

ALIGNING ERP IMPLEMENTATION WITH COMPETITIVE PRIORITIES: AN EXPLORATORY STUDY

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Abstract

Enterprise Resource Planning (ERP) is an information system that manages, through integration, all aspects of the business including production planning, purchasing, manufacturing, sales, distribution, accounting, and customer service. Through data integration, ERP eliminates redundant processes and cross-functional coordination problems that hinder the integration of the organization. While an increasing number of companies are following this trend making substantial investments toward ERP systems implementation many have failed at this implementation and did not experience the benefits that ERP systems have promised. Several researchers have suggested that these ERP implementation failures are most often the result of business problems instead of technical difficulties. An enterprise system affects a firm's strategy, organization, and culture. No implementation can be successful when ERP systems and a firm's strategy clash. This study proposes that ERP implementation should be aligned with a firm's competitive strategy and competitive priorities. We used case study methodology to better understand the process of fitting competitive priorities with ERP implementation. Five mutli-national companies were identified for the purpose of data collection. All of these companies have implemented ERP for longer than two to three years within facilities spanning different countries. Overall, the preliminary results support our research propositions: Competitive priorities should be guide to direct the ERP implementation.

1. Introduction

Enterprise Resource Planning (ERP) is an information system that manages, through integration, all aspects of the business including production planning, purchasing, manufacturing, sales, distribution, accounting, and customer service [1]. Different functions are linked by the system to one another and to the database. Figure 1 provides an overview of the scope of ERP systems and the integration of information between a central database and all functional areas. The central database collects data from various areas and makes it available for all business activities across functions and business units. ERP streamlines data flows throughout the entire organization and allows managers direct access to real-time operations. Through data integration, ERP eliminates redundant processes and cross-functional coordination problems that hinder the integration of the organization.

