

Chapter 7

Implementing Communications-Driven and Group Decision Support Systems

INTRODUCTION

Globalization and computing technologies have expanded product markets and changed business organizations. One change is that companies have become more geographically dispersed, and this has created new challenges for managers. Also, changes in organizations and changes in the nature of the work performed by teams have increased significantly the importance of effective teams. The concept of business relationships is also changing. Relationships between people inside an organization and people previously considered outside like customers, suppliers, and other stakeholders are increasingly important.

Because of these changes, many organizations have discovered the value of collaborative work. Also, there is an increased emphasis on computer-supported business decision processes. Many companies want to make the knowledge of managers and experts available to those who could benefit from that knowledge.

The interaction of these various forces has resulted in an increased use of participatory decision making, temporary teams, and technology to support geographically dispersed teams. Work groups, task forces, and teams have become important means to improve the performance of organizations. For some groups and teams, Group Decision Support Systems (GDSS), groupware, and other communication and collaboration tools can improve the performance of team members.

For all of the above reasons, managers are implementing communications-driven DSS. Because communications-driven DSS are usually purchased, rather than developed in-house by companies, the focus in this chapter is on how products are implemented and used, rather than on building a proprietary group support system. This chapter emphasizes the various categories of group decision support situations, specific examples of group decision support tools, a managerial perspective on group decision support, a contingency theory of

group support, the benefits of GDSS, the evolution of so-called virtual organizations, and evaluating communications and group support tools. A good starting point is to review key terms.

KEY TERMS

Managers spend a significant amount of time working with other managers and staff in teams and work groups. Cross-functional business teams, project teams, new product teams, and even crisis management teams operate in businesses today. Many of these groups use e-mail, bulletin boards, and groupware systems. Group support systems, video conferencing, and GDSS are especially valuable in helping teams where members are geographically separated or where they cannot meet face-to-face. GDSS also have been shown to improve the effectiveness and productivity of some types of face-to-face meetings.

Meetings can now occur when participants are separated by distance and computer-supported meetings can occur at various times or asynchronously. Full-motion video, audio, and Web-based meeting tools support these electronic meetings or e-meetings. The business and social changes created by implementing these tools to support group communication, collaboration, and knowledge sharing are many. One set of significant changes that has resulted from implementing collaborative computing technologies is the creation of virtual organizations.

Communications-driven DSS is a category of DSS that uses network and communications technologies to facilitate collaboration, communication and shared decision-making support. Communications technologies are central to supporting decision making and provide the dominant decision support functionality. A simple bulletin board or threaded e-mail is the most elementary level of functionality. Communications-driven DSS are multiparticipant DSS that enable two or more people to communicate with each other, share information, and coordinate their activities.

A number of terms are used to describe software that supports groups in decision-making and knowledge-work tasks. Some examples include electronic meeting system, collaborative workgroup software, groupware, and GDSS. All of these terms refer to tools intended to help members of a group make better decisions and perform tasks better than they could working alone without computer support. All of these technologies can be incorporated in a communications-driven DSS.

Groupware is any software that can be used to support and assist groups in completing tasks. Groupware helps users coordinate and keep track of ongoing projects and tasks. Such applications are not meant to replace people in an interactive situation; rather, groupware refers to tools that extend or enhance collaboration. Groupware products are very different from single-user decision support applications.

GDSS are a hybrid type of DSS that allows multiple users to work collaboratively using various model-driven software tools. GDSS are

specifically designed to support a group rather than an individual. DeSanctis and Gallupe (1987) defined a GDSS as “an interactive computer-based system to facilitate the solution of unstructured problems by a set of decision-makers working together as a group.” GDSS provide software tools to assist communication, collaboration, and decision making in groups. GDSS are often used in a decision room which is a specially arranged room designed for computer supported meetings. In the room, computer workstations are available for use by meeting participants. A facilitator helps the participants use the GDSS and manages the use of the system. The objective for using a decision room is to enhance and improve a group’s decision-making process and the quality of its decisions.

A term that overlaps communications-driven DSS is “multimedia decision support.” Multimedia decision support refers to the integration of video, computer, and decision-support technologies to help decision makers. In multimedia decision support, a decision makers’ actions, choices, and decisions affect the way in which the group interaction occurs, the information that is reviewed and discussed, the analyses that are performed, and the actions that are agreed upon. Company intranets provide a viable, affordable delivery mechanism for the deployment of multimedia decision support applications to a manager's desktop and to decision rooms.

