SRM [11, 13]. Similarly, SRM provides the benefit to a buyer in term of lower cost, better quality, and shorter time delivery, which at the end enhances a competitive advantage of the organization. By looking at this two relationship together, we can conclude that ERP influences the SRM and subsequently affects the competitive advantage. Concerning this discussion, we postulate that SRM mediates the relationship between ERP system and competitive advantage. We, therefore, propose the last hypothesis:

H4: SRM mediates the effect of ERP on competitive advantage.

Methodology

Sampling and Data Collection. The population of this study is 63 export-oriented manufacturers located in the region of East Java, Indonesia. Of the 63, 43 manufacturers are public or listed, while the rest, 20 firms, are private or unlisted. Those firms were interviewed by using a self-administered questionnaire and each firm was represented by one respondent from top management level, such as CEO or General Manager as they are considered to be the most knowledgeable persons of their firm.

An interview and discussion was conducted with particular respondents when considered necessary. The questionnaire was designed using subjective assessment with a five-point Likert scale. From 63 firms, 59 have correctly completed the questionnaires representing a response rate of 93.6%. Data were analyzed using Partial least square (PLS) technique using smartPLS software ver.3.0 to analyze the data. PLS is an appropriate tool for analyzing the data particularly in the case of small sample size [21, 22] and limited theoretical knowledge [25].

Operational Definition of the Constructs. This study assesses three constructs using the definition proposed by previous researchers. The ERP measures the extent to which the system provides the information to the user. Seven indicators are used, i.e., 1) accuracy of information, 2) quality of information, 3) easiness to use, 4) frequency used to retrieve the information, and 5) satisfaction of the user in respect to the information obtained, 6) easiness to understand the information received, and 7) increased overall efficiency. SRM measures the extent to which the supplier gives benefits to the firm by assessing whether supplier: 1) participates to increase productivity, 2) reduces the production cost, 3) believes the firm upon what has been promised; 4) delivers the part quickly, 5) engages in new product development, and 6) has a mutually beneficial long-term relationship. Finally, competitive advantage measures the competitiveness of the manufacturer by assessing the extent to which the firm: 1) provides products at competitive prices, 2) produces products with superior quality, 3) delivers products promptly, 4) introduces new products to the customer's needs, and 5) introduces new products faster than competitors.

Analysis Result

The first analysis is to assess the measurement model by evaluating the convergent and discriminant validity of each indicator and the reliability of the block indicators of each variable.

Table 1. Measurement model assessment.

Construct and Indicator	Factor loading	Cross loading			C//R	Remark
		ERP	SRM	CA		
Enterprise Resource Planning (ERP)						
The accuracy of information (ERP1)	0.684		0.449	0.603	0.844	Valid and reliable
Quality of information (ERP2)	0.712		0.511	0.639		
Easy to use (ERP3)	0.718		0.646	0.653		
Frequent usage (ERP4)	0.779		0.540	0.697		
Satisfaction of user (ERP5)	0.633		0.507	0.507		
Easy to understand (ERP6)	0.634		0.586	0.575		
Increase overall efficiency (ERP7)	0.886		0.682	0.694		
Supplier Relationship Management (SRM)						
Increase productivity (SRM1)	0.838	0.506		0.560	0.885	Valid and reliable
Reduce the production cost (SRM2)	0.655	0.590		0.615		
Believe upon the manufacturer promise (SRM3)	0.682	0.611		0.575		
Deliver the order quickly (SRM4)	0.766	0.571		0.575		
Engage in new product development (SRM5)	0.702	0.544		0.572		
Competitive Advantage (CA)						
Provide product at competitive prices (CA1)	0.627	0.694	0.560		0.881	Valid and reliable
Produce product with superior quality (CA2)	0.673	0.580	0.615			
Deliver product promptly (CA3)	0.780	0.620	0.575			
Introduce product to customer need (CA4)	0.813	0.591	0.575			
Introduce new product faster than competitor (CA5)	0.699	0.608	0.572			

Table 1 shows the result of measurement model assessment is as follows. All indicators are considered valid in terms of convergent validity as the factor loading of each indicator exceeds the acceptable minimum value of 0.50 [24]. The indicators are considered valid in respect to discriminant validity as the cross loading indicates that the loading of each indicator with its construct is higher than that with other constructs. The result also demonstrates that three constructs are reliable as the composite reliability (C/R) exceeds the minimum recommended value of 0.7 [26].

