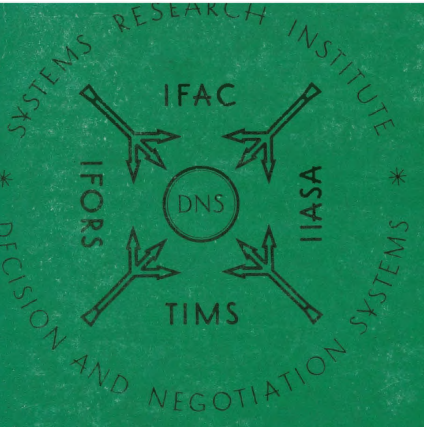


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# SUPPORT SYSTEMS FOR DECISION AND NEGOTIATION PROCESSES

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# ORGANIZATIONAL DECISION SUPPORT SYSTEMS: CENTRALIZED SUPPORT FOR DECENTRALIZED ORGANIZATIONS

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**Abstract**: Organizations are becoming increasingly decentralized in their operations and decisionmaking. Advanced information technologies provide the glue that holds such organizations together and facilitates their operations. Organizational decision support systems (ODSSs) provide mechanisms for the assuring that the decisions being made throughout such organizations are consistent with each other and with the overall organizational goals. Through means of an ODSS, information and guidance is automatically passed from higher levels to lower levels for use in decisionmaking models.

**Keywords**: Information systems, models, decisionmaking, organizations

## Organizational Decision Support Systems

As the pace of technology change continues unabated into the 1990's, the focus is shifting from office automation and traditional computer applications to the development of tools to use the enormous potential of technology to increase the speed and the quality of organizational decisionmaking. One such tool is the decision support system (DSS).

Early descriptions of DSSs were based on the paradigm of a single decisionmaker at a stand-alone terminal or microcomputer who had a specific decision to make. However, recent advances in computer technology, information systems, and telecommunications (which, taken together, I will refer to as information technology [IT]) have made it possible to broaden the scope of a DSS to include organizational units and even entire organizations. In fact, some computer system designers and theorists have begun to characterize certain technologies as "groupware"--hardware and software complexes that are designed from the perspective of the role they will play in the dynamics of action and coordination among a group of people working in interaction with one another. The actors may act autonomously, but they are interdependent and are working towards mutually defined

goals. In the case of an organizational DSS (ODSS), these goals are the goals of the organization.

Organizations have been evolving to take advantage of the capabilities offered by IT, and conversely, IT has facilitated dramatic changes in how organizations operate. The multinational corporations of the 1970's, which were really separate companies loosely coupled at the top, have given way to truly integrated global corporations, structured as a global web of operations instead of a multinational pyramid. According to Eom (1990), the global corporation "does research wherever necessary, develops products in several countries, [and] promotes key executives regardless of nationality." But, although decentralized, it is fully integrated in all its activities, including product design, fabrication, accounting, marketing, and finance. In fact, many successful companies now are facades "behind which teems an array of decentralized groups and subgroups continuously contracting with similarly diffuse working units all over the world... The threads of the global web are computers, facsimile machines, satellites, high-resolution monitors, and modems--all of them linking designers, engineers, contractors, licensees, and dealers, worldwide" (Reich, 1991). So, IT makes such an organization possible. Organizational decision support systems help make it successful.

An ODSS is a decision support system that is used by individuals or groups at several workstations in more than one organizational unit, who make varied (interrelated but autonomous) decisions using a common set of tools. It is designed to coordinate and disseminate decisionmaking across functional areas, hierarchical layers, and geographically dispersed units.

The three basic components of an ODSS are the same as those of a traditional DSS (TDSS), although there may be differences in how the components are designed and used. They are the user (and dialog management), models (and a model management system), and data (and a database management system). An ODSS includes two additional components: a case management system, to facilitate assembling and cataloguing the input data for model runs and to keep track of the output from the runs, and a communications system that allows the users to communicate and cooperate with each other and with the models and data in the process of organizational decisionmaking. Figure 1 illustrates the components of an ODSS and their interrelationships.

Although ODSSs have much in common with TDSSs, they are not simply larger. There are many substantive differences, which lead to important differences in how

they should be designed, developed, and maintained. (These issues are covered in some detail in Carter, Murray, Walker, and Walker (1992).) Among these differences are:

- *Purpose.* The primary purpose of a TDSS is to improve the performance of an individual decisionmaker; an ODSS is intended to improve the efficiency and effectiveness of organizational decisionmaking.
- *Politics.* A major difference between building a TDSS and building an ODSS is that in the former, individuals must be sold the system; in ODSS development, organizations must be sold the system.
- *Approach to Building.* Because of its size, complexity, and organizational impact, building an ODSS is a much more significant undertaking than building a TDSS. It requires a large, structured project and a clearly defined process. The preferred approach, however, is different from the System Development Life Cycle approach used to build most large management information systems. (For a description of the preferred approach, see Carter, Murray, Walker, and Walker (1992).)
- *Focus on Functions.* the focus in the development of a TDSS is usually on the individual decisionmaker, while the focus in the development of an ODSS is on the functions to be performed. The ODSS is part of a a unified, organizational approach to problem solving. It must, therefore, be designed with a consistency and unity that is inconsistent with a focus on individuals.