The Web and intranet infrastructures are important factors enabling development of more powerful communications-driven DSS. The most powerful group support software is now based on these communications technologies. Communications-driven DSS software has at least one of the following characteristics: it enables communication between groups of people; it facilitates the sharing of information; it supports collaboration and coordination between people; and/or it supports group decision tasks.

GROUP DECISION SUPPORT SITUATIONS

Situations that might benefit from communications-driven decision support can be analyzed in terms of time and place. Traditionally a 2 by 2 matrix is used to represent the four possible situations with the time dimension running on the Y-axis and the place dimension running along the X-axis. Table 7.1 categorizes GDSS, groupware and other communications tools by time and place of use. The four situations include: same time/same place, same time/different place, different time/same place, and different time/different place.

In same time or real time meetings, communication occurs at the same time for all participants. In different time or asynchronous time meetings, communication occurs at different times. In same place meetings, people meet in the same room. In different place meetings, a meeting occurs and participants are in geographically distributed locations. In real time meetings, we try to establish a WYSIWIS (What You See Is What I See) interaction. This concept is analogous to having two people at their own homes watching the same television show at the same time. Computer technologies, especially video

conferencing, chat, and tools like Microsoft NetMeeting extend this concept and allow people to interact and communicate in a WYSIWIS environment.

	Same Place	Different Place
Same Time	Decision rooms Computers with projector displays Voting tools	Two-way video Audio conferencing White boards Screen sharing Chat
Different Time	Workstation software for shift work Document sharing	Conferencing Bulletin boards Email Voice mail

Table 7.1 Four Combinations of Group Decision Support

Same Time and Same Place

In this situation, support at the low end of the technology spectrum includes tools like computer projection systems that display computer images on a traditional white screen. On the high end are meeting rooms where each person has her own computer with appropriate software to assist during a meeting.

Same Time and Different Place

Studying same time and different place situations is an important research area. We need to understand how technology can support the growing business need for remote meetings. Shared workspaces are one such technology that is based on the concept of WYSIWIS. The idea is to allow people in geographically distributed locations to work together at the same time and see what other participants are doing. Video teleconferences allow participants to see and hear each other across great distances and give users more of a feeling of being in the same meeting room as the other participants. In a video conference, participants can observe the facial expressions and body language that accompanies what participants hear. Video conferences are a richer communication channel than audio or text-based interactions. A multiparticipant video conference can provide support of a meeting where some participants are located at a distance from others. Time-zone differences can, however, become an issue in scheduling meetings of this type. Microsoft NetMeeting supports video conferencing and has groupware capabilities.

Flagstar Bank (FSB) won the 1997 *Computerworld* Smithsonian Award for its use of information technology in the Finance, Insurance, and Real Estate category. Flagstar Bank’s Lenders’ Interactive Video Exchange (LIVE) project

used Intel ProShare conferencing systems with automated underwriting DSS technologies. With LIVE, a homebuyer at a branch bank and a loan underwriter at the central bank location can meet face-to-face using interactive video and get loans approved within an hour. Usually, the loan approval process takes weeks, and the prospective homeowner has no contact with the person who makes the decision.

Different Time and Same Place

Managers sometimes need to share information with a manager who worked on a prior shift. They need to investigate how computer software can support existing administrative, sequential, decision making, and information filtering needs. Some groupware systems attempt to help managers make smooth transitions in shift work situations at places like hospitals and factories by facilitating group memory and charting progress so that there is a quick and smooth transition from one shift to the next.

Different Time and Different Place

Some managers need to collaborate over large distances and across time zones. The need for research in this group situation is increasing because of an ongoing need for more coordination between geographically dispersed team members. Group voice mail, e-mail, fax, conferencing software, internets/intranets, and hypermedia allow users to communicate at different times even though they are in geographically distributed locations.

Buckman Laboratories, an industrial chemical company based in Memphis, Tennessee, has over 1200 employees around the world. The concept of sharing knowledge and best practices has been a concern at Buckman for many years. Buckman has a knowledge transfer system called K'Netix, the Buckman Knowledge Network. When employees need information or help, they just ask for it via forums, which are Buckman-only on-line forums. Conversations are the basis for transferring knowledge around the company. So, the important conversations are captured. Volunteer experts identify the conversations that contain valuable information and, more importantly, valuable streams of reasoning. These are then edited to remove extraneous material, given key words, and stored in the forum library. This system combines document and communications-driven DSS.