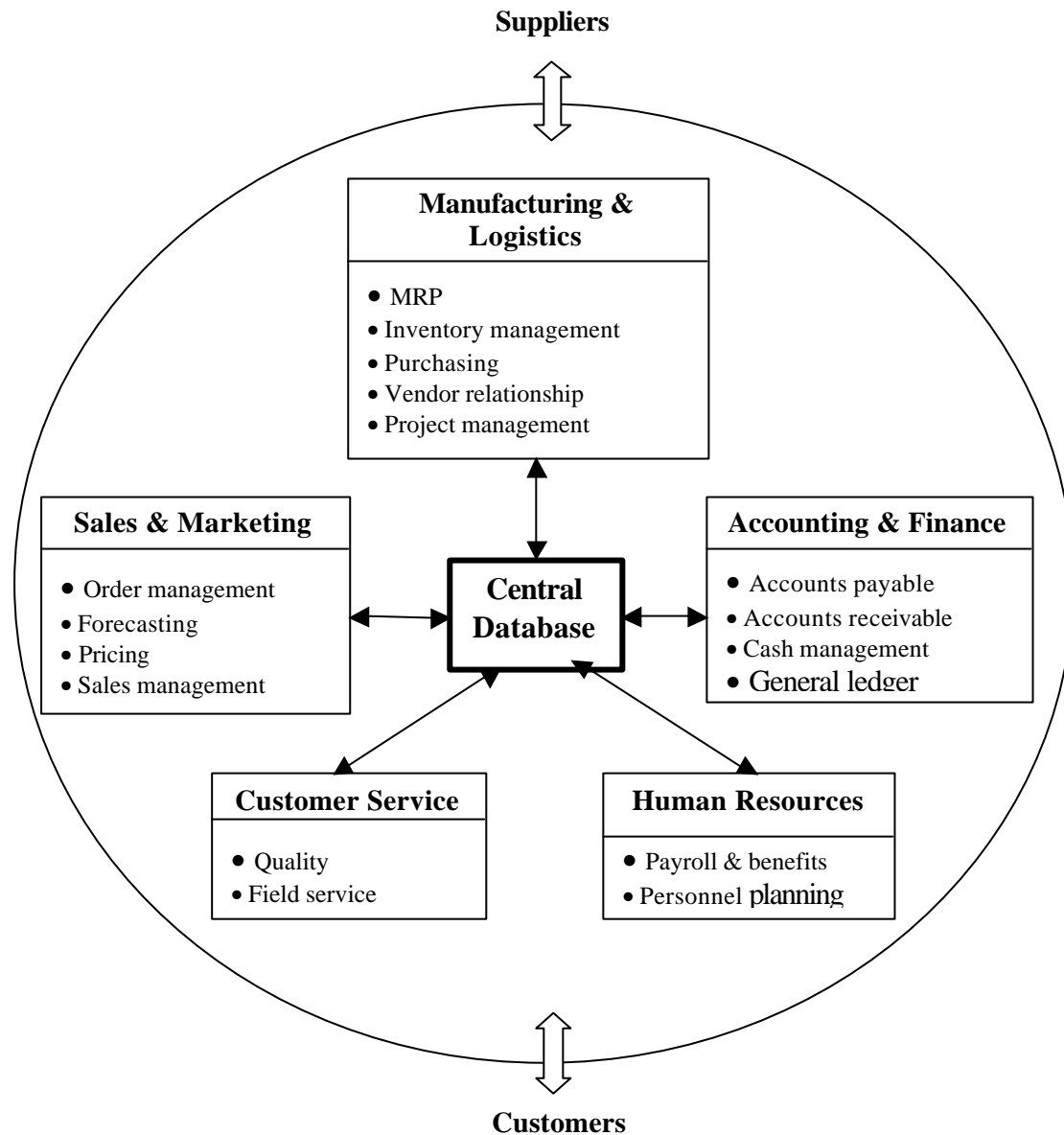


Fig. 1 An Overview of ERP Systems

Information managed by ERP systems can play an active role in business to gain a competitive advantage. Take a simple ERP function as an example. When a sales person enters an order from the customer on a computer, the transaction data permeates the entire company's information system. The system updates the inventory of parts and supplies automatically, changing the production schedules and balance sheets as well. Thus, the employees of different departments have the information needed just in time to complete the processing of their jobs. Feedback is fast and efficient. From this information the sales person can inform the customer of updated delivery dates and the managers can receive accurate inventory status immediately. The ERP facilitates the enterprise-wide integration of information by tying suppliers, distributors, and customers together. To summarize, an ERP system provides organizations, and especially operations, with extensive information and coordination of supply chain functions.

Previous studies have focused extensively on the implementation of ERP from an information technology point of view. While the technical aspect of installing ERP systems is undoubtedly critical, the strategic aspect of ERP systems could have an even greater impact on a firm's competitiveness. After all, ERP is said to be the backbone of supply chain management (SCM), and SCM has been regarded as the key to improving a firm's performance and competitiveness [2]. Based on this premise, this paper investigates the alignment between a firm's competitive strategy and its ERP implementation. The next section reviews relevant ERP and competitive strategy literature followed by the presentation of research questions. The research method is then discussed. The methodology involves case studies and is used to explore this possible relationship or fit between strategy and ERP implementation. The findings from case studies are discussed and the research model is verified. Finally potential research issues are presented.

2. ERP and Operations Strategy

2.1 ERP Implementation

ERP emerged as a complete business software system that enables an organization to share common data and activities throughout the entire enterprise. It arrived at a time when process improvement and accuracy of information became critical strategic issues. The emphasis of supply chain management and the advancement of information technology create a need for enterprise-wide integration. In the past few years, ERP has become a “must have” system for almost every firm, to improve competitiveness [3]. The popularity of ERP systems is evidenced by its projected sales of exceeding \$30 billion in 2002.

Due to the popularity of ERP, there has been substantial research in ERP published over the last few years. These studies have covered a wide range of various research issues pertaining to ERP systems. Some of these works identified technical issues pertaining to architecture, data standards, configuration, and hardware and software integration (see, for example, [4][5][6]). Some researchers investigated the impact that critical factors (e.g., top management support, sufficient training, proper project management, communication, etc.) have on the success of ERP implementation [7][8][9][10]. Others studied tactical issues such as process and organizational adaptation, measurement of the benefits, and resistance to change ([11][12]). Finally, a relatively small group of researchers have been more concerned with strategic issues involving the alignment of products and process to ERP implementation [2][13][14][15]. This study intends to provide a more in-depth and comprehensive investigation of the strategic aspect of ERP implementation.

