Effectiveness of Inter-Organizational Systems in Global Manufacturing: Evidence from Industrial Cases in Taiwan

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ABSTRACT

Enterprise Information Systems, such as Enterprise Resource Planning (ERP) systems, have been applied to integrate business processes within a global manufacturing enterprise. Recently, the inter-organizational systems are applied to assist in business data sharing and collaboration among enterprises based on the ERP application. However, their resource requirements and failure rates are high, and many enterprises are concerned about the Business-to-Business (B2B) effectiveness. In this research, the authors study global manufacturing enterprises, which developed their B2B systems with Taiwanese government sponsorship successfully. B2B effectiveness is evaluated through operational efficiency and profitability, while the business scale, Electronic Data Interchange (EDI) induced supplier numbers, and application scope are considered influencing factors. After the evidence of multiple regression models and non-parametric statistic testing, the results show that only the application scope has a significant impact on profitability. The authors discuss these results from the perspective of enterprise integration as well as the system application scope and give suggestions to global manufacturing enterprises that want to apply inter-organizational systems.

Keywords: Business-to-Business (B2B), Enterprise Information Systems, Enterprise Resource Planning (ERP) Systems, Inter-Organizational Systems

BACKGROUND

E-business is one type of information technology (IT) application necessitating the implementation of Internet technologies to empower business processes, e-commerce, and enterprise collaboration (O’Brien & Marakas, 2006). The e-business application includes the intra- and the inter-organizational systems. Enterprise Resource Planning (ERP) system, one of the intra-organizational systems, is a commercial software package that embodies and integrates any number of business processes involved in the operation of an organization (Wenrich & Ahmad, 2009). It has been applied in many organizations. Recently, the enterprise collaboration...
is emphasized so that new multi-enterprise business models like value collaboration networks, customer-centric networks that coordinate all players in the supply chain, are becoming popular (McGaughey & Gunasekaran, 2007). Based on the ERP system application, the inter-organizational system is applied to develop a platform to share information, to facilitate collaboration, and to reengineer processes among organizations in a Business to Business (B2B) environment.

For the manufacturing enterprise, e-business application is big projects and their complexity causes the high failure rate of e-business applications. Based on one estimate, the failure rate of ERP implementation is range from 40% to 60% (Langenwalter, 2000). Moreover, the e-business application always needs lots of resources such as capital and labor. Mabert et al. (2003) found that even with significant investment in time and resources, a successful outcome is not guaranteed. These evidences make e-business effectiveness an issue for the manufacturing enterprise. In this study, the effectiveness of inter-organizational systems for global manufacturing enterprises is studied based on industrial evidences in Taiwan. In Taiwan, manufacturing industry represents about 25% of Gross National Product (GNP), and in past decades Taiwanese manufacturing enterprises have provided world-class electronic hardware products which represent about 60% of the world’s supply of desktop PCs (Shang & Marlow, 2005). To improve competitive advantage, since 2002 the Taiwanese government has supported manufacturing enterprises to develop their e-business infrastructure with their up- and down-stream business partners. Fifteen global electronics manufacturing companies joined this project and implemented their inter-organizational systems in three years. Their experiences have become reference cases for other companies or industries. Using these industrial examples, we study the relationship between the operation’s effectiveness and the application of inter-organizational systems. We would like to understand whether an inter-organizational system application brings effectiveness to global manufacturing enterprises and what impacts the effectiveness of system applications. These findings could provide managerial insights and directions for manufacturing enterprises to develop their global IT systems.

This study is organized as follows: the literature on e-business performance evaluation and the hypotheses are presented; the research method is explained; the results are presented and analyzed; and the conclusions, limitations, and suggestions for further research are discussed.

LITERATURE REVIEW AND HYPOTHESES

In past studies on the relationship between IT investment and performance, the focus has been on the quantitative assessment of IT costs and benefits, looking at return on equity (ROE), return on assets (ROA), return on investment (ROI), and so on (Kumar, 1990). However, IT applications bring other less tangible benefits including tighter systems integration, faster response time, more accurate data, and so on. Besides, there are some external factors that impact IT effectiveness, such as the industry environment, uncertainty of requirements, threats from competitors, and so on. These lead to mixed findings concerning the relationship between IT investment and financial performance and restrict the application of cost-benefit approaches (Roach, 1991). The problem forces researchers to not only study the effectiveness of IT investment but also analyze the influence of other factors.

Byrd and Marshall (1997) investigated the relationship between the IT investment and organizational performance of 350 companies over four years. Their results showed a positive relationship between the number of computers and employee sales, but the amount of time spent on staff training was negatively related to the asset turnover ratio (ATR). In addition, the relative IT budget had a negative relationship with sales. Rai et al. (1997) examined the impact...
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