A business team or task force may need communications-driven decision support in all four of the above situations.

COMMUNICATION AND GROUP SUPPORT TOOLS

Communication technologies can be used to support many different purposes in companies. It has become important to manage and support communications among team members as well as communication between the organization and its stakeholders, like customers and suppliers. Creating an

integrated communications-driven DSS strategy, which addresses all these needs, is important.

Multiparticipant systems like group and interorganizational DSS create complex implementation issues. Networking issues create challenges for many types of DSS, but especially for systems with many participants. An enterprise-wide DSS grows and inevitably becomes a major part of the overall information systems infrastructure. One can identify four communications-driven DSS architectures: decision rooms, local decision networks, teleconferencing, and remote decision making (cf., DeSanctis and Gallupe, 1985). Some architectures seem to work best for ongoing decision support and others are limited to groups where member are in close physical proximity to each other (see Figure 7.1).

When group members are in close proximity, and ad hoc or one-time decision support is needed, then a decision room with a GDSS is the best choice. When ongoing support is needed, decision support with a local area network with groupware or a GDSS often has advantages over repeated use of the decision room. When group members are widely dispersed, video conferencing decision support can provide participants needed face-to-face interaction. When the support needed is more ongoing, then it may be advantageous to use a Web-based communications-driven DSS. The following paragraphs explain in more detail group DSS, groupware, and video conferencing.

Group Decision Support Systems

GDSS aid groups, especially groups of managers, in analyzing problem situations and in performing group decision making tasks. Common GDSS components include: an agenda tool; a whiteboard, an opinion meter, an idea categorizer, electronic brainstorming, a group outliner, a topic commenter, voting tools, a survey tool, and alternative analysis tools.

In a GDSS you can create an agenda with a listing of the activities you want to accomplish, such as brainstorming, categorizing ideas, and voting. GroupSystems, a GDSS product, offers a variety of voting methods including Yes/No responses, rank ordering alternatives, True/False responses, and rating on a 10-point scale.

Electronic Brainstorming is the most popular GDSS tool. Meeting participants are given stimulus questions like “What are possible new products our customers might buy?” All participants concurrently respond to the question for a fixed period of time, usually about 10 minutes. A participant types in an idea, anonymously submits it, and then types in another.

People from outside of a company can participate using GDSS. They can come to a company’s group decision room or participate remotely using a Web-based GDSS. People unfamiliar with GDSS should visit GroupSystems at <http://www.groupsystems.com>. According to their Web site, the ability to help a group develop consensus is one of the key features that distinguishes GroupSystems from data-sharing software such as Lotus Notes or conferencing programs.

GDSS have lost some of the excitement they generated in the early 1990s, but a number of organizations still actively use decision rooms, including: Air Force Innovation Center, IBM Global Services, SABRE Group, and Southern New England Telecommunications.

Groupware

Computer conferencing provides meeting participants with connectivity and with a database of comments and interactions. Electronic bulletin boards are a simple type of groupware. Email is also a groupware tool. Other capabilities of groupware software includes information sharing, joint document authoring, shared calendars, and project management. Groupware provides support for communication and collaboration among group members, and it provides coordination for group tasks.

A conferencing or messaging system or what is also known as a bulletin board is a widely used communication support tool. It allows posting of messages that can be read and responded to by team members and meeting participants at any time. A conferencing system can be searched for content, sender, and date. Also, posted articles or messages can have embedded hyperlinks. Most conferencing systems can have any number of topics or forums.

Most managers use some type of electronic mail. An electronic mail facility is needed to provide one-to-one message transfer among team members. Some systems are better than others, but e-mail remains an important communication and collaboration tool.

A chat tool is also sometimes useful. A chat tool provides real-time text-based communication among participants. People can type in a message, and they can “chat” with others in the chat session.

An interesting meeting support tool is a whiteboard. A whiteboard allows for real-time communication among meeting participants, using a graphical drawing or painting interface. A person draws on the whiteboard and all other participants “see” what is drawn on their computer screens.

Most groupware programs let users transmit e-mail, but they also tend to have such features as group calendars, databases and message boards. Groupware programs let users check other staff members’ schedules in order to plan meetings. One of the biggest strengths of groupware programs is their messaging capability.

