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DO STRATEGIC SYSTEMS REALLY PAY OFF?

An Analysis of Classic Strategic IT Cases

To explain IS-based competitive advantage and its bottom-line impact on market share and profitability, this article studies some of the more famous strategic systems in business. Factors that enhance sustainability and a diagnostic tool for ranking systems in your company's IS portfolio are provided.

Strategic Information Technology was once viewed as the catalyst to propel IS managers from the back room into the corporate suite. Many consultants and researchers still push strategic IT as the vehicle to easier market access, product differentiation, cost efficiencies, and improved competitive positioning within a firm's industry. Yet CEOs are hard-pressed to cite even one example of how they have achieved more than a temporary advantage from investments in IT. In fact, most CEOs don't speak of IT's competitive promise any longer; instead they view IT as a necessity to remain competitive.

This diminished view of the impact of strategic IT reflects a growing skepticism about the opportunities for maintaining sustained competitive advantage with early use of information technology. Instead, the competitive use of IT must be a component of overall business strategy, and its application depends more on understanding unique business opportunities than on competitive benefits from technological features that can be easily duplicated. IS managers are thus challenged to use more sophisticated methods for projecting when competitive benefits might accrue from strategic IT choices. And increasingly, they must reduce the risk of highly visible and expensive development efforts that do not pan out over the long run.

Several strategic IS case studies have become the models of how to use information technology to improve a firm's competitiveness. Many of these highly touted strategic information systems were first introduced 20 years ago. With the passage of time, it is now possible to explore the long-run performance of these early adopters of strategic IT and address some important questions: How has the competitive position of those firms that introduced strategic information technology changed in terms of profitability and market share over

time? What is the competitive position of strategic IT users relative to their industry competitors? What are the important issues to consider when identifying projects that have the best chance of providing sustainable competitive gains? By studying these questions, IS managers can gain a new understanding of IS-based competitive advantage and its sustainability.

STRATEGIC TECHNOLOGY AND COMPETITIVE ADVANTAGE

Case examples are often used to describe the strategic effect of IT. Individual case studies such as Merrill Lynch' s CMA (Cash Management Account) system, McKesson' s Economost, and the American Airline SABRE system have become legendary. Over the past 10 years the list of these popularized strategic systems has grown long. Yet there has been little empirical analysis to determine whether these systems have resulted in sustainable competitive advantage or how effectively the firms adopting strategic IS have performed over time.

Competitive advantage results from unique characteristics that enable a firm to maintain a dominant position within its respective industry. Two fundamental factors create competitive advantage: comparative efficiency, which allows an organization to produce its goods or services more economically than its competitors, and bargaining power, which allows a firm to resolve bargaining situations with its customers and suppliers to its advantage. Comparative efficiency is determined by both internal efficiency and interorganizational efficiency; bargaining power is determined by unique product features, switching costs, and search-related costs.

The ability to use IT for competitive advantage differs among industries. Therefore, competitive advantage depends on both industry conditions and internal capability to identify and exploit opportunities. Because many of these early IS applications were initially conceived to satisfy internal problems (and only later were recognized as having competitive potential), there is a certain element of luck involved in determining which IS applications eventually produce competitive advantage.

Sustainability and First-Mover Advantage

First-mover advantage arises if IT enables one firm to gain a head start over its rivals. First-mover opportunity may occur because the firm possesses some unique resources, strategic foresight, or simply luck. This advantage is usually gained by either leadership in product or process technology, preemption of assets, or development of buyer switching costs. The extent to which the first mover can capitalize on order-of-entry benefits and minimize costs may determine sustainability.

The first mover' s ability to maintain the preeminent position is difficult. Industry followers may enjoy a "free ride" on first-mover investments, or the first mover may be sluggish to respond to follower actions.

Furthermore, government regulation may force first-mover organizations to make the technology available to competitors, as was the case with American Airline' s SABRE. In fact, competitive advantage through successful preemption of information technology is difficult to achieve because there are no barriers to copying. If the system is easily copied and improved by a competitor, no sustainable financial benefits occur. The strategic system becomes, in fact, a competitive necessity and the industry returns to a state of equilibrium.

Measuring Sustainability Through Financial Performance and Market Share

Competitive advantage is achieved when a firm receives a return of investment that is greater than the industry norm and is sustained for a long enough period for the firm to gain dominance in its industry. A strategic first mover should be able to reduce cost, add value, and create significant switching costs that produce financial benefit before the system is copied by the competitors.

