

Chapter 2: Gaining Competitive Advantage with DSS

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I. Introduction

In many organizations, managers and MIS professionals have worked together to create important transaction-oriented strategic information systems. These information systems have significantly improved the processing of business transactions. In some organizations, the search for other strategic technology opportunities remains focused on enhancing business transaction processing. This focus on operations is too narrow. Although business transactions can involve managerial decision-making, redesigning a transaction processing system creates advantages that are very different from those that can result from building an innovative Decision Support System. DSS meet a different need and serve a different purpose. Managers need to recognize that strategic decision support applications can provide substantial opportunities for targeting sales efforts and improving profits. Information technology is creating new DSS capabilities that can and should be used to build innovative, specific Decision Support Systems that yield competitive advantage for an organization.

You may be asking: Can a Decision Support System really provide a competitive advantage to a business? Yes, a DSS can be a strategic information system and a specific Decision Support System can create a competitive advantage. Managers need to know when, how and why DSS are and can be competitive weapons.

Evidence indicates managers can now use sophisticated Data-Driven and Document-Driven DSS to obtain information that was buried for many years in filing cabinets or archived on computer tapes. Model-Driven DSS can reduce waste in production operations and improve inventory management. Knowledge-Driven DSS can analyze cash register transaction data and help managers find relations in consumer buying behavior that increases sales and inventory turnover. Group decision support systems and Communications-Driven DSS can support teams working all over the world. Inter-Organizational DSS can support a company's suppliers and customers. An Inter-Organizational DSS can reduce stock-outs and inventory carrying costs, and increase the number of happy customers.

This chapter provides additional examples of how various types of Decision Support Systems can enhance and improve managerial decision making processes and provide an organization with a competitive advantage. The major sections discuss technology trends, gaining competitive advantage, how DSS can provide a competitive advantage, examples of Strategic DSS, characteristics of Strategic Decision Support Systems, identifying opportunities and Information Systems planning, and DSS risks and benefits.

II. Technology Trends

Computers have become indispensable tools in companies, government offices and in most other organizations. For many managers computers are recognized and accepted as necessary productivity tools. Despite the general and widespread acceptance of computers and their important role in organizations, the business computing revolution is far from complete. If anything, the pace of technology change is speeding up, not slowing down and the expectations for computers and information systems in companies continues to expand

and grow. So what are the trends associated with information technology that may have a major impact on the design and development of Decision Support Systems? In my opinion:

1. The World-Wide Web is forcing the convergence of major media like newspapers, computerized information services and television. Having a Web site and an E-mail address is common and in many cases necessary for companies and individuals. But the Web is much more and it is strategically important to companies. The Web supports internal and external global collaboration for managers. Also, combining knowledge management and corporate portals can help managers gather, manage, share, and use information.
2. Network technologies are very important and mission critical in most companies. Computing and network technologies have become more integrated and more powerful. The speed and capacity of networks is increasing. Access to fast network connections is becoming widespread and less costly. An open architectural view of networking and computing is dominating IS/IT thinking and the development of DSS. Decision support applications are potentially 7x24 for many companies; if the network is down, decisions won't be made.
3. Linux is becoming an important operating system in corporations. Major vendors like IBM and Oracle are supporting open source software like Linux and the Apache Web server. These vendors are porting their applications to the Linux operating system. This trend is negatively impacting the use of proprietary UNIX and Microsoft Windows 2000 software as the corporate server environments of choice. Linux is a viable alternative operating system for building enterprise-wide decision support systems.
4. Electronic commerce is becoming widely accepted by both managers and customers. Business-to-Business and Business-to-Consumer e-commerce can be profitable. DSS can help managers accomplish this goal.
5. The Web is promoting new models of business cooperation, including extranets, Inter-Organizational DSS and shared computing resources. For example, inter-organizational and supply chain decision support applications can be outsourced and hosted by application service providers.
6. Handheld computing is gaining greater acceptance and the use of handhelds by managers and other employees will increase. Wireless Web devices are expected to outnumber wired devices in the next few years. Handhelds support distributed data collection for Data-Driven DSS, expanded Communications-Driven DSS and distributed decision-making.
7. Data-Driven DSS, especially analytical databases and data warehouses, are needed in companies and should become common. For example, clickstream and other emerging Webhousing tools should help companies analyze and profit from the customer data stored in Web logs.

This list of trends is incomplete and dated even as it is written. Seizing opportunities to build innovative DSS involves continuously monitoring technology trends and having the courage to "think outside of the box". The phrase about "boxes" and "thinking" is already trite but the need to innovate remains if a company is to gain a competitive advantage from building a decision support system.