Video Conferencing

AT&T demonstrated the first Picture Phone at the 1964 World’s Fair in New York and in 1970 AT&T offered its Picture Phone for lease at \$ 160 per month. In the next 15 years, developments in interactive video seemed to stagnate. In September 1992, CU-SeeMe was introduced for the Macintosh and in December 1996 Microsoft NetMeeting with video was released. Today,

interactive video is supported by a number of vendors. For example, Microsoft's NetMeeting software is available for use on LANs and the Internet. There are also dedicated video conferencing systems from a number of vendors like Polycom and Intel that can support same time/different place meetings with full-motion video.

Video conferencing decision support is designed to assist when business operations are widely dispersed. Current technology supports two distinct types of video conferencing. One type links one personal computer to another and allows two people to interact. The second type supports multiple individuals or individuals and groups in conference rooms or at PC's. A video conference room has a large video display, multiple microphones, and high-speed transmission of video images.

The most important factor to consider in choosing between video conferencing systems is the quality of the audio. Out-of-sync and poor quality audio is unacceptable. Audio must provide rich and fully synchronized sound for participants.

Video conferencing and Web-based tools can potentially speed up decision making while reducing time and other costs for meetings. Also, video conferencing with Web-based tools can provide managers access to computer-based resources and Web-based materials during meetings. Video conferencing for decision support makes it possible to involve more people in decision meetings and it may reduce the stress associated with travel. This type of decision support is, however, inappropriate when there is insufficient network bandwidth.

A MANAGERIAL PERSPECTIVE ON COMMUNICATIONS-DRIVEN DSS

Using alternative communications media raises very different sets of questions for managers. The important task for a manager who is implementing communications-driven DSS is to ask relevant questions related to how a proposed technology can support a decision group or work team. Let's examine some questions that should concern managers about group decision support technologies.

Bulletin boards and Web-conferencing. Is a threaded discussion forum needed for posting questions and comments? Will managers use the technology? If so, how can a team leader encourage an interesting and engaging conversation among people who don't access comments at the same time? How does a team leader know when it's time to make a decision and when there is consensus about a choice? How does a team leader deal with conflict when everyone is participating at different times? What is the virtual equivalent of eye contact? How can participants build a culture that will support a distributed decision-making process?

Document sharing. Do managers need to collaborate on documents and other files from distributed locations? Will document sharing help or harm relationships and trust among team members? Does document sharing help or

hurt team building? Is document sharing different for internal and external users? What happens when a document is incorrect? Who's responsible?

Electronic mail. Are managers currently using e-mail? What norms need to be established for things like response time and whether e-mail can be forwarded to others? What norms are important about who gets copied on e-mail messages and whether or not there are blind copies? How does the style of e-mail messages influence how people feel about the team? How does a team leader discourage "flaming" or the sending of harsh and inflammatory messages?

GDSS and computer-supported face-to-face meetings. If one holds such a meeting supported by GDSS, how does the ability to contribute anonymous input affect the team? How can one test whether consensus in the group is meaningful or an artifact of the computer-supported session? How much training is needed? How much will the software be used?

Interactive video. In a decision conference with video conferencing, will participants feel comfortable with being on TV and being recorded? How can one manage a meeting with multiple remote participants at different locations to make sure that everyone has a chance to be heard? How much training is needed for a team leader and for team members?

The overriding question facing managers is "What group communication and collaboration support tools are appropriate or 'best' in a given situation?" In some ways, even this question is becoming less important because all of the above tools are converging in an integrated group support product. Having an integrated group support tool set will let participants choose different tools during a meeting without needing to change the software meeting environment.

A CONTINGENCY THEORY

Communications-driven DSS address a number of problems associated with group communication and group decision making. The most basic systems address the problems of communication barriers and emphasize improving communication, idea formation, discussion, and messaging. More sophisticated systems add decision-support modeling and group decision techniques to enhance the system. The most sophisticated systems provide for automated group communications, as well as include capabilities for selecting and arranging rules for a meeting.

Research suggests that a meeting supported by a GDSS can improve productivity of participants and result in more ideas (cf., McGoff, Hunt, Vogel, and Nunamaker, 1990; Gray and Nunamaker, 1996). The effectiveness of a GDSS is a function of the design of the software, the composition and skills of group members, the task that is being supported, and the context of the meeting. Context refers to situational factors like the meeting room design, time pressures, and experience of and use of a facilitator.