As noted, PLS is a non-parametric estimation procedure. Hence, the bootstrapping method is used to extract *t-value* to ascertain the significance level of each path coefficient to examine the hypotheses. The primary method used to assess the inner model is by examining the variance explained R^2 . The result of the analysis indicates the variance explained (R^2) for Supplier relationship management (SRM) and the Competitive advantage is $R_1^2 = 0.788$ and $R_2^2 = 0.607$ respectively. Another measurement used to assess the inner model is its predictive relevance which is denoted as $Q^2 = 1 - (1 - R_1^2)(1 - R_2^2)$. The result of Q^2 on this study equals to 0.916 which means the ERP has a good performance in predicting the competitive advantage.

Furthermore, four hypotheses were tested by assessing the path coefficient and the *t-value* obtained from the PLS result. Table 2 lists the path coefficient (β) and *t-value* for each relationship as follows. Based on the significance level of 5% or *t-value* of 1.96, the results demonstrate that all path coefficients are positive and significant.

Table 2. Path Coefficient and t-value.

Hypotheses	Original Estimate(β)	Mean of subsamples	Standard deviation	t-value
ERP → CA (H1)	0.617	0.626	0.113	5.439
ERP → SRM(H2)	0.779	0.785	0.045	17.123
SRM → CA (H3)	0.318	0.311	0.126	2.525
ERP → SRM → CA (H4)	0.248	0.244	0.101	2.445

As expected ERP influences competitive advantage ($\beta = 0.617$ and *t-value* = 5.439). This finding supports the hypothesis H1 and confirms the previous research that ERP has an impact on the competitive advantage [1, 2, 4-6]. The result shows that the ERP system influences the competitive advantage of export companies in East Java. In today's rapidly changing technological era, export companies must be able to adapt to existing technology. In the current, the technology is also very helpful to create a competitive advantage. The implementation of the ERP system in the export company provides various benefits such as the integration of functions and quality information. The ERP system improves the supply chain performance and ultimately creates a competitive advantage, and increases profits for the company. Export companies generally have a large variety of competitors scattered around the world, so it is not easy for export companies to maintain their superiority. The requirement of a technology or ERP system is mandatory in maintaining or creating a competitive advantage for the export companies in East Java.

Furthermore, ERP also has a direct impact on SRM ($\beta = 0.779$ and *t-value* = 17.132). This result is consistent with previous research on the relationship between ERP and SRM [11, 13]. The ERP system, hence, influences the supplier relationship management. The ERP system used in a manufacturing or company will support the long-term relationship with the suppliers. One of the benefits of the supplier relationship management is information sharing. Sharing of quality information [27], one dimension of the ERP system, is highly useful for improving relations among export companies.

The result also indicates that SRM affects competitive advantage as shown by the path coefficient of 0.318 and the *t-value* of 2.252. Supplier relationship management has a positive influence on the competitive advantage. An excellent relationship among companies and their suppliers creates a competitive advantage for the export companies. With a good relationship, the supplier will seriously provide a higher quality product and of course at a more affordable cost. It is not easy for an export company to launch a new product quickly if it is not supported by a flexible supplier.

This result is consistent with previous research by [8, 9, 11, 20]. The last finding is that SRM mediates the influence of ERP on the competitive advantage as shown by the path coefficient of 0.248 and the *t-value* of 2.445. This result indicates that supplier relationship management directly affects the competitive advantage and also mediates the relationship between ERP and competitive advantage. In summary, all hypotheses H1, H2, H3, H4, are supported as expected.