III. Gaining Competitive Advantage

A Decision Support System creates a competitive advantage if three criteria are met. First, once the DSS is implemented it must become a major or significant strength or capability of the organization. Second, the DSS must be unique and proprietary to the organization. Third, the advantage provided by the DSS must be sustainable for at least 3 years. Even with rapid technology change a 3 year payback is realistic. Managers who are searching for strategic investments in information technology need to keep these three criteria in mind. A competitive advantage means an organization does something important much better than its competitors.

The widespread usage of computer technology has changed the way companies do business. Information technology has altered relationships between companies and their suppliers, customers and rivals. Porter and Millar (1985) discuss two specific ways that information technology can affect competition: by altering industry structures, and by supporting cost and/or differentiation strategies. A common approach used to identify opportunities to change the structure and profitability of an industry is to examine five competitive forces. Michael Porter argued that the power of buyers, the power of suppliers, the threat of new entrants, the threat of substitute products, and the rivalry among existing competitors determines the profitability of an industry. How a company uses information technology can affect each of the five competitive forces and can create the need and opportunity for change. For example, information technology has altered the bargaining relationships between companies and their suppliers, channels, and buyers. Information systems can cross company boundaries. These inter-organizational systems have become common and in some instances they have changed the boundaries of the participating industries. DSS can reduce the power of buyers and suppliers. DSS can erect new barriers that reduce the threat of entrants. DSS can help differentiate products and services and reduce the threat from substitutes. Also, DSS can help managers reduce the cost of rivalry actions and in some cases reduce the need for competitive actions and reactions.

Some firms have no competitive advantage. Firms can achieve a competitive advantage by making strategic changes and firms can lose a competitive advantage when competitors make strategic changes. Information systems and information technologies are changing rapidly and are viewed by many managers as "strategic weapons" for gaining competitive advantage. These systems are also known as Strategic Information Systems.

Many authors have proposed definitions for a Strategic Information System (SIS). For example, Strategic Information Systems have been defined as systems designed to change goals, products, services, or environmental relationships of organizations. Some authors argue that any information system that helps an organization gain a competitive advantage is a Strategic Information System. Both of the previous definitions should guide managers in their search to use technology to support decision making. Decision Support Systems that create changes in products, services or relationships are especially important for gaining an advantage over competitors.

Strategic Impact Grid

Information systems and information technology play different roles in different industry settings. McFarlan, McKenney and Pyburn (1983) proposed a four quadrant strategic impact model of the strategic relevance of IS/IT (see Table 2.1). Firms in the **Factory** quadrant are dependent on cost-effective, reliable IT operational support for internal operations. Information systems development emphasizes maintenance and program improvements. Smooth functioning of computerized systems is vital to daily operations. New applications in data warehousing, MIS, and DSS are potentially useful, but not fundamental to the ability of firms in this quadrant to compete.

	Low impact of new applications	High impact of new applications
High strategic impact of existing systems	Factory	Strategic
Low strategic impact of existing systems	Support	Turnaround

Table 2.1 Categories of Strategic relevance

In the **Strategic** quadrant, information systems and information technologies are essential for executing current strategies and operations for firms. Information systems are critical to the survival and competitive position of the firm. In this quadrant, applications under development in DSS will be crucial to future competitive success.

In the **Support** quadrant, firms that develop innovative DSS are unlikely to gain competitive advantage. Information technology resources are important for applications like accounting and payroll, but the firm is not dependent on technology. Finally, managers who want to use information systems and especially DSS to improve the competitive position of a firm will encounter special challenges in the **Turnaround** quadrant. These firms are trying to revitalize operations through new systems. These firms have not previously depended on IS/IT and yet new applications may impact the survival of the firm. Transaction processing applications under development are important strategically. DSS projects have had a low priority in these situations, but as some companies innovate with DSS the turnaround may involve catching up in decision support applications.

The strategic impact grid helps managers analyze the firm's current information systems position. Firms in the Strategic quadrant are in the best position to gain advantage from building DSS. Corporations can also use the grid to compare several business units or divisions.

IV. How can DSS provide a Competitive Advantage?

Evans and Wurster (1997) argue in a recent Harvard Business Review article that the World is in the midst of a fundamental shift in the economics of information. They think major changes will occur in the structure of entire industries and in the ways companies compete. The change that they feel is so important is the widespread adoption of Internet

technologies. They believe the Internet is supporting new behaviors that are reaching critical mass. They claim millions of people are communicating at home and at work in an explosion of connectivity that threatens to undermine the established value chains for businesses in many sectors of the economy.