Hammer and Stanton [14] related ERP with reengineering as ERP provides information that flows horizontally across the business. They argued that firms should use ERP as an integrative mechanism to create a new style of management. Davenport [13], Bowersox et al. [2], and Whybark and Jacob [15] asserted that ERP was more than a software package but “a way of doing business”. Davenport blamed many failures of ERP implementation on a lack of the alignment with business needs. There is no single “best process” to do business as ERP systems assume and, therefore, the customization of ERP systems is necessary. He further raised the warning that firms could lose their source of advantage by adopting processes that are indistinguishable from competitors. He even suggested that firms should restrain from ERP investment until further study of its business implications is fully understood. Bowersox et al. [2] also supported the need for addressing issues of operational rigidity in order to maintain existing unique value-adding practices. They called for more efforts toward integration of supply chain systems based on ERP systems. Whybark and Jacob expressed their concerns with ERP implementation. Using the furniture industry as a reference, they illustrated how ERP implementation could lead to disaster without consideration for production processes and customer demand. They suggested that two factors: centralization of information and flexibility of production systems should be simultaneously considered as firms configure their ERP systems at multiple facilities. For example, firms that have the need for highly centralized control and low flexibility could develop one single set of “best practices” to fit all facilities. In contrast, firms with no need for centralized control but desire for high flexible systems to meet frequent customer changes may opt for multiple ERP systems with multiple “best of breed” processes in individual facilities.

Overall, studies in this area emphasized the business implication of ERP implementation, which should be far more important than the technical challenge of the implementation. However, there is no framework or procedure available as a guide for linking ERP implementation to a firm’s competitive strategy in the marketplace. Research has not made an effort to address ERP implementation from the strategic perspective, although such a need is well recognized. For the rest of this section, we review the theoretical relationship between competitive strategy and ERP implementation.

2.2 Operations strategy and ERP implementation

Corporations consist of several strategic business units (SBU’s). Each SBU is usually a subsidiary, division or plant within the corporation that has its own business strategy that specifies the scope and the competitive strategy of that business unit. The competitive strategy refers to the basis on which that SBU will achieve and maintain a competitive advantage. It is the competitive strategy that guides the choice and development of competitive priorities, which specify how the operations function provides a firm with a competitive advantage in the market place. Skinner [16] first suggested that the choice of competitive priorities includes cost, quality, delivery, and flexibility. Since then many studies have added various dimensions of competitive priorities such as service and innovation. Table 1 defines various competitive priorities that have been identified by the literature.

Table 1 Competitive priorities

CRITERIA	DEFINITION
<i>Price</i>	Production and distribution of the product or service at lowest cost
<i>Quality</i>	(a) High performance: superior features, close tolerance, and great durability
	(b) Quality consistency: the frequency of meeting the design specifications
<i>Delivery</i>	(a) Dependability: the ability to meet delivery schedules or promises
	(b) Speed: the ability to react quickly to customer orders
<i>Flexibility</i>	(a) Product mix: the ability to vary the mix of products
	(b) Volume: the ability to operate profitably at varying production levels

From the customer's point of view, competitive priorities refer to dimensions and attributes of products or services that they choose to purchase. Some customers are primarily interested in the cost aspect of service, while others may be willing to pay a higher price for fast delivery service. Accordingly, firms would then position themselves to offer their products and services with low price or fast delivery. The comparison of Southwest and United Airlines illustrates the concept of competitive priorities [17]. Southwest chooses to compete with low-cost, point-to-point, short-haul service to attract price-sensitive customers. In contrast, a full-service airline, such as Continental, employs a hub-and-spoke system with first-class and business-class service. These two airlines certainly attract very different customer groups.

Once competitive priorities are chosen, they become the basis for making structural and infrastructural decisions. Structural decisions refer to facility location, capacity, processes, and integration. They are usually considered to be long-term and strategic in nature. On the other hand, infrastructural decisions are related to workforce skills, reward systems, planning and control systems, quality issues, and organizational structure. They tend to be more tactically oriented as compared to structural decisions. The literature has verified that the alignment of competitive priorities with operations decisions is necessary to ensure a firm's competitiveness [18][19]. For example, Southwest, with the competitive priority of low price, would perform its operations differently than its rivals. It does not offer meals, assigned seats, interline baggage checking, or premium classes of service, which altogether reduces its cost but still manages to satisfy the needs of price-sensitive travelers.

