

# An innovation—diffusion view of implementation of enterprise resource planning (ERP) systems and development of a research model<sup>☆</sup>

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## Abstract

Firms around the world have been implementing enterprise resource planning (ERP) systems since the 1990s to have a uniform information system in their respective organizations and to reengineer their business processes. Through a case type analysis conducted in six manufacturing firms that have one of the widely used ERP systems, various contextual factors that influenced these firms to implement this technology were understood using the six-stage model proposed by Kwon and Zmud. Three types of ERP systems, viz. SAP, Baan and Oracle ERP were studied in this research. Implementation of ERP systems was found to follow the stage model. The findings from the process model were used to develop the items for the causal model and in identifying appropriate constructs to group those items. In order to substantiate that the constructs developed to measure the causal model were congruent with the findings based on qualitative analysis, i.e. that the instrument appropriately reflects the understanding of the case interview; ‘triangulation’ technique was used. The findings from the qualitative study and the results from the quantitative study were found to be equivalent, thus, ensuring a fair assessment of the validity and reliability of the instrument developed to test the causal model. The quantitative measures done only at these six firms are not statistically significant but the samples were used as a part of the triangulation method to collect data from multiple sources, to verify the respondents’ understanding of the scales and as an initial measure to see if my understanding from the qualitative studies were accurately reflected by the instrument. This instrument will be pilot tested first and administered to a large sample of firms.

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*Keywords:* Enterprise resource planning (ERP) systems; Process model; Causal model; Contextual factors; Triangulation; Integration and performance

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## 1. Introduction

When met with high levels of competition and pressure from the industry, most organizations invariably turn to the information systems department to help them attain advantages in the market by performing better internally through saving resources and through becoming adept in responding to these challenges from the environment. Many manufacturing and other organizations around the world have been able to achieve high levels of performance during the recent turbulent decades because of the application and usage of various IT tools that automated many of their routine organizational activities. Implementation and wide usage of IT tools have helped organizations to function in an organized fashion, thus, alleviating many redundancies that were ubiquitous across the entire organization. Venkatraman [57] recently mentioned that “We are at an interesting turning point in our business history: the industrial age is giving way to the information age and the digital infrastructure is fast replacing the physical infrastructure”. Similar to how industrial machinery and tools were used at the transition from Agrarian to Industrial Economy, currently we are at a stage where information technology tools available and the systems developed using those tools are at infant or premature stages of development and usage with more room for research, development and usage. If we take into account the number of users and how these users utilize these tools, this statement becomes more valid. The work force is slowly being transformed from ‘manual and routine task performing workers’ to knowledge workers because of the rapid use of IT that involves information processing, dissemination and data gathering rather than physical exertion as explained by Zuboff [59].

Information technology application and usage are associated with many inherent drawbacks that were opaque to many of the organizational decision-makers for many years. The changes in the global economy and the intense competition during the early 1990s resulted in a ‘rude awakening’ to many industrial organizations to chart new strategies to be successful if not at least to survive even in local markets. Information technology based tools were seen as one of the significant enablers of success, and organizations went on an IT investment binge in the hope that implementation of IT tools would automatically put them in a

comfortable position where all of an organization’s activities were expected to be automated resulting in an ‘efficient’ organization. But they were in for a surprise. Of the US\$ 275 billion spent by US firms in 1996 in software applications, 53% of the projects failed [23], and these failures were not because the software were coded incorrectly, rather the companies failed to understand the real organizational needs and systems required to solve their problems to improve performance. After all there was no shortage in the brainpower required to code programs and definitely it was not a laggard to stop US firms from designing an appropriate system. Based on empirical research, Quinn and Baily [45] found that the investments made in IT did not result in any improvements in industrial productivity. The reason for the inability of the firms to realize competitive gains even after spending billions of dollars is that proper usage of IT necessitates changes in the design and structure of an organization as mentioned by Brynjolfsson and Hitt [9] in their paper about ‘productivity paradox’. Brynjolfsson and Mendelson [10] found that organizations might not be able to realize full benefits of a technology unless they make the necessary changes in organizational structure, strategies and processes. Many renowned scholars in MIS including Grover, Teng, Segars, Fiedler, Henderson, Venkatraman, Scott-Morton, Lucas and Baroudi have called for changes in business processes, organizational structures and such management related issues in order to take full advantage of the implemented information technologies [25,28, 50,38].

On the technical side of IT, one of the primary reasons for the inability of many firms to realize the full potential offered by IT is the incompatibility among the various computer hardware and software systems as was found during the case studies and as reported by Ives and Jarvenpaa [29], Stevens [55] and others. Individual functions and divisions started implementing various computer hardware and software systems in their respective functions and divisions during the last decade, which eventually resulted in organizations characterized by a myriad of different systems that could not communicate with one another. Individual functions and divisions were able to realize better performance and efficiency but at an organizational level they were impeded from performing better through using all of the available information because

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