This definition of competitive advantage is close to the thinking of many CEOs who seek economic justification for large IT investments rather than have to make a leap of faith. Have the early users of strategic IT achieved sustained profitability and market share growth, and has their strategy remained

consistent over time?

Design of the Study in Brief

Strategic IS cases form the sample population for this study. An Information Week article that asked a panel of IS experts to select the top strategic IS systems was used to develop an initial sample set. Next, popularized cases were identified from a review of additional published materials, including Harvard Business School Cases, IS textbooks and periodicals, and magazines. Based on this search, 60 well-documented cases that were distinguished as strategic applications of IS were identified. These information systems are used in several industries. The launch dates of each of the 60 strategic systems were determined. (A launch date was designated as the date of the announcement that the system was generally available, in the case of a product, or widely in use, in the case of a process technology. Systems development and pilot or limited testing was not included as a launch date.) In eight cases it was impossible to determine the launch dates from any source; these cases were eliminated from the sample.

Next, we reviewed the directory of the COMPUSTAT II financial data set of industrial firms; another 17 firms were dropped from the sample because all or some of the years of annual financial data were missing. In the end, 30 firms with launch dates and complete COMPUSTAT II data sets were included in the study.

Exhibit 1 depicts the strategic IS systems included in this study along a time line. The horizontal axis displays the nature of the strategic system implemented. They range from operational systems, as in the case of Banc One's transaction processing system, to coordination systems such as Air Products and Chemicals' vehicle scheduling and distribution system, to marketing systems such as American Express' preferential traveler services.

PERFORMANCE MEASUREMENT BY STAGES

For each firm, performance measurement was made in three stages:

- λ Stage 1 (prelaunch). The 5-year period before system launch.
- λ Stage 2 (postlaunch 1). The period from system launch to 5 years after the system launch.
- λ Stage 3 (postlaunch 2). The period from 5 years after system launch to 10 years after the launch.

As depicted in Exhibit 2, initial impact can be measured by observing changes in competitive position from stage 1 to stage 2. Delayed improvements in competitive position can be observed by comparing stages 1 and 3. Finally, sustained competitive position can be identified through comparison of stages 2 and 3 relative to stage 1.

Two distinct measures of performance are used. First, relative profitability is calculated by taking the average return on sales (ROS) of the firm in a given stage and dividing it by the industry average. For example, if the 5-year average ROS for a firm before system launch was 10.8% while the industry average was 7.2%, relative profitability for that time frame would be 1.5--in other words, the firm would be earning, on average, 1.5 times as much on sales as the industry average. Use of industry average is a relative base to provide a more accurate view of firm profitability position within an industry.

The second measure used is relative market share. This is formulated as the ratio of firm market share to its largest competitor's market share. When viewed over time, changes in this ratio provide insight into competition for sales within industries. Relative market share was calculated for each of the sample firms within the given stages. For example, if firm market share prelaunch averaged 16% while that of its largest competitor averaged 20%, then relative market share for that time frame would be 0.8. On average, the firm's market share would be equivalent to 80% of its largest competitor's share.

Results: Strategic IS and Performance Measures

Movement from stage 1 to stage 2 is classified as initial impact. Once again, this movement records

changes in competitive position from system prelaunch to 5 years post launch. As shown in Exhibit 3, the initial benefits of strategic IT implementation were varied among firms.

Initial winners realized increases in both relative market share and profitability. These firms were American Airlines, Toys ' R' Us, Digital Equipment Corp. (DEC), Bergen Brunswig, Air Products and Chemicals, and Federal Express. Initial losers failed to realize increases in either performance measure. These firms include American Express, Chase Manhattan, United Airlines, Citicorp, Procter & Gamble, Mellon Bank, Chemical Bank, and Merrill Lynch. Other firms realized gains in one or the other performance measures. The initial impact of strategic IT in these instances can be classified as mixed.

There is a predominance of banks and financial service firms within the category of initial losers. Early competitive advantage through use of strategic IT within the information-intensity financial services industry is at best difficult. As strategic technology is implemented by the first mover, the industry is quick to adapt, thus diluting any initial competitive advantages. In the case of United Airlines, it is interesting to note that although its APOLLO reservation system was initially introduced shortly before American Airlines' SABRE, it was not marketed as successfully and did not establish the same level of initial market share. The initial impact of SABRE was positive in both measures of performance, thus classifying the system a winner.