ERP implementation impacts many aspects of business operations and performance. It is an infrastructural decision that affects various aspects of planning, scheduling and control systems. Figure 2 displays the integrated view of competitive strategy, competitive priorities, and operations decisions. In theory, the types of competitive strategies and competitive priorities define the nature of operations, such as product variety, production volume and production processes (i.e. make-to-order vs. make-to-stock). For example, a firm that competes on the dimension of flexibility would offer more product options specified by individual customer orders. Production volume is likely to be low and production schedule changes more frequently to meet with customer needs. This firm certainly cannot install an enterprise system that would force it to follow a more rational but less flexible process for filling orders and scheduling production. Otherwise, its core source competitive advantage would be at risk. It is the nature of operations that determines which type of ERP implementation a firm should follow [15].

Past research has discussed the importance of this connection but offers no specific guidelines for the process of connecting the nature of operations with the type of ERP implementation. For instance, how should firms with different competitive priorities adjust their current shop floor control to be in tune with newly implemented ERP systems? Do competitive priorities affect the configuration of ERP systems? If so, how? Should a firm that competes on the basis of low cost design the accessibility to the database differently from other firms that compete on flexibility? Based on the literature review, our research proposition is that a firm's competitive priorities effect its ERP implementation. We are interested in research questions such as: Which part of ERP implementation is affected by competitive priorities? How and why is it affected? How should firms align an ERP system with their competitive priorities? In general, this study intends to explore and discover research issues pertaining to the relationship between competitive priorities and ERP implementation.

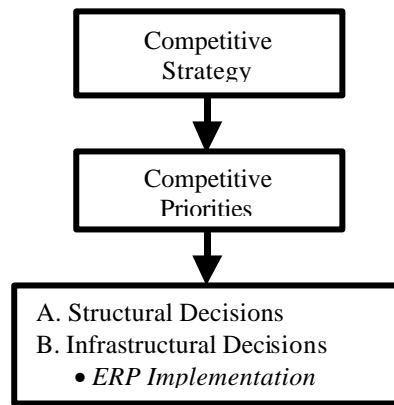


Fig. 2 Competitive Strategy and ERP Implementation

3. Research Design

3.1 Case study method

The nature of this study is rather exploratory since the past research has not addressed the issue of aligning ERP implementation with competitive priorities. There are also many “how” and “why” questions to be answered with regard to this issue. Therefore, this study uses case study methodology to better understand the process of aligning ERP implementation with competitive strategy and competitive priorities. While traditionally case study research has been criticized for lack of rigor, we have endeavored to follow suggestions from experts [20][21][22].

Case study methods used for this research involve the integration of data gained from several different companies of similar nature that have implemented ERP, while following the process of case study research specified by Yin [22]. We have identified several companies in the United States and Taiwan for the purpose of on-site interview and data collection. Table 2 summarizes the company profiles consisting of industry, products, production method, length of ERP implementation, ERP software, facilities locations, etc. In general, all the targeted companies have the following characteristics:

- (1) They are all multinational corporations that have facilities located in more than one country;
- (2) They all have clear long-term vision and specific competitive strategies;
- (3) They have implemented ERP for at least two years; and
- (4) All the supply chain systems involved include suppliers, manufacturers, and customers.

Table 2 Company profile

	Company Q	Company F	Company P	Company D	Company B
Industry	Computer	Computer	Computer	Chemistry	Pharmaceu-tical
Products	Notebook, motherboard	Notebook, PC	Monitor	Titanium dioxide, adhesion promoters	Health care, cosmetics, home cleaning
Production method	Make-to-order (MTO)	Make-to-order (MTO)	MTO & MTS	Make-to-stock (MTS)	Make-to-stock (MTS)
Plant locations	Taiwan*, China	Taiwan*, USA, China, Czech Rep.	Holland*, Taiwan	USA*, Taiwan	USA*, Taiwan
Time after implementation	3 years	4 years	3 years	6 years	2 years
ERP software	SAP	Magic in Taiwan & China; Varies in other areas	SAP	SAP	J. D. Edwards
Why ERP?	Requested by customers	Requested by customers	Requested by headquarters	Requested by headquarters	Market
Position in supply chain systems	Manufacturer	Manufacturer	Manufacturer	Supplier	Manufacturer

3.2 Case study protocol

A case study protocol is required to increase the reliability of case study research. It guides the investigator in carrying out the on-site interview for data collection. Appendix 1 presents the outline of the case study questions included in the protocol. There are a total of six sections included in the case questions. Section I records general information about the company with regard to its products, production method, size, sales, and other history background. Section II solicits the competitive strategy and competitive priorities information. Section III asks about the supply chain system of the firm in order to understand the interaction between the firm and its supply chain partners. Section IV seeks for specific ERP information including the purpose and scope of implementation, system configurations, and necessary adaptation during the implementation. Section V assesses the performance of ERP systems based on criteria involving improvement in operations as well as competitiveness. Finally Section VI discusses other implementation issues such as the length of implementation, the cost, the use of consultants, etc.