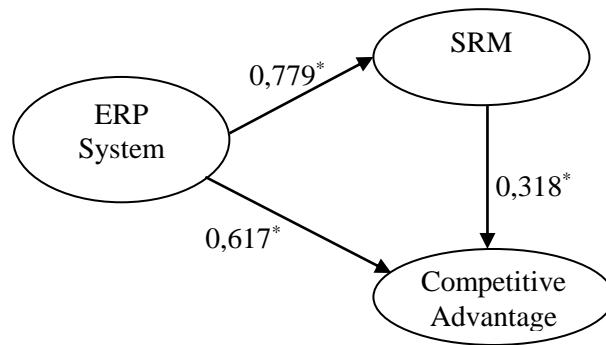


Figure 1. Full Model Result of Analysis

The level of uncertainty being faced by export companies in East Java is relatively high and diverse, such as the number of uncertain requests, and constantly changing prices. This situation is more uncertain since the export companies are also selling their products overseas where the competitive environment is continuously changing. If the company is not flexible, it will be difficult for the company to maintain the existence or competitive advantage of the export company itself.

Discussion

The present study was designed to examine the effect of ERP system on the competitive advantage and the mediating role of SRM in that relationship. The findings indicate that the results are in agreement with the previous study. The ERP affects the competitive advantage directly and indirectly. This coincides with previous research arguing that the ERP system is a fundamental system for integrating all related function within the supply chain network. Once a system is integrated, an organization will perform much better in terms of efficiency such as shorter lead time, reduced cost, and better quality. The ERP also affects the SRM which means that with the integrated system in place, the relationship between firm and supplier is getting better and the mutual benefit can be achieved by both parties. The most exciting finding was that SRM mediates the influence of ERP system on the competitive advantage. When the relationship is built on the information sharing among parties, the relationship will provide a higher mutual benefit. The result also demonstrated that the SRM, as expected, influences the competitive advantage. As the supplier support the firm in providing the product needs of the consumer in terms of quality, lead time, and cost, the relationship with the supplier will improve the competitive advantage.

Conclusion

The primary aim of the present research is to examine the mediating role of the SRM in improving the competitive advantage. The study reveals that SRM mediate the influence of ERP on the competitive advantage. The findings also support other three hypotheses. The ERP influences the competitive advantage directly. An establishment in ERP system enables the firm to integrate all related function either externally or internally such that they can collaborate in a much better manner. This study, as expected, has also shown that the ERP influence the SRM directly and the competitive advantage indirectly. The firm, therefore, is necessary to invest in the ERP resources in the pursuit of superior competitive advantage. This work contributes to the current research in the supply chain management particularly to the relationship of the ERP with the competitive advantage. This work also suggests an implication that managers should invest in ERP system and establish an excellent SRM to enhance the competitive advantage of the firm.

References

- [1] I. Edgar, M. Farizal Rajemi, and S. Natarajan, Technology factors, ERP system and organization

performance in developing countries, *Int. J. Sup. Chain Manag.*, 4(4) (2015)82–89.

[2] H. Abdelghaffar, Success Factors for ERP Implementation in Large Organizations: The Case of Egypt, *Electron. J. Inf. Syst. Dev. Ctries.* 52(1) (2012) 1–13.

[3] Prasojo, Surabaya di banjiri hotel Bintang 3. 2015.

[4] R. Bin Che Rose, A conceptual framework of the relationship between organizational resources, capabilities, systems, competitive advantage and performance, *Res. J.Int. Stud.* 12 (2009) 45–58.

[5] S. Li and B. Lin, Accessing information sharing and information quality in supply chain management, *Decis. Support Syst.*, 42(3) (2006) 1641–1656.

[6] L. Hsu and M. Chen, Impacts of ERP systems on the integrated- interaction performance, *Ind. Manag. Data Syst.*, 104(1) (2004) 42–55.