Internet technologies have also opened wide the doors for innovative web-based decision support systems. Inter-Organizational DSS can improve linkages with customers and suppliers. In some situations Group DSS and Groupware can remove time and location barriers. DSS can help a firm operate seven days a week, 24 hours a day and without regard to an employee's or a customer's location. In some cases DSS can help integrate a firm's operations. An Inter-Organizational Web-Based DSS can create linkages that are difficult to overcome.

DSS can potentially help a firm create a cost advantage. DSS can provide many benefits including improving personal efficiency and reducing staff needs, expediting problem solving and increasing organizational control. Managers who want to create a cost advantage should search for situations where decision processes seem slow or tedious and where problems reoccur or solutions are delayed or unsatisfactory. In some cases DSS can reduce costs where decision-makers have high turnover and training is slow and cumbersome, and in situations where activities, departments and projects are poorly controlled.

Also, DSS can create a major cost advantage by increasing efficiency or eliminating value chain activities. For example, a bank or mortgage loan firm may reduce costs by using a new DSS to consolidate the number of steps and minimize the number of staff hours needed to approve loans. Technology breakthroughs can sometimes continue to lower process costs and rivals who imitate an innovative DSS may nullify or remove any advantage.

DSS can potentially create a differentiation advantage. Providing a DSS to customers can differentiate a product and possibly provide a new service. Differentiation increases profitability when the price premium charged is greater than any added costs associated with achieving the differentiation. Successful differentiation means a firm can charge a premium price, and/or sell more units, and/or increase buyer loyalty for service or repeat purchases. In some situations competitors can rapidly imitate the differentiation and then all competitors incur increased costs for implementing the DSS.

Finally, DSS can be used to help a company better focus on a specific customer segment and hence gain an advantage in meeting that segment's needs. MIS and DSS can help track customers and DSS can make it easier to serve a specialized customer group with special services. Some customers won't pay a premium for targeted service or larger competitors also target specialized niches using their own DSS.

V. Examples of Strategic DSS and SIS

The following examples at Frito-Lay, L.L. Bean, Lockheed-Georgia, and Mrs. Field's Cookies should clarify how Decision Support Systems can provide a competitive advantage. These examples are "classics" that have been widely reported in business case studies and the popular press.

Frito-Lay

In the late 1980's, Frito-Lay (www.fritolay.com/home.html) managers felt that they needed to redesign the sales process into a more decentralized organization where route sales people were given decision-making authority on promotions and product mix (cf., Applegate, 1994). The development of a hand-held computer enabled this strategic transition to occur. Route sales people collected data on every sales transaction for every customer on a route. Ten thousand Frito-Lay salespeople use hand-held computers to track Frito-Lay products. These notebook size computers produce a vast quantity of data that flows into the data center at Frito-Lay headquarters in Texas. This data is used in a Data-Driven DSS. This technology automated a cumbersome process and improved the quality of data that was already being collected. The technology also provides data to support decentralized decision making while maintaining centralized control systems.

L.L. Bean

In the spring of 1989, L.L. Bean (www.llbean.com) hired consultants to design a system that would provide better allocation of resources in telemarketing. Managers decided to have an Economic Optimization Model (EOM) built in-house (cf., Quinn, Andrews, and Parsons, 1991).

The Economic Optimization Model system required a shift in focus for the company from a traditional service-level criterion, such as 14 calls per agent per hour, to a method that would optimize economic efficiencies. This model-driven DSS examined variables such as the number of telephone lines to carry incoming traffic, the number of agents, and the queue capacity or the number of wait positions for sales agents. Then, through various mathematical modeling tools, the system generates specific resource amounts L.L. Bean should deploy to be most economically advantageous. The system takes into account many variables. For example, installation and maintenance costs of telephone lines, labor costs of sales agents including their training, costs associated with being on hold with the 800-service provider, and the cost of permanently lost orders. This new profitability-based model continues to add resources until the marginal cost of additional resources exceeds the return on that investment. EOM also scheduled the resources based on fluctuations in activity. When one group of operators became overwhelmed the next shift of operators would be starting and then as things were becoming slow one group of operators would soon be leaving.

From a \$40,000 capital investment in the system, the company estimated a profit gain of \$9.2 million to \$10 million for 1989. Sales call volumes were up 6.5% over the previous

year, managers attributed the majority of the gains to the new EOM system. Managers benefited from an integrated planner that could evaluate "what if" scenarios. Most importantly L.L. Bean's reputation with customers improved. Other benefits included decreased customer wait times, improved morale of employees, and lost order penalties reduced. The EOM provided L.L. Bean a competitive advantage.