Overall, results for the initial impact (stage 1 to 2) are somewhat disappointing for firms implementing strategic information technology. Only 6 of 30 firms realized initial improvements in both measures, while 8 firms failed to realize gains in either measure. In terms of profitability, 15 firms improved relative competitive position from stage 1 to stage 2. Improvements in market share were realized by only 13 of the 30 firms. Of course, these results should be framed within the context of relevant industry and competitive factors. Specifically, these findings suggest that first-mover advantage may depend on the industry.

Highly competitive industries such as banking and financial services adapt more quickly to technological changes. In addition, the implementation of a system by a first mover may necessitate the building of a comparable system regardless of anticipated financial results. In the case of United Airlines, initial benefits of strategic IT simply did not exist. However, the successful introduction and acceptance of SABRE forced the accelerated development and marketing of technology that has become a strategic necessity for the airline industry.

All benefits of strategic IT may not be realized initially. Up-front costs, implementation problems, and system enhancement may cause economic benefits of technology to be realized in the long term but not in the short run. Analysis of competitive position beyond 5 years of systems development is needed in order to observe delayed economic benefits. Changes in competitive position from stage 1 to stage 3 can be classified as delayed or sustained impact. This movement records changes in performance measures from 5 years before launch to 5 to 10 years post launch. In essence, an examination of performance measures over these time frames is needed to determine which firms have sustained their competitive position or have realized delayed economic benefits from strategic information technology. This analysis also identifies firms that have been unable to sustain initial advantages or have been unable to realize any economic gain from strategic IT.

Exhibit 4 illustrates the change in performance measures from stage 1 to stage 3 for the sample firms. Perhaps the most interesting finding in this analysis is the stability of system winners. Specifically, each firm that realized initial benefits in both performance measures--market share and profitability--was also able to sustain these benefits 5 to 10 years beyond system launch. This group of winners across stages 2 and 3 are designated as sustained winners in Exhibit 4. These first movers enjoy order-of-entry benefits that assist the sustainability of competitive advantage. Sustained losers (those who experienced no economic benefit in either time frame) include only 3 firms.

Of the 30 sample firms, 12 show some form of sustained or delayed benefit in terms of relative profitability. Improvement in market share from stage 1 to 3 was realized by 19 firms. Interestingly, although the winner category remained a fairly homogeneous group, only 3 firms were down on both measures over stages 2 and 3 (sustained losers). This may point to both the delayed pay-off of major investments in IT and to the difficulty of maintaining sustained strategic advantage from less than truly winning strategic systems. However, many additional firms did not receive benefits in both measures of performance.

Specifically, Federal Express, Toys ' R' Us, American Airlines, Bergen Brunswig, Air Products and Chemicals, and Digital Equipment Corp. all realized initial improvement in competitive position from stage 1 to stage 2. This benefit was sustained in stage 3. Improvements in market share for McKesson and profitability for Baxter and Owens-Corning allowed these firms to join the previously mentioned winners in terms of improved competitive position from stage 1 to stage 3.

Segregating the combined measures of Exhibits 3 and 4 yields results of sustained or improved profitability and market share from stage 1 to stage 3. Initial improvement in relative profitability was realized by 15 firms. Of these, 8 were able to maintain improved position in stage 3, whereas 7 were unable to sustain initial gains. Conversely, 15 firms failed to realize initial gains from stage 1 to stage 2. Of these, 4 did manage to realize gains in stage 3.

In terms of relative market share, 17 firms failed to realize initial improvement from stage 1 to stage 2. However, 6 of these firms did realize delayed market improvement in stage 3. Initial improvement in market share was realized by 13 firms.

All the firms that realized initial improvement in market share were able to sustain this advantage in the longer term. This finding raises the question of whether strategic IS investments that are oriented toward growth in market share rather than profitability have a stronger propensity for sustainability.

The study sample focused on strategic IS systems that have been highly touted in the IS literature; based on case descriptions, these systems were successfully implemented. In theory, these cases should represent sustained winners, yet only 6 firms in stage 2 and 9 firms in stage 3 showed both positive profitability and market share growth. If less than one-third of the firms identified as strategic users of IT managed to achieve both sustained profitability and market share growth, what is the fate of later adopters or firms that failed to follow the same strategy? Are these systems, the majority of which have not resulted in sustained competitive advantage, as strategic as widely touted?

