

# *DSS Theory: What are the advantages and disadvantages of computerized decision support?*

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This question in various forms has been popular in the Ask Dan! email. For example, J. Maclearn asked "What are the advantages and disadvantages of decision support systems?" On a related topic, Wong Soon Chen asked me to justify the statement that "Managers need computerized decision support and supporting technologies to do their jobs better" with relevant facts and figures. Mick Spain wrote "I'm trying to do an academic literature review of decision support systems in general and measuring how they benefit strategic decision making in particular." He requested my comments on the topic and recent references. Lynn Oelke wrote asking "What are the benefits of using DSS for Health Care Administrators?" Rosjalina asked "How can data warehouses benefit organizations?"

A number of Ask Dan! columns have addressed related questions, but now seems like a good opportunity to summarize the advantages and disadvantages of computerized decision support. It is not possible in an Ask Dan! column to cite all of the studies that support the following conclusions, but interested readers are encouraged to check Alter (1980), Power (2002) and Udo and Guimaraes (1994) and review articles that have been published in the Decision Support Systems journal (ISSN: 0167-9236, imprint: NORTH-HOLLAND, began publication in 1985). Let's start with the advantages:

1) Time savings. For all categories of decision support systems, research has demonstrated and substantiated reduced decision cycle time, increased employee productivity and more timely information for decision making. The time savings that have been documented from using computerized decision support are often substantial. Researchers have not however always demonstrated that decision quality remained the same or actually improved.

2) Enhance effectiveness. A second category of advantage that has been widely discussed and examined is improved decision making effectiveness and better decisions. Decision quality and decision making effectiveness are however hard to document and measure. Most research has examined soft measures like perceived decision quality

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rather than objective measures. For example, Hogue and Watson (1983) reported the most important reason managers cited for using a DSS was to obtain accurate information. Studies of model-driven DSS have examined this outcome more than research on other types of DSS (cf., Sharda, Barr, and McDonnell, 1988). Advocates of building data warehouses identify the possibility of more and better analyses that can improve decision making.

3) Improve interpersonal communication. DSS can improve communication and collaboration among decision makers. In appropriate circumstances, communications-driven and group DSS have had this impact. Model-driven DSS provide a means for sharing facts and assumptions. Data-driven DSS make "one version of the truth" about company operations available to managers and hence can encourage fact-based decision making. Improved data accessibility is often a major motivation for building a data-driven DSS. This advantage has not been adequately demonstrated for most types of DSS.

4) Competitive advantage. Vendors frequently cite this advantage for business intelligence systems, performance management systems, and web-based DSS. Although it is possible to gain a competitive advantage from computerized decision support, this is not a likely outcome. Vendors routinely sell the same product to competitors and even help with the installation. Organizations are most likely to gain this advantage from novel, high risk, enterprise-wide, inward facing decision support systems. Measuring this is and will continue to be difficult. For more discussion of this issue read Ask Dan! (Vol. 6, No. 17, July 31, 2005).

5) Cost reduction. Some research and especially case studies have documented DSS cost saving from labor savings in making decisions and from lower infrastructure or technology costs. This is not always a goal of building DSS.

6) Increase decision maker satisfaction. The novelty of using computers has and may continue to confound analysis of this outcome. DSS may reduce frustrations of decision makers, create perceptions that better information is being used and/or create perceptions that the individual is a "better" decision maker. Satisfaction is a complex measure and often researchers measure satisfaction with the

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DSS rather than satisfaction with using a DSS in decision making. Some studies have compared satisfaction with and without computerized decision aids. Those studies suggest the complexity and "love/hate" tension of using computers for decision support.

7) Promote learning. Learning can occur 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. This potential advantage has not been adequately examined.

8) Increase organizational control. Data-driven DSS often make business transaction data available for performance monitoring and ad hoc querying. Such systems can enhance management understanding of business operations and managers perceive that this is useful. What is not always evident is the financial benefit from increasingly detailed data. Regulations like Sarbanes-Oxley often dictate reporting requirements and hence heavily influence the control information that is made available to managers. On a more ominous note, some DSS provide summary data about decisions made, usage of the systems, and recommendations of the system. Managers need to be very careful about how decision-related information is collected and then used for organizational control purposes. If employees feel threatened or spied upon when using a DSS, the benefits of the DSS can be reduced. More research is needed on these questions.