Lockheed-Georgia

In 1975, Robert B. Ormsby, President of Lockheed-Georgia, a subsidiary of cargo aircraft producer Lockheed Corporation, was interested in the development of an online reporting system that could provide top executives with concise, timely, relevant information that could be shared within the organization to aid with decision making. The goals of the new system would be the insufficiencies of the existing system. In the fall of 1978, development began for a Management Information and Decision Support (MIDS) system (cf., Houdeshel and Watson, 1987).

The intended benefits of MIDS were improved communications, an evolving understanding of information requirements by the organization, and cost reductions in the generation of reports and presentation materials. MIDS helped managers identify areas that require attention; thus enabling improved decision making. Information has become more timely since it is updated as events occur and accuracy is improved through the verification of all information before it is made available.

After 12 years of successful operation, in 1990 MIDS required a hardware update. At this time, managers reviewed both hardware and software and decided to purchase a commercial Executive Information System called Comshare's Commander EIS instead of developing another in-house system. MIDS II, as it became known, resembled the look and feel of the previous system. Lockheed requested that Comshare (www.comshare.com) offer the ability to operate their system through a keyboard in addition to mouse and touch screen, and they wanted the ability of the old MIDS system to monitor use of the system. Lockheed requested that these changes be done not only to their version, but also to all Commander EIS packages thus enabling easier upgrades. MIDS II rolled out in 1992 with faster response times, easier navigation, better links to outside resources, and lower maintenance costs.

Mrs. Field's Cookies

Mrs. Field's Inc. (www.mrsfields.com) developed a management information system in the early 1980s to provide uniformity in store management while supporting the objective of rapid expansion. The information system was designed to serve two purposes for the company. The first was control and the second was better management decision making for store managers. What evolved from this need was a strategic information system that was designed to enable each store to be run as Debbi Field ran the original Palo Alto store. Her husband Randy did this by creating a software system that put much decision making and intelligence into a store level computer. The software gave the store manager time to do those tasks that people uniquely do. The system was justified on the basis of potential

payback in money saved, its ability to generate new sales, and the strategic importance in acquiring competitive advantage (cf., Applegate and Pearlson, 1994).

Eventually a Knowledge-Driven or Suggestion DSS was developed that automated routine activities and responded to exceptions by prompting the store manager for input. Eventually these exceptions were structured and the system responded automatically to many situations.

On a more sophisticated level, the system tracked financial performance of each store, provided comprehensive scheduling of operations, including marketing support, hourly sales goals, and even assisted with candidate interview selection. Each store's Tandy PC accessed the corporate management system. Many applications were menu-driven such as, day planning, time clocks, store accounting, inventory management, interviewing schedules, skill testing, and e-mail. After entering basic workday characteristics the system would run a mathematical model to compute the day's schedule of events including how many cookies to bake of each type, when to mix and cook them and projected sales per hour. As store sales were periodically entered into the system then revised projections and recommendations would be made. With sales and inventory information the system prepares and generates supply orders. Headquarters was able to learn quickly when a store was not meeting expectations and managers could immediately respond.

VI. Identifying DSS Opportunities and IS Planning

How can a manager identify opportunities to create DSS that can provide a competitive advantage? Once a manager believes it is possible to gain advantage from DSS then a creative search process is needed to identify problems and needs. A cursory review of articles indicates there are many planning processes and analysis frameworks that might help (cf., Neumann, 1994). The Information Systems Planning process should provide a systematic method of searching for and evaluating opportunities. The IS planning must be linked to Business Strategic planning and the process should be ongoing and open-ended. Managers need to collect competitive intelligence, fund DSS research and development projects, conduct brainstorming sessions, and follow hunches and intuition.

The IS planning process needs to examine the technical infrastructure to determine what is currently possible and examine enhancements that would facilitate or enable new capabilities. IS planning should involve broad consultation and both problem-oriented and opportunistic search. DSS do not always solve specific problems; rather DSS may create new capabilities. Evaluating DSS opportunities is sometimes difficult because of problems with assessing costs and benefits. In some situations the analysis will be directed to a build versus buy decision because industry-specific packages are available. This type of DSS may be needed but it probably will not provide a competitive advantage.

DSS projects have various levels of risk associated with them. When DSS projects have ambiguous objectives and low structure, the projects have higher levels of risk because the costs and scope of work of the project are hard to define. Also, because the objectives of the project are ambiguous, it can be difficult to assess the return on the investment. DSS

projects with a higher degree of structure and more clearly defined objectives generally are lower risk. More detailed planning is possible for projects with specific objectives. The size or scope of a DSS project in terms of the number of users served and the size of databases developed also impacts the risk of the assessed projects. Small DSS projects in terms of scope or dollar expenditures tend to be of lower risk than large projects. Finally, the sophistication of the technology and the experience of the developers using the technology influences the overall project risk. The ultimate decision to invest in a DSS project should not be based solely on project risk. Sometimes, the DSS project that is most likely to result in a competitive advantage is the riskiest project (cf., Applegate et al, 1996).