IMPLICATIONS

Investment in strategic systems are typically costly undertakings. The initiator of strategic IT must be reasonably assured of significant gains in competitive position before undertaking the risk of systems development. These gains are not in terms of the traditional internal performance measures; rather, these gains must be measured in terms of improved competitive position relative to other industry participants.

Of 30 firms, only 6 can be classified as sustained winners within the definitional framework. These sustained winners realized initial improvement in both profitability and market share from prelaunch to postlaunch and were able to sustain these gains over 10 years. Only these 6 firms realized initial gains in profitability and market share measures. Thus, it would seem that initial impact is an important determinant of sustainability.

This implication is readily apparent when analyzing changes in relative market share. All 13 firms realizing initial gains in this measure sustained improved market share in the long term. However, firms that showed initial improvement in profitability were not able to sustain this advantage in the long term. However, when viewed by the nature of the strategic system, sustained winners were spread across all system types: operational, coordination, and marketing.

Sustainability Factors

To better understand those factors that may determine the sustainability of a competitive advantage derived from IT, we have compiled a checklist of factors that should be considered when selecting strategic systems projects.

Order of Entry. It is commonly held that early entrants into a market enjoy an enduring competitive advantage over late entrants.

Preemption. Preemptive moves allow a firm to secure an advantageous position that is difficult to dislodge

because of the advantages captured by being the first mover.

Response Lag. Response lag is defined as the amount of time from first-mover project launch until competitors have a substantive response in place. If the competitor provides a response lag, the better the chances the first mover can achieve sustainability.

Size. Superiority in size and investment are important when it is prohibitively expensive for competitors to imitate the first mover.

Geographic Scope. This refers to the locations in which a firm chooses to compete or the places it chooses to situate particular operations. Geographic scope may be exploited if strategic factors, such as infrastructure and communications, are superior to competitors.

Product Scope. This comes from the ability to introduce new products, dominate product design, establish product positioning, accelerate product approval in regulated industries, and capitalize on product skills.

Vertical Scope. This is accomplished when supply is bounded or of varying quality. Some means of capturing the input chain include backward integration, lower cost suppliers, tying up contracts in a market, growing reputation, and maximizing established relationships.

Industry Scope. Scope economies are derived from activities in interrelated markets. Sustainable advantage in one market can be used to build sustainability in another.

Organizational Base. Components of the organizational base affect sustainability--for example, superior managerial adaptability or willingness to redesign the organization, superior managerial vision or willingness to take risk, and superior managerial experience in the use of IT.

Learning Curve. This is a more important factor in industries that depend on information diffusion. If learning is kept proprietary, it generates leadership in market share and barriers to entry.

Switching Cost. Supplier-specific learning by the buyer in terms of the user-friendliness of the system and user training are two components of sustained competitive advantage. Another form of switching cost is contractual in nature (i.e., frequent-flyer programs or software licensing agreements).

Buyer Uncertainty. If the first mover is able to achieve significant early exposure with consumers, the attribute of that product becomes recognized as important within the product category.

Research and Development and Patenting. The strength of a competitor' s capability to exploit the patent race depends on the ease with which the first mover' s product innovation can be imitated.

Technological Resources. The existence of a comprehensive technological infrastructure that is difficult to imitate is a sustainability factor. These resources include technical competence, the ability to package and sell sophisticated, internally developed IT services, and the uniqueness of both the application systems in use and under development.

Information Resource. A rich data base may translate into the development of sophisticated analytic tools to enhance the service and development of the strategic systems. The extent to which intelligence is embedded in the firm' s existing data bases, decision support systems, and expert systems may determine its ability to exploit opportunities.

Competitor Restrictions. Government intervention, patents, and antitrust laws are examples of inhibitors to a competitor' s ability to imitate the first mover' s strategy.

Flexibility. IT has the capability of expanding current capabilities and enhancing a company' s offering by expanding geographical reach or extending levels of operation. This flexibility enables quicker response to

customer orders, greater customer satisfaction, and enhanced service quality, all of which are important sustainability factors.

Risk. Preemptive strategic moves involve the taking of calculated risk. Firms can reduce risk or shape their luck by capitalizing on a preemptive opportunity. This responsibility follows heavily on the strategic foresight and maneuvering of senior management.