Intuitively, we know that no one set of tools or processes is best in all group decision-making circumstances. DeSanctis and Gallupe (1987) presented a typology with three dimensions that they argued are crucial for designing or

choosing group support software. The three dimensions are task type, group size, and group proximity.

Task Type

The particular group task is an important factor to consider in communications-driven DSS and GDSS evaluation and selection. The attributes of the task determine the need for information and the communication practices in the group. Group goals and tasks include:

- Generating ideas and actions, includes planning and creativity tasks.
- Choosing alternatives, includes intellectual tasks like choosing the right answer, and preference tasks.
- Negotiating solutions, includes resolving differing viewpoints as well as dealing with conflicting motives.

Group Size

Very small groups of 2 to 3 members that can meet face to face generally do not need extensive support from computerized tools. Very large groups may need much more sophisticated decision support tools than medium sized groups. The experience of group members with computerized tools also appears to impact performance with them. Some tools can be learned much more quickly than others.

Group Proximity

Decision room groups that can meet at the same time and same place probably do not need as many communication and decision-aiding tools as distributed groups that are meeting at different times and in different places. When groups are in close proximity, they can use synchronous decision support, like a decision meeting room, or asynchronous decision support, like email or bulletin boards. When group members are widely dispersed, video conferencing or interactive Web-based conferencing can provide synchronous support and the same asynchronous tools can support widely dispersed groups.

Task Type and Media Type

As mentioned in an earlier section, a wide variety of tools can support group communication and collaboration. A number of studies have examined the relationship between task type and media type. Hollingshead, McGrath, and O'Connor (1993) explored the relationship between communication technology and group task performance. They found that the amount of experience with the computer technology and the group membership had a larger impact on performance than task type. The task/media fit model (Daft and Lengel, 1986) was generally supported. Table 7.2 summarizes current thinking about what media best fits which types of decision tasks. In general, computer-mediated

communication is a good fit for generating ideas and plans. Negotiating conflicts of interest should be done face-to-face, and computer support is not necessarily helpful.

	Asynchronous Decision Support	Synchronous Decision Support	Face-to-Face Meetings
Generating ideas and actions	More ideas Experienced users satisfied	More ideas Experienced users satisfied	Acceptable
Choosing alternatives	Good for rating and ranking by experienced users	Good for rating and ranking	Can be more time consuming
Negotiating solutions	Hard to conduct negotiations	Possible with interactive video and white board	Preferred approach

Table 7.2 A Matrix of Task Types and Media Types

In general, communications-driven DSS are most successful when the people who do the work to support the system are hired for that purpose or are beneficiaries of the system. For example, the automatic meeting and scheduling feature of an electronic calendar is not always used in companies. The immediate beneficiary of the system is often the manager or secretary who initiates a meeting. Group members must do additional work to enter their schedule information so they may resist using the application. The primary beneficiary of most project management applications is the project leader or manager. Other team members must enter considerable information about their tasks and completion times. If team members are rewarded for entering information, the quantity and quality of information entered will increase over a period of time.

In order to have productive conversations among members of virtual teams, you need to create a common or shared understanding for the group. Group support systems succeed when managers, developers, and users adhere to social conventions. For example, in a Group DSS the explicit record of opposing positions may be politically unacceptable to some managers. If so, the information should not be recorded.

Communications-driven DSS succeed when their use is built around specific structured work procedures that allow or even encourage exception handling and task modification. For example, arrangements that are in the best interest of a group may not be compatible with the structure, procedures, and processes imposed by a group support system. Unless the system is strongly supported by senior management, the system will not be used because it is not compatible with the group's preferences and procedures.

GROUP DECISION SUPPORT SYSTEMS BENEFITS

One of the best-known GDSS is a product called GroupSystems. The product was initially developed at the University of Arizona; currently GroupSystems is marketed by a company called GroupSystems (check <http://groupsystems.com>). It is used at a number of corporations, government agencies, and universities. A computer-supported meeting room is typically set up with a workstation computer for each participant in the meeting. A large public screen provides viewing of shared information for participants in the meeting. The computer hardware is connected by a local area network (LAN). Meeting software provides support for creating an agenda, generating ideas, organizing ideas, evaluating and rating ideas, and other group-decision tasks. Each participant in a face-to-face computer-supported meeting can use the software concurrently and, if desired provide input anonymously. Also, voting and rating of ideas usually occurs anonymously in GDSS.