If managers want to develop effective IS plans and evaluate DSS projects it is important that they attend Information Systems, Industry and Vendor conferences. Also, to gain knowledge and search for opportunities, managers and MIS staff should use the World-Wide Web to search for DSS information and visit DSS vendor web sites. The DSSResources.COM web site provides a knowledge resource about many aspects of information systems (see Figure 2.1).

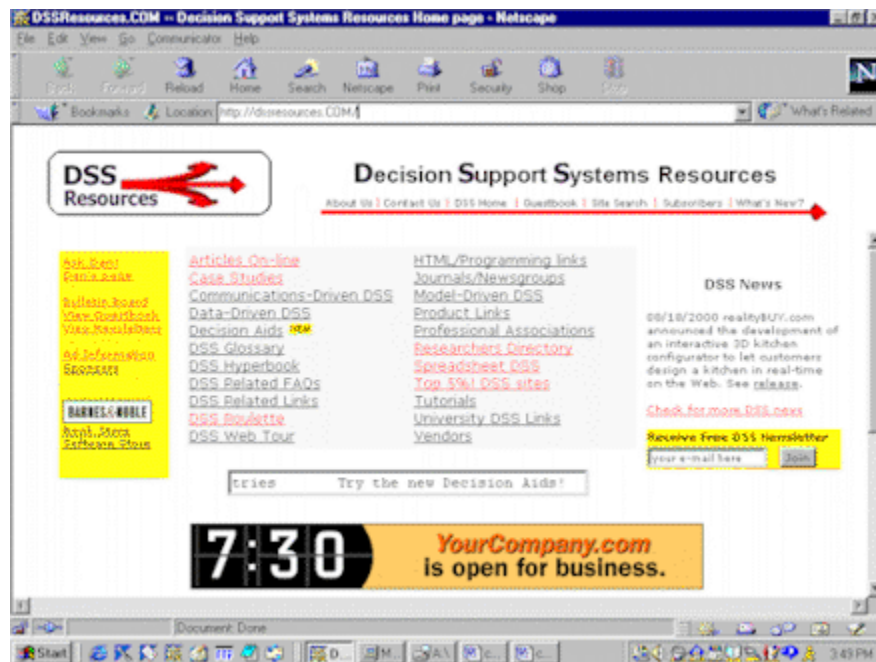


Figure 2.1 Summer 2000 version of DSSResources.COM web site.

DSSResources.COM (Decision Support Systems Resources) is a Web-based knowledge repository. The mission of the site is to help people who are interested in learning about how to use information technologies and software to improve business and organizational decision-making. The target audience is MIS professionals, MIS students, managers interested in DSS and academics teaching MIS/DSS. The site is needed because Decision Support technology is changing and evolving very rapidly. MIS managers, business managers and academics face a difficult challenge trying to stay abreast of those changes and to make good, informed decisions about building and maintaining DSS for organizations.

We are challenged by too much information and by too many sources of information. Much of the information about DSS is hard to find or "noisy". The DSS web site is an integrated source of information relevant to Decision Support Systems. DSS Resources is a "living" hypertext document. The on-going challenge is to have to have the site reflect the state-of-the-art in DSS research and practice. DSS Resources changed its URL to www.DSSResources.COM on September 29, 1999.

VII. Risks and Benefits

Development and implementation of Strategic Information Systems, including Decision Support Systems, has many risks. Gaining any advantage may require a large financial investment. Competitors' responses to the innovation may result in a heated race to gain or regain lost market share or provide the new capability. The competitive race can evolve into one of technology one-upmanship rather than one of better meeting customer needs. Sometimes the development of a strategic information system can shift power away from a specific company or an entire industry (cf., Porter and Millar, 1985). Technology risks include picking the wrong vendor, using a new technology too early in the technology life cycle, or using a technology that soon becomes obsolete. The inability to predict human behaviors and reactions, and the basic human instinct to resist change makes people the greatest risk when building new systems. No matter how wonderful a proposed DSS, if people resist the change, then the new system will fail. To gain an advantage a new DSS must work as planned and a company's stakeholders must perceive its strategic significance for the firm.