3.3 Pilot study & on-site interview

The pilot study case helps refine the data collection plan with regard to both the content of the case questions and the procedures of on-site interviews. Company Q was chosen as the pilot case due to the close business relationship, or “kwan-si”, between the informant and one of the investigators. This close relationship allowed us to conduct a less structured and longer interview that is typical in the early stages of research. In addition, company Q seemed to have the most complete documentation of its ERP implementation, which would provide us opportunities to refresh the research proposition and improve the conceptual understanding of the research issues. Based on the feedback of the pilot study, the protocol was revised with the primary changes consisting of adding multi-site ERP implementation questions. We also adjusted and enhanced the interview skills.

On-site interviews were conducted after the pilot case study. Prior to each interview, the protocol questions were shared with the interviewees for the purpose of preparing and gathering necessary information. Overall, each on-site interview took approximately 6 hours. Sources of data collection include interviews, direct observation, documentation, and archival records. Theoretically, using multiple sources of evidence should address the issue of construct validity in case study research.

4. Results of Case Studies & Conclusions

Data analysis was performed based on the original research propositions regarding the alignment of ERP implementation with competitive priorities. Table 3 summarizes some of the findings with regard to the alignment. First, our findings confirm the theoretical relationship between competitive priorities and structural and infrastructural decisions. For example, the competitive priority of fast delivery and flexibility (Company Q) are associated with the make to order production method, small production volume, wide range of product varieties, high labor skills, instable production schedule, and large number of suppliers. Confirming this relationship is important since it serves the purpose of ensuring construct validity [p. 34, 21].

The information presented in the lower part of Table 3 focuses on the issues pertaining to ERP implementation. The purpose of the analysis here is to seek for pattern matching between competitive priorities and ERP implementation. For example, company Q converted its organizational structure from functional, to several self-contained units after ERP implementation, to be more flexible to market demand changes. Since its operations need a high level of flexibility, there is no best process to adopt and it took tremendous amount of time and effort to customize ERP systems for its own use. The company rewrote large portions of the software code to ensure a fit with its competitive strategy. With the ERP implementation, it was then able to increase the level of information sharing between facilities to improve responsiveness to customer changes.

While an increasing number of companies are following this trend making substantial investments toward ERP systems implementation many have failed at this implementation and did not experience the benefits that ERP systems have promised. For instance, Dow Chemical spent seven years and half a billion dollars but was not able to gain much benefit from the ERP systems it implemented (Davenport, 1998). Several researchers have suggested that these ERP implementation failures are most often the result of business problems instead of technical difficulties. An enterprise system affects a firm's strategy, organization, and culture. No implementation can be successful when ERP systems and strategy clash. Using competitive priorities as the guideline to direct the implementation appears to be a more strategy as the preliminary results illustrated. Overall, the preliminary results support our research propositions, while more detailed data analysis is necessary to discover more insights and research issues.

Table 3 Preliminary results of case studies

	Company Q	Company F	Company P	Company D	Company B
Competitive Priorities	Flexibility, Fast delivery	Cost, Fast delivery	On-time delivery, Innovation	Quality	Quality, Innovation
Structural & Infrastructural Decisions					
Production Method	MTO	MTO	MTO & MTS	MTS	MTS
Production volume	Small	Med/Large	Large	Large	Med
Product variety	Wide	Med	Narrow	Narrow	Med
Labor skills	High	High/Med	Med	Low	Med
Production schedule	Instable	Instable	Stable	Instable	Stable
No. of suppliers	Large	Med	Med	Small	Med
ERP Implementation					
Organizational structure					
Centralization (after ERP)					
Information sharing					
Use of the “best process”					
Time/effort of adaptation					

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