McGoff and his colleagues (1990) reported success with the use of the GroupSystems application at IBM. The most prominent benefit reported was saving an estimated 56 percent in work/meeting hours. Their research estimated that the savings were so great that the return on investment for a decision room was one year. Computer-supported meetings seem to be helpful in keeping a meeting on track and on reducing the amount of unrelated discussions about outside issues. IBM was also able to resolve issues in a shorter time span, because meetings were longer in length but fewer in number, allowing problems to be resolved faster.

Anonymity of participants resulted in many positives in the IBM research studies. First, there was greater participation. The increased participation rate carried over into the work culture with members approaching their leaders more often to stay involved with related issues. Also, there was less group think (Janis and Mann, 1977). The system was designed with an easy-to-use graphical interface; thus, low levels of computer literacy did not deter use of the system. According to McGoff et al., the most surprising benefit of the software was the uses of the session data after a meeting. This data was used to support managerial decisions, to document future sessions, in presentations and project management workshops, for technical reviews, and in bimonthly meetings to keep the group focused on the project until completion.

Jessup and Valacich's (1993) book *Group Support Systems* reports many experimental and field studies on group support technologies. The research paints a "rather cloudy picture," but in "most field research, GSS use appeared to improve meeting outcomes such as performance, efficiency, and satisfaction" (p. 73).

Many companies created decision rooms in the late 1980s and early 1990s. For example, managers at Marriott reported that in the first 2 months of use, 1,000 people used the new meeting room for generating ideas. Boeing used a version of Ventana GroupSystems and claimed that using a group support system reduced the total time spent in meetings by 71 percent. Team projects involving meetings at Boeing were also accomplished more quickly by using

computer support. GTE used GroupSystems.com's products to generate ideas. Agilent Technologies recently migrated from GroupSystems to GroupSystems OnLine. According to a vendor case study, the result has been an increase in the sharing and capturing of knowledge as well as an increase in productivity. Agilent has customized planning and project management methodologies built on GroupSystems to meet various department needs.

Before communications-driven DSS are implemented, it is essential that management support its use. If top management does not believe GDSS, groupware and communications-driven DSS will benefit the organization, it will be difficult to persuade people to use the system. However, if management is behind the implementation and use of the new tools, several positive effects may be noticed. First, when group support is introduced in a company, it should increase the productivity of its users. This occurs because an increased amount of work can be accomplished in shorter amounts of time and because of enhanced communication between employees. Second, group support software facilitates teamwork through open communication. Third, some groupware products help document important work information in a convenient location. Finally, communications-driven DSS can enhance communication between upper management and the rest of a company's employees.

According to many proponents of computerized support, the main benefit of a GDSS is that it saves time and money. How does it accomplish this? Here are a few of the ways:

- Simultaneous input leverages a team's time and creates better quality ideas.
- The computer system records ideas for distribution and future work.
- Process support facilitates completing team tasks faster.
- In some cases, a GDSS provides access to information that lets a group use outside data while working in the system.
- Meetings can be held with the participants in the same room or spread around the world. Travel costs can be reduced.
- A video conference allows a team member to discuss alternatives with remote team members.

The anticipated benefits of communications-driven DSS and GDSS are many. Actually realizing them can be somewhat challenging, and it may be disruptive to the current operations of a company. One major change that has resulted from computerized group support is the creation or enabling of virtual organizations. The next section discusses the changes in organization structure facilitated by computing and communications technologies.

VIRTUAL ORGANIZATIONS

According to Hatim Tyabji, retired CEO of VeriFone, a virtual organization is a company that operates continuously through traditional barriers of time and distance. The entire company communicates around the clock via electronic mail and other information systems and tools. Managers converse via e-mail, by

the transmittal of internal documents, or by the company-wide combined usage of a single informational database (cf., Galal, Stoddard, Nolan, and Kao, 1996). Tyabji said in an interview “E-mail is powerful in this company because there are no exceptions. There is no paper. There are no secretaries. Period” (Taylor, 1995, p. 115). Virtual organizations are dependent on communications-driven DSS for their existence and their effective functioning.