All categories and types of Decision Support Systems focus on improving the effectiveness of decision-makers rather than on increasing the efficiency of data storage and retrieval. Managers should routinely ask how a proposed computerized Decision Support System would do this? In what ways do any type of computerized support system increase managerial effectiveness? The following are common benefits cited by Steven Alter (1980, pp. 95-106), Udo and Guimaraes (1994), and others for Decision Support Systems:

1. Improve personal efficiency. One of the ways to help people become more effective decision-makers is to help them become more efficient in manipulating data. At a minimum, this should allow a person either to perform the same task in less time or to perform the same task more thoroughly in the same length of time. The result of automating the clerical component of decision-related tasks is often to improve consistency and accuracy, and to allow people to spend more of their time on the substantive rather than clerical aspects of their jobs.

2. Expedite problem solving and improve decision quality. A Data-Driven DSS can provide faster turnaround in retrieving decision relevant information; improve consistency and accuracy; and it may provide better ways of viewing or solving problems. DSS users can obtain answers to non-routine questions more or less immediately. Decision-makers can consider more alternatives. Suggestion DSS may reduce the variability in the application of guidelines and policies. Model-Driven DSS can help managers conduct "what if" analyses and modify their assumptions and scenarios in financial planning. Also,

Group DSS can reduce the length of feedback loops and the need to redo analyses. Problems seem to get resolved faster. Also, some managers perceive DSS provide an "impartial" source of information that encourages "fact-based" decision-making. This perception expedites problem solving.

3. Facilitate Interpersonal Communication. DSS provide users with "tools of persuasion" to help them argue to do something based on analysis or to show that "a good job" had been done. Many types of DSS can provide managers in an organization with a vocabulary and a process for decision making and discussion.

4. Promote Learning or Training. Quite frequently learning occurs as a by-product of initial and ongoing use of a DSS. Two types of learning seem to occur: learning of new concepts and the development of a better factual understanding of the business and decision making environment. Some DSS serve as "de facto" training tools for new employees. Some Suggestion DSS and management expert systems reduce the expertise needed by an employee to perform satisfactorily and help newcomers gain expertise. They also preserve expertise that might be lost through loss of an acknowledged expert.

5. Increase Organizational Control. Some DSS provide summary data for purposes of overall organizational control. Summary data can be monitored, retained and analyzed. Managers need to be very careful about how decision-related information is collected and then used for organizational control purposes. Trying to gain increased control of employee decision behavior can be counter-productive if employees feel threatened or spied upon when they are using a DSS.

DSS can have positive benefits, but DSS can create negative outcomes in some situations. For example, some DSS development efforts lead to power struggles over who should have access to data. Also, managers may have personal motives for advocating development of a DSS. A DSS can increase the "visibility" of its sponsor and have positive rewards if it is successful. Some IS staff support DSS implementations so they can experiment with new technology or expand staff rather than because they believe in the proposed DSS. Isolating and identifying hidden agendas is difficult, but DSS proponents in IS and management must attempt to examine them. The successful development and use of DSS requires that people accept the DSS and that they are motivated to help make the project a success. Hidden agendas can hurt the motivation of all of the people involved in a DSS development project.

Some opportunities are better than others. The key task for managers is understanding new technology and being able to develop only those systems that create positive business results, while rejecting those that use "technology for the sake of technology." Using IS/IT to gain competitive advantage definitely has risks.

VIII. Conclusions and Commentary

Companies must continuously improve their information technology to gain and maintain competitive advantage. Companies that invest significant time and money to achieve an

advantage want a system that has sustainability. When competitors can quickly respond with similar or better systems the result is a higher cost of doing business for everyone involved. To create sustainability, an organization can preempt its competitors by being first to market. This creates surprise, respect, and time advantages. Alternatively, sustainability may be achieved through intimidation. Creating a system that is large, complex, or risky can ward off duplicators. True sustainability can only be achieved through continual development and enhancement of a strategic system.

If managers are trying to develop a Strategic Decision Support System, they should ask how it affects company costs, customer and supplier relations and managerial effectiveness. Managers should also attempt to assess how the Strategic DSS will impact the structure of the industry and its competitors. Organizations should identify their goals, the potential reactions of competitors, and evaluate if the impact of the DSS is good for the industry as a whole or has adverse effects such as, more price sensitivity and lower margins. Ultimately, DSS must be used to gain competitive advantage.

DSS often have positive benefits, so why do some managers resist using Decision Support Systems? Let's examine seven explanations for managerial resistance to using DSS that are cited in the literature. First, managers may have insufficient computer training. Managers are receiving more computer training and new managers are quite sophisticated in their use of computer software. The magnitude of this problem should be decreasing. Second, some managers argue using a DSS will diminish their status and force them to do secretary's work. Using a DSS is not a secretary's work. Companies can not afford to pay two people to do one job. This attitude is counter productive.

