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Moving Toward Mission-Critical: The Migration of Strategic and Support Systems

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ABSTRACT

This research proposes a model of the dynamic relationship among information systems in the strategic, mission-critical and support categories. Findings suggest that systems in the support and strategic systems categories inevitably migrate to the mission-critical category, ultimately weighting IT portfolios toward mission-critical systems. Movement of systems among categories and the tendency toward a preponderance of systems in the mission-critical category have implications for practitioners charged with system planning and prioritization, system design, and resource allocation. These implications are explored.

INTRODUCTION

While much has been written about the characteristics of strategic information systems and some has been written about systems categorized as support and mission-critical, research largely has been silent on the relationship between categories of systems. This work addresses that void by linking static system classification frameworks and strategic system sustainability studies to generate a model of the dynamic relationships among systems in the strategic, mission-critical and support categories.

PRIOR RESEARCH

Classification of information systems by system type, may trace its origins to Anthony (1965) who categorized systems as operational, control, and planning. Later, McFarlan, et al. (1983) categorized IT organizations as strategic, turnaround, factory and support, depending upon the strategic level of their existing and developing systems. Wiseman (1985) categorized systems as DP, MIS, and SIS. Clemons (1991) differentiated between strategic and operational systems. Ward (1996) categorized systems as strategic, high potential, key operational, and support. Following the success of early strategic systems, including American Airlines SABRE system, interest in the strategic systems category soared, but subsequent studies found that strategic system benefits are illusive (Kemerer and Sosa, 1988) and temporary. Leininger (1992), Kettinger, et al. (1994), and Mata, et al. (1995) found that competitive advantage based solely on information technology was not sustainable. Thus, a wide variety of approaches has been proposed for categorizing IT systems. Although such system classification frameworks contribute to understanding characteristics and specific uses of IT within organizations, and studies of strategic system longevity highlight the transitory value of IT-based competitive advantage, they do not address the dynamics of system movement among categories, or the long-term implications of such movement.

DEFINITION OF SYSTEM CATEGORIES

In contrast to prior static models, this research examines the relationship among system categories and how systems move between categories.

1. Strategic systems provide competitive advantage. Ward defined strategic systems as "applications which are critical to sustaining future business strategy" (1996). It is axiomatic that strategic systems meet operational availability and reliability requirements.
2. Mission-critical systems sustain existing business operations and are mandatory for survival in the industry, but do not provide competitive advantage. Ward's key operational systems are "applications on which the organization currently depends for success" (1996). Even a temporary disruption in service could have severe consequences for business performance.
3. Support systems improve business efficiency and managerial effectiveness, but do not sustain the business or provide competitive advantage. Ward described support systems as applications that "are valuable but not critical to success" (1996).

Ward identified a fourth category, labeled high potential, applications that "may be important in achieving future success" (1996). The contribution of such systems to the organization is not yet determined. Over time, high potential systems either move into one of the other three categories, or they atrophy and die.

DYNAMIC RELATIONSHIPS AMONG SYSTEM CATEGORIES

Studies show that competitive advantage based on information technology alone is not sustainable (Leininger, 1992; Kettinger, et al., 1994; Mata, et al., 1995). Rather, strategic advantage and initial competitive gains are reduced based on competitors' responses. Subsequent system enhancements may restore a measure of strategic advantage, but these too are subject to competitors' responses. Thus, over time, systems tend to change type, as shown in the model in Figure 1, becoming less strategic and more mission-critical. Ultimately, all strategic systems appear destined to evolve into mission-critical systems.

Consonant with Porter's (1985) concept of a value chain, support systems that effectively address linkages in the internal value chain may become strategic systems. Other support systems, however, may remain forever in the support category. For example, a time accounting system that tracks programmer time for a manufacturing concern is unlikely to ever become anything other than a support system. Still other support systems may become so heavily used that over time they become mission-critical. This is the case with many organizations' e-mail systems (Gantz, 1997).

ASSESSING VALIDITY OF THE MODEL

Using classic cases to validate proposed models is a well-established methodology. In social science, Dyer, Jr. and Wilkins (1991) noted that classic cases are extremely powerful because they describe general phenomena so well that others have little difficulty seeing the same phe-

Figure 1. Movement over time among discrete categories of information systems

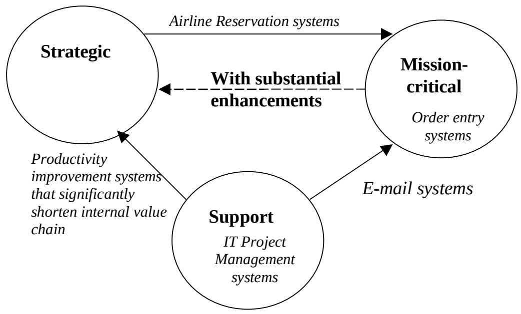
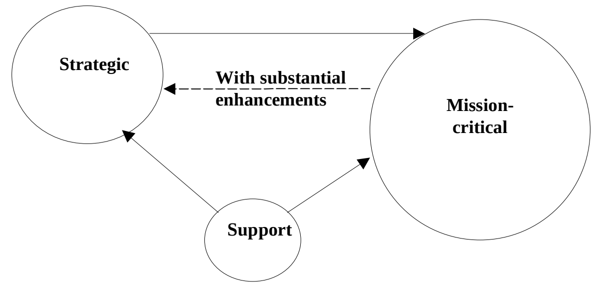