[7] Hidayat and Amad, Effect of the Enterprise Resource Planning (ERP) on Competitive Advantage, *J. Eng. Appl. Sci.*, 10(11) (2016) 2298–2308.

[8] M. Cousineau, T. W. Lauer, and E. Peacock, Supplier source integration in a large manufacturing company, *Supply Chain Manag. An Int. J.* 9(1) (2004) 110–117.

[9] A. A. Thatte, Competitive advantage of a firm through supply chain responsiveness and SCM practices, 2007.

[10] S. D. Jap, Perspectives on joint competitive advantages in buyer-supplier relationships, *Int. J. Res. Mark.*, 18(1–2) (2001) 19–35.

[11] G. M. Al-Abdallah, A. B. Abdallah, and K. Bany Hamdan, The Impact of Suppl. Relationship Manag. on Competitive Performance, *Int. J. Bus. Manag.*, 9(2) (2014) 192.

[12] Z. Yu, H. Yan, and T. C. Edwin Cheng, Benefits of information sharing with supply chain partnerships, *Ind. Manag. Data Syst.*, 101(3) (2001) 114–121.

[13] P. D. Larson and J. D. Kulchitsky, The Use and Impact of Communication Media in Purchasing and Supply Management, *J. Supp Chain Manag.* 36(3) (2000) 29–39.

[14] J. Barney, Firm Resources and Sustained Competitive Advantage. *J. Manag.* 17(1) (1991) 99–120.

[15] M. a McGinnis and R. M. Vallopra, Purchasing and Supplier Involvement in Process Improvement, *J. Supply Chain Manag.*, 35(4) (1999) 42–50.

[16] V. Clulow, J. Gerstman, and C. Barry, The resource- based view and sustainable competitive advantage: the case of a financial services firm, *J. Eur. Ind. Train.*, 27(5) (2003) 220–232.

[17] S. Li, B. Ragu-Nathan, T. S. Ragu-Nathan, and S. Subba Rao, The impact of supply chain management practices on competitive advantage and organizational performance, *Omega*, 34(2) (2006) 107–124.

[18] M. O'Brien, J. A. George, *Management Information Systems*, Tenth. New York USA: McGraw-Hill/Irwin, 2007.

[19] T. H. Davenport, Putting the enterprise into the enterprise system., *Harv. Bus. Rev.*, 76(4) (1998) 121–131.

[20] H. Salarzadeh Jenatabadi, H. Huang, N. A. Ismail, N. Binti Mohd Satar, and C. W. Jasimah bt Wan Mohamed Radzi, Impact of Supp. Chain Manag. on the Relat. between ERP System and Organizational Perform, *Int. J. Bus. Manag.*, 8(19) (2013).

[21] S. J. Williams, Managing and developing suppliers: Can SCM be adopted by SMEs?, in *Int. J. Prod. Res.* 44(18–19) (2006) 3831–3846.

- [22] J. D. Wisner and K. C. Tan, Supply Chain Management and Its Impact on Purchasing, *J. Supply Chain Manag.* 36(4) (2000) 33–42.
- [23] W. W. Chin and P. A. Todd, On the use, usefulness, and ease of use of structural equation modeling in MIS research: A note of caution, *MIS Q.*, 19(2) (1995) 237–246.
- [24] W. W. Chin, The Partial Least Square Approach to Structural Equation Modeling, *Mod. Meth. Bus. Res.* (1998) 295–336.
- [25] A. M. Moreno and J. C. Casillas, Entrepreneurial orientation and growth of SMEs: A causal model, *Entrep. Theory Pract.*, 32(3) (2008) 507–528.
- [26] C. Fornell and D. F. Larcker, Evaluating Structural Equation Models with Unobservable Variables and Measurement Error., *J. Mark. Res. (JMR)*. 18(1) (1981) 39–50
- [27] W. Suprpto, Z.J.H. Tarigan, and S. R. Basana, The influence of ERP system to the company performance seen through innovation process, information quality, and information sharing as the intervening variables, *ICEMT' 17*, July 2017.