Decision support systems should accomplish a purpose that is valued in an organization, but in addition it is important to examine the impact of computerized decision support from individual, group and organizational perspectives. I am a computerized decision support "evangelist". I have concluded based upon experience and research that DSS when appropriately implemented and used can provide individuals, groups and organizations with advantages and benefits. I have been spreading the word about computerized decision support for more than 30 years, but I have tried to remain objective and balanced in my writings and research. In that spirit, let's examine "the dark side", the disadvantages of computerized decision support.

DSS can create advantages for organizations and can have positive

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benefits, but building and using DSS can create negative outcomes in some situations. For example, some data-driven 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 specific DSS that harms other managers or the organization as a whole. My discussion of disadvantages builds upon the work of Klein and Methlie (1996, p. 172-181) and Winograd and Flores (1986). The following are eight disadvantages:

1) Overemphasize decision making. Clearly the focus of those of us interested in computerized decision support is on decisions and decision making. Implementing DSS may reinforce the rational perspective and overemphasize decision processes and decision making. It is important to educate managers about the broader context of decision making and the social, political and emotional factors that impact organizational success. It is especially important to continue examining when and under what circumstances DSS should be built and used. We must continue to ask if the decision situation is appropriate for using any type of DSS and if a specific DSS is or remains appropriate to use for making or informing a specific decision.

2) Assumption of relevance. According to Winograd and Flores (1986), "Once a computer system has been installed it is difficult to avoid the assumption that the things it can deal with are the most relevant things for the manager's concern." The danger is that once DSS become common in organizations, that managers will use them inappropriately. There is limited evidence that this occurs. Again training is the only way to avoid this potential problem.

3) Transfer of power. Building DSS, especially knowledge-driven DSS, may be perceived as transferring decision authority to a software program. This is more a concern with decision automation systems (check [DecisionAutomation.com](http://DecisionAutomation.com)) than with DSS. I advocate building computerized decision support systems because I want to improve decision making while keeping a human decision maker in the "decision loop". In general, I value the "need for human discretion and innovation" in the decision making process.

4) Unanticipated effects. Implementing decision support technologies

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may have unanticipated consequences. It is conceivable and it has been demonstrated that some DSS reduce the skill needed to perform a decision task. Some DSS overload decision makers with information and actually reduce decision making effectiveness. I'm sure other such unintended consequences have been documented. Nevertheless, most of the examples seem correctable, avoidable or subject to remedy if and when they occur.

5) Obscuring responsibility. The computer doesn't make a "bad" decision, people do. Unfortunately some people may deflect personal responsibility to a DSS. Managers need to be continually reminded that the computerized decision support system is an intermediary between the people who built the system and the people who use the system. The entire responsibility associated with making a decision using a DSS resides with people who built and use the system.

6) False belief in objectivity. Managers who use DSS may or may not be more objective in their decision making. Computer software can encourage more rational action, but managers can also use decision support technologies to rationalize their actions. It is an overstatement to suggest that people using a DSS are more objective and rational than managers who are not using computerized decision support.

7) Status reduction. Some managers argue using a DSS will diminish their status and force them to do clerical work. This perceptual problem can be a disadvantage of implementing a DSS. Managers and IS staff who advocate building and using computerized decision support need to deal with any status issues that may arise. This perception may or should be less common now that computer usage is common and accepted in organizations.

8) Information overload. Too much information is a major problem for people and many DSS increase the information load. 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. DSS developers need to try to measure the information load created by the system and DSS users need to monitor their perceptions of how much information they are receiving. The increasing ubiquity of handheld, wireless computing devices may exacerbate this problem and

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disadvantage.

I briefly identified advantages and disadvantages of data warehouses in DSS News, Vol. 1, No. 7 in July 31, 2000. I have also discussed unintended negative consequences of DSS (Vol. 4, No. 8, April 13, 2003), rational thinking (Vol. 5, No. 21, October 10, 2004), sustainable competitive advantage (Vol. 6, No. 17, July 31, 2005), cognitive biases (Vol. 6, No. 20, September 11, 2005), and how use of a Communications-Driven DSS impact a decision-making meeting (Vol. 7, No. 4, February 12, 2006).

As always, your comments and suggestions are welcomed.

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