A Sustainability Decision Tool

The Strategic System Sustainability (S3) Diagnosis Tool (see sidebar) is an easy-to-use, self-administered survey to help rank and select potential strategic systems within the corporate IS portfolio. While many other variables must be considered when deciding whether to proceed with a new strategic IT development effort, the S3 Diagnosis Tool can provide important insights as to a system' s likelihood of achieving sustained competitive advantage, given the sustainability factors listed previously.

The S3 Diagnosis Tool is most appropriately used when deciding between two or more strategic system development efforts. A group composed of strategic users and IS staff should make an assessment of each question on the S3 Diagnosis Tool for each strategic application under consideration. By summing the group' s cumulative totals for the 30 questions, an overall sustainability score can be assigned to each potential strategic system, with the system with the highest score offering the greatest potential sustainability. Depending on the unique situation within a firm, questions may be added or dropped. In addition, weighting and matrix schemes may be further employed.

This is, of course, only a relative measure; even the highest-scoring systems development alternative does not guarantee sustainability of competitive advantage. However, by using this or similar techniques, important discussion about systems alternatives can be generated. Such a discussion may make the difference between selecting a sustained winner and being stuck with a sustained loser.

CONCLUSION

More research is needed to address whether the adoption of a strategic system actually correlates to positive returns on the bottom line of a firm. Too often, decisions concerning the introduction of strategic IT have been based on management' s ability to make a leap of faith. A healthy skepticism concerning the competitive advantage pay-offs of IT is in order, because the introduction of IT does not guarantee an improved competitive position for the early adopters. A more balanced perspective is one in which the competitive use of IT is a component of overall business strategy and the application depends on the understanding of unique opportunities and risks. To be strategic, the information resources of a firm must be driven by business strategy. Furthermore, as organizations restructure, information resources must be integrated into the product and process dimensions of the enterprise.

STRATEGIC SYSTEM SUSTAINABILITY DIAGNOSIS TOOL

	Strongly Disagree					Strongly Agree
1. The system is one of the first of its kind in our industry.	1	2	3	4	5	
2. It would be difficult for our competitors to copy the system.	1	2	3	4	5	
3. The system allows us to capture better information than our competitors.	1	2	3	4	5	
4. Our customer (internal or						

external) greatly benefits from the system.	1	2	3	4	5
5. It would take our competitors a long time to copy this system.	1	2	3	4	5
6. Our large size helps us to use the system well.	1	2	3	4	5
7. Our size puts us in a better position than our competitors to develop and enhance the system.	1	2	3	4	
8. Our geographical dispersion helps us use the system well.	1	2	3	4	5
9. Our variety of product lines helps us use the system well.	1	2	3	4	5
10. The system will help us introduce new products and services.	1	2	3	4	
11. The system enhances the information content of our products.	1	2	3	4	5
12. The system helps us influence (control) our suppliers.	1	2	3	4	5
13. The system helps us influence (control) our buyers.	1	2	3	4	5
14. The system helps us take advantage of our relationship with our buyers and suppliers.	1	2	3	4	5
15. Our industry is not very competitive.	1	2	3	4	5
16. The system uses our organizational structure well.	1	2	3	4	5
17. Our executive management is committed to the system.	1	2	3	4	5
18. Our organizational culture encourages such systems.	1	2	3	4	5
19. This type of system has not been publicized many external form.	1	2	3	4	5

20. Our customers will have a hard time switching from the system.	1	2	3	4	5
21. The system is easy to use and attractive to our customers.	1	2	3	4	5
22. A strong contractual commitment can be secured with customers as a result of our using this system.	1	2	3	4	5
23. The system employs our strong technological infrastructure.	1	2	3	4	5
24. The system uses our IT expertise.	1	2	3	4	5
25. The system is complex.	1	2	3	4	5
26. The system generates reliable information.	1	2	3	4	5
27. The system exploits our strong information base.	1	2	3	4	5
28. Our financial situation is strong.	1	2	3	4	5
29. We are committed to the strategic use of IT.	1	2	3	4	5
30. We are willing to take risks.	1	2	3	4	5

CHART: EXHIBIT 1 Strategic IS Cases: Chronology and System Types

CHART: EXHIBIT 2 Time Line Analysis

CHART: EXHIBIT 3 Change in Performance Measures: Stage 1 to Stage 2

CHART: EXHIBIT 4 Change in Performance Measures: Stage 1 to Stage 3

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