Third, using a DSS may not fit a manager's problem solving style, which is sometimes intuitive rather than analytical. While this may be true, managers should use both analysis and intuition in solving problems. Fourth, using a DSS does not fit with the manager's work habits of verbal and non-verbal problem solving in face-to-face meetings. DSS should not and can not replace all face-to-face meetings. Communications-Driven DSS are an adjunct to traditional meetings. Other DSS can often be used in a face-to-face meeting. Fifth, DSS models, interfaces, and systems are usually poorly designed. Poor design is a problem, but not an inherent problem. Managers need to be involved in building DSS and more resources need to be focused on DSS design and development. Sixth, some managers argue building and using a DSS is expensive and time consuming. Building a DSS is expensive and time consuming. Using a DSS does not need to be time consuming or tedious or difficult. DSS can actually save managers time and speed-up decision processes.

Seventh, information overload is a major problem for people, managers already receive too much information and many DSS increase the overload. Although this can be a problem, DSS can help managers organize and use information. DSS can actually reduce and manage the information load of a user.

Many of the seven reasons cited above for not using DSS are excuses and rationalizations rather than meaningful objections. To gain competitive advantage, project champions and DSS developers need to overcome the problems caused by managers who resist the use of Decision Support Systems.

Finally, companies must determine who they want a proposed DSS to support and what result they want from the new DSS. An Inter-Organizational DSS should offer customers value. Value can be improved service, new products, lower product or service costs, or customization. Often these benefits come from an increase in short-term costs of the DSS provider, but this is better than allowing a competitor to lead in technology innovation and jeopardize an organization's market share in the long term.

IX. Audit Questions

1. Does the firm have any Strategic Information Systems?
2. Is IS/IT planning and strategy focused on strategic questions?
3. Is IS/IT used appropriately given the company's situation?
4. Are business processes designed for effective use of IS/IT?
5. Has the corporate culture had a positive or negative impact on the IS/IT strategy the firm is implementing?
6. Has the firm examined its business processes from a customer service and information technology perspective?

Questions for Review

1. What criteria must a Decision Support System meet if we are to conclude it provides an organization with a competitive advantage?
2. What is an example of a DSS that provides a company with a competitive advantage? Define competitive advantage.
3. What are the potential benefits of a Decision Support System?

Questions for Further Thought

1. Why do managers want to create a competitive advantage for their organization?
2. Why do managers investigate information systems and information technologies as potential sources of competitive advantage?
3. DSS can often be very costly to design, build, implement and maintain. The failure rate can be 50% or more for some systems. How much risk should managers accept as they search for a competitive advantage?
4. How can a DSS change the competitive dynamics in an industry? Provide new services? Provide new products?
5. What is the impact of Information Systems and Information Technology on organizations?

An Internet Exercise

Use a search engine and visit the web sites of Frito-Lay, L. L. Bean, and Mrs. Field's Cookies and try to update the information provided in the

chapter. Do their DSS and Strategic Information Systems continue to provide a competitive advantage?

X. Wal-Mart Case Example

Wal-Mart Partners with NCR

Gains competitive edge with new customer preferences data

Wal-Mart partnered with NCR in 1997 to dramatically increase the size and information analysis capabilities of its data warehouse by adding new customer preferences data.

As part of the contract, NCR supplied a WorldMark(TM) 5100M massively parallel processing (MPP) server and upgraded a second installed NCR 5100M from 32 to 96 nodes. The contract also covered NCR professional services, including database design, data transformation and data management, as well as maintenance.

The two WorldMark 5100M servers -- running NCR's Teradata(TM) relational database management system (RDBMS) -- tripled the size of Wal-Mart's existing data warehouse from 7.5 terabytes to over 24 terabytes.

With the increased capacity, Wal-Mart retained its position of having the 'world's largest commercial data warehouse,' with more than 30 applications running on the system and handling as many as 50,000 queries in one week.

"This expansion is part of Wal-Mart's drive to deliver what its customers want: the right item, at the right store, at the right time and at the right price," said Randy Mott, senior vice president and chief information officer for Wal-Mart. "It's the ultimate form of customer service."

"Our business strategy depends on detailed data at every level," Mott explained. "Every cost, every line item is carefully analyzed, enabling better merchandising decisions to be made on a daily basis. It is the foundation for maintaining Wal-Mart's competitive edge and its continuing success in providing everyday low prices and superior customer satisfaction."