**Centralized Support For Decentralized Organizations**

Advanced information technologies provide the necessary mechanisms for decisionmaking in decentralized organizations. Geographically dispersed lower- and middle-level managers can use computer-assisted communication technologies to stay informed about the organization's overall situation and about its current problems, policies, and priorities. As a result, these managers can make better, less parochial decisions than they could if such technologies were not available.

According to Huber (1990), in large organizations high-level managers are encouraging the decentralization of decisionmaking because of their "desire to decrease the time for organizational units to respond to problems or the desire to

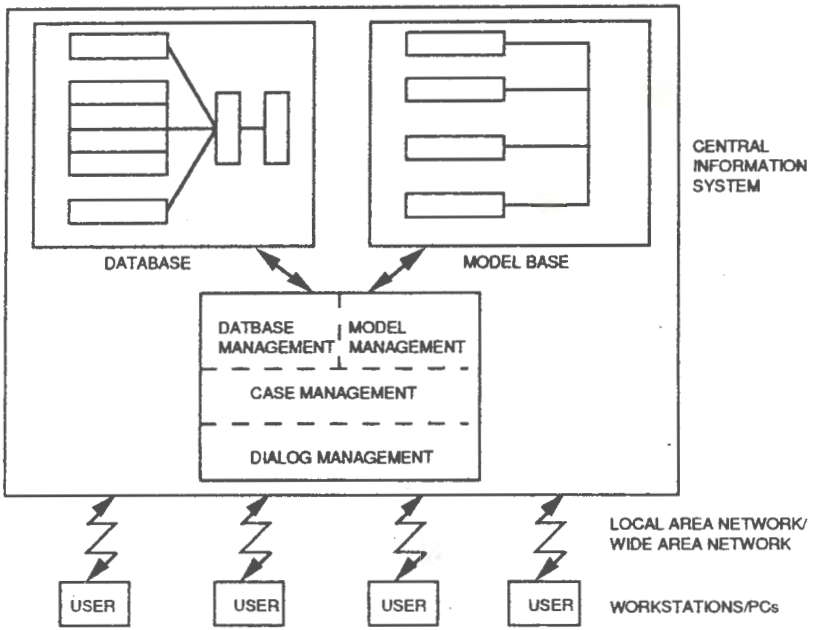


Fig. 1--Components of an organizational decision support system

provide autonomy for subordinates." After observing the implementation of networked personal computers in the General Motors' Environmental Activities Staff, Foster and Flynn (1984, pp. 231-232) concluded that "from the former hierarchy of position power there is developing instead a hierarchy of competency... Power and resources now flow increasingly to the obvious centers of competence instead of to the traditional hierarchical loci."

Placing responsibility and authority in the hands of those at the working level, who have knowledge and enthusiasm for the tasks at hand, can be very rewarding for the organization. But, it can also be very risky. The lower-level managers need direction and guidance. There must be a mechanism for assuring that the decisions being made by the many different persons in the many different locations are consistent with each other and with the overall goals of the organization. An organizational decision support system provides such a mechanism.

The way an ODSS can accomplish this involves taking advantage of several of the benefits of advanced information technologies in combination, including the ability for geographically dispersed individuals to access the same databases, the rapid transmission of information, and the ubiquity of microcomputers. In this setting, high-level managers use aggregate models for making decisions that reflect overall organizational goals and that provide guidance to lower level managers. The resulting information and guidance do not dictate the decisions to be made by the lower-level managers, but they limit the options that are available them. These parameters (e.g., costs, targets, constraints) are instantly and (if desired) automatically passed to the lower levels through the ODSS database. The models that the lower level managers use for their decisionmaking will then take these parameters into account, and will produce results that are consistent with them. As a result, the lower-level managers throughout the organization are given considerable freedom to make decisions in their areas of responsibility, but will make decisions that reflect a shared vision, shared goals, and common purpose. This process is analogous to the way George Dantzig (1963, p. 462) envisioned the decomposition principle of linear programming being used for "central planning without complete information at the center."

Some researchers (see for example, [Kaula and Dumdum, 1991] and [King and Star, 1990]) argue that an ODSS should be designed using an "open system" architecture, in which each user's autonomous subsystem would communicate with the others and would share data, but there would be no attempt at global consistency. "Consequently, there is perpetual inconsistency and incompleteness among various subsystem knowledge bases" [Kaula and Dumdum, 1991, p. 169]. It is certainly difficult to build a consistent system. But, before a decision is made, the costs and benefits of the alternative approaches should be considered.

The tradeoff among alternatives depends to a large extent on whether the decisions being made are tightly or loosely coupled. As discussed by Swanson [1990], if the decisions are tightly coupled, each decision tends to be highly constrained by one or more of the others, and global consistency is highly desirable. In contrast, where decisions are loosely coupled, few such constraints tend to exist, and a more open system would be suitable. Tightly coupled decisions are more likely in pyramidal organizations, such as the Air Force. Loosely coupled decisions are more likely in an environment of voluntary bottom-up collaboration, such as in a brokerage house.

In any event, it is not an all or nothing decision. There will always be areas in which users operate with their own programs and data. The ODSS focuses on those functions and databases for which global consistency is important. The remaining functions and databases can be viewed as being autonomous TDSSs that are loosely connected for purposes of sharing information (with no guarantees concerning the quality of that information). Global consistency does not mean tight central control. Each user has the autonomy within his area of responsibility that he always had. But he is supplied with the guidance (and data and models) to enable him to operate effectively and efficiently while making decisions that are consistent with the goals of the organization.

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