



Achievement assessment for enterprise resource planning (ERP) system implementations based on critical success factors (CSFs)

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Abstract

This paper addresses a framework to critical success factor (CSF) assessment of Enterprise Resource Planning (ERP) system implementation, and proposes a structured approach to help a small manufacturing enterprise (SME) identify the key requirements and measurements that determine its achievement of ERP implementation. Based on realistic data, critical success factors are converted into quantitative information to reflect measurements including cost, schedule, and goal achievement that must be addressed during implementation. One outcome of this study is that some CSFs are more important than others. Another outcome is that great emphasis should specifically be placed on CSF5, “people.” A third outcome is that a “good” balance can be reached based on schedule, cost, and achievement level such that desired achievement levels are attained at a low cost and a reasonably short implementation time (schedule) using simulation.

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1. Introduction

Effective use of enterprise resource planning (ERP) systems has become a key discriminator of competitive advantage for many small manufacturing enterprises (SMEs), cf. Blanchard (1998). This is evidenced by the fact that some 385,000 SMEs in the

United States contribute to more than half of the country's total value in manufacturing (e.g. United States Department of Commerce, 1999). Yet, United States Department of Commerce (1999) reported that overall SME productivity is growing at one half the rate of larger manufacturing companies. For this reason, many SMEs are turning to ERP to provide custom solutions. Although the benefits of a properly implemented ERP system are significant, the price of a poorly implemented system is great. Many implementations take more time and are more

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costly than necessary to achieve a given success level (see for instance Cantu, 1999). Although small and mid-sized companies are increasingly embracing ERP, research indicates that many of them fail to achieve their goals in terms of ERP utilization and overall expected improvement. Donovan (1999) suggested that the main cause for this underachievement is poor ERP implementation. It was further revealed that over 90 percent of companies that have implemented ERP systems were not successful on their first attempt, cf. Donovan (2000). The benefit of having (and using) the implementation framework presented in this study is a first step toward reducing the incidences of failed implementations.

The proposed framework is the result of several years of study of many ERP system implementations. In an ideal situation, a SME would have unlimited resources to sufficiently address each critical success factor (CSF) to ensure a high probability of implementation success. However, it is the authors' observation that few SMEs have the resources (or will power) to adequately address every CSF as they should. SMEs are thereby forced to make implementation compromises according to resource constraints, and subsequently putting the success of their ERP project at risk.

2. Overview of the critical success factor (CSF) framework

The scope of the paper is limited to ERP implementation issues after the purchase of the ERP hardware and software. Although one could argue that ERP implementation is a never-ending cycle of continuous improvement, the focus of this study is on initial implementation efforts, and the immediate success results achieved from those efforts.

There exist numerous generic ERP implementation models based on CSFs that address key implementation issues (see for instance Holland and Light, 1999; Reel, 1999; Teltumbde, 1999; Wu and Chang, 1999). However, in order to synthesize how much tangible and intangible costs are required to achieve a given success level, an implementation framework based on five CSFs (e.g. Cantu, 1999) is considered. Each CSF has an associated cost,

schedule, and achievement level that contributes to the overall project cost, schedule, and level of success achieved. By varying the degree to which each CSF is addressed during implementation (i.e. the amount of time spent on each CSF), the overall project cost and achievement level can be controlled so as to satisfy the predetermined goal(s) of a company.

Each of the five CSFs is further described by its respective attributes, with a total of 22 attributes. As with the CSFs, the level of attention paid to each attribute dictates the degree to which that attribute will contribute to the schedule, cost, and achievement of the overall goal(s). The CSFs and their attributes are shown in Table 1.

This study uses CSFs as evaluation variables for a simulation model to assess implementation strategies based on the notion that the attention given to each CSF during implementation impacts the overall cost, schedule, and achievement level. The degree to which the framework CSFs are addressed during ERP implementation has a direct impact on the success of the ERP effort, such that the more CSFs that are addressed, the higher the implementation success rate.

2.1. Data resource

Framework data was derived from multiple sources, including original field research and collaboration with ERP implementation consultants. Twenty-six companies were contacted for participation in this study. Ultimately, six companies were willing, qualified, and contributed to the final outcomes of this study. Data was collected to evaluate the results of their implementation in general, and their use of the ERP implementation framework in particular. Five of the companies are manufacturing based, and one company is retail based. Expert opinion data was collected from company representatives whose job titles and roles included company president, vice president, information systems chief, implementation team leaders, and ERP system users.

Relevant data includes:

- a determination of which CSFs were addressed during implementation and why they were addressed,

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