That competitive edge and commitment to customer satisfaction is underscored by the unique aspects in Wal-Mart's implementation. For example, although Wal-Mart's data warehouse incorporates information on a nationwide basis, that information can be tailored by store to allow merchandise buyers to gain insight into local purchasing patterns.

"Our extended partnership with Wal-Mart is another significant milestone for NCR," said Bill Eisenman, senior vice president of NCR's Computer Systems Group. "It underscores NCR's commitment to customer service -- as it does Wal-Mart's -- and NCR's expertise in building very large data warehouses to support complex customer information and decision-support systems."

Information stored in the data warehouse -- which is collected from the retailer's 2,900 stores -- will be used to enhance Wal-Mart's Decision Support System, particularly for the retailer's rapidly growing chain of Supercenters and Wal-Mart International units. Using the 65 weeks of data kept by item/by store/by day, Wal-Mart buyers and vendors can query and analyze information to make informed decisions on replenishment, look at customer buying trends around the world, analyze seasonal buying trends, make mark-down decisions, and react to merchandise volume and movement at any time.

The NCR WorldMark servers were installed and upgraded by mid-97. One system is configured with 32 nodes, 256 Pentium Pro 200 processors and 8 terabytes of storage; the second server will be upgraded to 96 nodes, 768 Pentium Pro 200 processors and 16 terabytes of storage. For more historical information, read the [press release](#) from January 9, 1995 announcing "Wal-Mart buys world's largest decision-support system from AT&T".

Wal-Mart (www.walmart.com) also implemented a Strategic Decision Support System called Retail Link. It is an example of an Inter-organizational DSS. Managers at Wal-Mart felt that by integrating their processes and information flows with their suppliers they would bind the suppliers to their organization, resulting in improved revenues for both parties.

In 1991, Wal-Mart launched Retail Link which allows Wal-Mart to collect sales data from various stores, consolidate it into useful reports, and distribute it to suppliers with weekly forecasting information. In addition to forecasting information, suppliers get electronic order forms that help ensure there is an adequate supply of the items that Wal-Mart needs. This system used existing electronic data interchange (EDI) and satellite technologies to create a competitive advantage that other retailer's have tried to mimic but none have replicated. The result of Retail Link is less inventory in stores, more inventory of the right products at the right time and place, improved revenues for both supplier and retailer, and better partner relationships with suppliers.

In 1998, Wal-Mart and Warner-Lambert began using the Internet to communicate interactively about sales forecasts. They have reduced the time a product is in the supply chain by 2 1/2 weeks. That translates into millions of dollars in reduced inventory. Check on the Collaborative Forecasting and Replenishment Initiative (CFAR) website at <http://www.benchmarking.com>.

About Wal-Mart

Well-known as the world's largest retailer, Wal-Mart had annual revenues of over \$104.4 billion for the year ending Jan. 31, 1997, and has more than 2,900 stores and over 700,000 employees. Based in Bentonville, Arkansas, it has pioneered concepts such as Supercenters and its SAM's Club, which is a members-only shopping club that carries products at wholesale prices. A highly successful offshoot of Wal-Mart's traditional retail stores, SAM's Clubs comprise 20 percent of Wal-Mart's business.

More information about Wal-Mart can be found on the World Wide Web at: <http://www.wal-mart.com>.

About NCR

[NCR Corp](#) is a leader in delivering commercial open computer systems for transaction processing and decision-support solutions to customers in all industries. The company, with headquarters in Dayton, Ohio, has 38,000 employees, including 20,000 service professionals in 1,100 locations and 130 countries. NCR solutions help improve businesses by turning customer information into results, protecting existing information technology investments, reducing risks and ensuring success.

More information on NCR can be found on the World Wide Web: <http://www.ncr.com> . NCR WorldMark is a trademark and NCR Teradata RDBMS is a registered trademark of NCR Corp. All other product names are trademarks of their respective holders.

Questions for Discussion:

1. How large is a terabyte? How much processing power is needed to support 50,000 queries a week?
2. Why does Wal-Mart have a data warehouse? Does it provide a competitive advantage? If so, what type of an advantage?
3. What is Retail Link? Who uses it?
4. What does it mean to say the NCR WorldMark server is configured with 32 nodes, 256 Pentium Pro 200 processors and 8 terabytes of storage?
5. Does the NCR website help you understand how a data warehouse is developed?

XI. References

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A special thanks to Nikole Hackett for her contributions updating the status of DSS at many of the companies discussed in this chapter. I would appreciate your comments and feedback. This is a working draft. This chapter may be used for non-commercial or academic purposes during 2000. D. J. Power. August 18, 2000, Email power@dssresources.com.