Figure 2. Growth in number and relative importance of mission-critical systems over time.



nomena in their own experience and research. In information systems, Grant (2002), mapped illustrative classic cases to a framework, and observed that the methodology provided anecdotal evidence of plausibility and illustrated a framework's application although it did not carry the weight of an empirical study. Kettinger, et al. (1994) applied classic cases to the study of strategic system sustainability and compiled a list of 30 "popularized" cases of strategic systems implemented between 1971 and 1983. One case, American Airlines' SABRE System, is used here to illustrate the new model. Additional cases are being analyzed, as this study continues.

American Airlines' SABRE (Semi-Automatic Business Research Environment) system was implemented in 1964, as a support system installed only at airports and airline ticket offices to keep track of seats, flights, and other operational information. According to Hopper (1990), SABRE was developed in response to American Airlines' inability to monitor its inventory and attach passenger names to booked seats. By the end of the 1960s SABRE had reduced operating costs by automating the seat reservation and fare calculation processes and performed complex yield management computations to minimize empty seats and maximize revenue (Scheier, 2002). It is reasonable to conclude that after years of continuous use, the airline came to rely on the system for core business operations, and it migrated from the support category to mission-critical status. In 1976, a major enhancement to the system allowed it to be installed in travel agency offices, marking the transformation of the marketing and distribution of airline services (Hopper, 1990) and the transformation of SABRE from a mission-critical system to a strategic system.

Over the next decade SABRE preserved much of its competitive advantage by adding hotel, rail, rental car and travel agency back office and accounting system capabilities. By the end of the 1980s, however, strong competition from United Airlines' Apollo System and other computerized reservation systems reduced SABRE's U.S. market share to 40 percent of computerized travel agents. American Airlines' CIO, Hopper (1990), questioned, "If a CRS [computerized reservation system] can be replaced within a month by a rival system, can it really be considered a source of enduring competitive advantage?" Computerized reservation systems had become commodities and while SABRE's capabilities remained central to airline operations, SABRE moved from a strategic system to a mission-critical system.

Discussion

Consideration of movement between discrete system types, as shown in the model in Figure 1, may be valuable to IT organizations in several ways. First, recognizing that an existing system is shifting between categories may help IT management identify new priorities. For example, as systems move from support to mission-critical, new aspects emerge as crucial. Security, backup, and recovery functions, of lesser importance to support systems, become imperative as a system shifts to mission-critical status. Likewise, during system planning, recognition that many systems have mission-critical potential may enable IT organizations to design systems with long-term system status in mind. Systems may be designed for future high availability and scalability, even when implemented as support systems, thus preventing substantial reengineering.

Second, the shift from strategic to mission-critical creates new opportunities for outsourcing. While most organizations are reluctant to outsource strategic systems, firms do not apply this prohibition to mission-critical systems. In 2000, for example, AMR Corporation, the parent company of American Airlines, sold its interest in SABRE to a separate holding company, effectively outsourcing what had once been the airline's premier source of IT-based competitive advantage.

A third way organizations may benefit from a consideration of the model involves resource allocation. Since, at least, the 1980s, IT organizations emphasized developing strategic systems for competitive advantage, often allocating their best human and technical resources toward this effort. This approach fails to recognize the increase in number and importance of mission-critical systems within IT portfolios. At any given time, the number of strategic systems is likely to remain relatively small. However, over time, the number of mission-critical systems will expand significantly, as all strategic systems and many support systems migrate toward a mission-critical state (See Figure 2). Ironically, the more aggressively organizations pursue systems aimed at competitive advantage, the larger the proportion of mission-critical systems becomes. In many organizations mission-critical systems are maintained by trainees, or junior level employees of outsourcing firms, while the best, brightest, and most experienced technical staff are allocated to strategic endeavors. Maintenance of mission-critical systems, viewed as drudgery compared to the sexy lure of new technology, is no one's career goal. Often the best salary increases, bonuses and promotions derive from high-visibility strategic projects. This is not to say that strategic projects are less important, but rather that mission-critical systems are in fact, another, and oft overlooked, first priority for IT departments. Their growth in number and relative importance implies a need to reexamine how resources are allocated.

FUTURE RESEARCH

The model presented here, describing the inevitable increase in the number and importance of mission-critical systems, is supported by both prior research into the impossibility of sustained competitive advantage and the SABRE system classic case. A next step is to explore other classic cases, and to apply the model to current organizations using primary research data. Additional plans are in process to address the organizational and management implications of the burgeoning numbers of mission-critical systems.

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