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Effect of technological intensity on the relationships among Six Sigma design, electronic-business, and competitive advantage: A dynamic capabilities model study

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Abstract

The implementation of Six Sigma programs must take into consideration the level of technological intensity of the organization to determine the relative impact of program design factors and the applications for electronic business on sustainable competitive advantage (SCA). From a Dynamic Capabilities Model perspective, this research studies the moderating effect of technological intensity on the relationships among Six Sigma program design factors, e-business applications, and SCA for sixty-six manufacturing and service organizations. Technological intensity of a firm is defined as the level of research and development (R&D) expenditures as a percentage of corporate sales revenues. Corporations with greater technological intensity invest more heavily in Research and Development to become more competitive. Factor analysis for ten Six Sigma program design items resulted in five program design factors. High technological intensive firms are perceived as attaching a greater importance to certain design factors that are related to electronic-business practices, as compared to other design factors for low technological intensive companies. Similarly, different program design factors are associated with SCA for high-tech than for low-tech companies. Finally only high-tech companies have applications of Six Sigma to electronic-business practices that are correlated with SCA. The recent evolution of Six Sigma programs from manufacturing companies to service organizations

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suggests competitive opportunities exist for firms to enhance their success, especially in terms of process improvement design factors and applications to electronic-business.

Keywords: Six Sigma design; Electronic-business; Technological intensity; Human resource management; Competitive advantage

1. Introduction

As Six Sigma process improvement programs expand globally, competitive advantage depends increasingly on program design considerations such as selected Six Sigma program technical, human resource, and electronic-business (e-business) factors. Although the US productivity growth rate has set new records for the past 7 years, especially for high technology, automobiles, and services, productivity growth for foreign competition has surged farther ahead (Arndt & Aston, 2004). Corporate process improvement from Six Sigma programs represents a significant opportunity in terms of the reported gains in profitability and customer satisfaction (Dusharme, 2001). A survey of corporate CEOs and other executives in manufacturing, healthcare, other services, and education reveals that Six Sigma programs have a 48% awareness level and are used by 16% of those organizations (Weiler, 2004).

The issue of how Six Sigma programs can have an impact on competitive advantage remains unaddressed. The design of a Six Sigma program requires choices among many types of Black Belt practices, such as different types of teams, reporting structures, employee selection and training, and reward and recognition systems (Harry & Schroeder, 2000; Lucas, 2002). The application of Six Sigma practices to e-business operations can effectively enhance process improvement in many organizations. In addition, the technological intensity of the organization can affect the relative impact of the design factors on the level of competitive advantage to be achieved.

The purpose of this approach is to describe how an appropriately designed Six Sigma program can command a corporate competitive advantage by taking Six Sigma technical, human resource management (HRM), and e-business factors, as well as the level of the organization's technological intensity, into consideration. The overall framework to be studied in this paper is presented in Fig. 1.

1.1. Resource-based view and dynamic capabilities model

Recent research suggests the Dynamic Capabilities Model (DCM), an expansion of the Resource-Based View (RBV) of the firm, is increasingly referenced as the leading theoretical basis for research of management systems. The RBV approach has evolved over the past two decades from an economic theory to a strategic management model (e.g., Barney, 1991, 1997, 2002; Powell, 1995; Wernerfelt, 1984). Considerable critical review of the RBV has provided theoretical extensions such as the DCM, significant limitations, and comparisons with other management theories (e.g., Teece, Pisano, & Shuen, 1997). Nevertheless the RBV and DCM have served as the conceptual framework for numerous recent case studies and empirical research.