Alternative Definitions

One can also view a virtual organization as a network of independent organizations linked together by information systems and information technology to exploit market opportunities by sharing skills, costs, and market access. Some virtual organizations operate on a project-only, temporary basis. Many so-called virtual organizations operate as permanent companies. According to Vine (1995), “a virtual organization uses technology to create new arrangements among employees, suppliers, customers, and others to quickly gain new opportunities with greater efficiency and lower cost.”

A Simple Example of a “Virtual Organization”

A small consulting firm might use the Internet to facilitate collaboration by its employees who are professionals working at home offices and at client sites. Even the owner of the consulting firm could work in a home office and communicate and collaborate with the other members of the firm.

Employees could perform their work and send e-mail memos and reports to the owner, who in turn would supervise the operation and meet with the other members face-to-face at a weekly breakfast meeting or as needed. Team members might subscribe to a listserv mailing list or another information resource to obtain advice or even locate specialists for project work. This strategic use of the Internet reduces overhead and commuting time while increasing flexibility, speed, and overall effectiveness.

Benefits of a Virtual Organization

According to Peter Drucker (1988), by the year 2008 the typical large business will have half the levels of management and one-third the managers of its counterpart of today. Specialists will be brought together in task forces that cut across traditional departments. Coordination and control will depend largely on employees’ willingness to discipline themselves. According to Drucker, behind these changes lies information technology. Information-based organizations pose their own management challenges: motivating and rewarding specialists; creating a vision to unify an organization of specialists; devising a management structure that works with task forces; and ensuring the supply, preparation, and testing of top management people.

What are the anticipated benefits of virtual organizations? There are eight major benefits discussed in the literature including: increased effectiveness, reduced costs, improved client satisfaction, reduced capital investment needs in

new businesses, expenses are greatly reduced, lead times are shortened, inventory is better managed, and a direct connection is established with the customer.

According to Charles Handy (1995) in a *Harvard Business Review* article, the technological possibilities of the virtual organization are appealing, but it is easy to ignore the potential problems. He argues the managerial and personal implications that result from the new technologies require rethinking old notions of control. He notes that as it becomes possible for more work to be done outside the traditional office, trust will become more important to organizations. Handy proposes seven rules of trust that when violated reduce the effectiveness of a virtual organization. First, he says, trust is not blind—it needs fairly small groupings in which people can know each other well. Second, trust needs boundaries—he suggests managers should define goals, then let workers try to achieve them. Third, trust demands learning and openness to change. Fourth, “trust is tough”—when trust turns out to be misplaced, people have to be fired. Fifth, trust needs bonding—the goals of small units must fit with those of the larger group. Sixth, trust needs touch—workers must sometimes meet in person. Finally, trust requires leaders. Technology can undermine trust, only people can create and maintain trust in work groups.

There will be many types of virtual organizations. Some will succeed and realize the anticipated benefits; other types will fail for lack of trust and a lack of technological expertise.

Aligning Information Systems and Organizational Structures

Identifying all possible alignments of information technologies and decision support implementations in organizations is beyond the scope of this chapter, but it is useful to discuss and examine four organization structures that may result from implementing communications-driven DSS. The metaphorical labels for these are a community structure, a federation structure, a mobile structure, and a skyscraper structure (cf. Power, 1988).

A Community Structure.

A large “community” of organizations can potentially achieve economic efficiencies in providing goods and services. In a community organization, a large number of interdependent organizations can be grouped into a multilevel hierarchy where individual organizations retain extensive autonomy. A communications-driven DSS is the key to providing coordination and control for the management group of the community. A sophisticated infrastructure of communication and information systems is vital to creating a large grouping of supplier and buyer organizations. The corporate telecommunications network and information systems can facilitate coordinated purchasing, exchanges, and sales by community members. Also, various DSS can facilitate centralized strategic planning and monitoring. Maintaining discrete organizational entities in the community should facilitate management control and, if needed, reorganization of the community. Measurement and reward systems can be

linked to the “profits” of each member organization. Stock options and other equity arrangements linked to unit performance should encourage the best managers to remain with the community.

A Federation Structure.

Organizations without hierarchies may evolve in response to improved communication and information technologies. Private, centralized computing resources can also help small business owners and professionals coordinate their businesses. Information and communication technologies can help them share knowledge and more efficiently use and obtain resources. These new “federation” organizations can be managed using communications-driven DSS. Intelligent management support systems can aid owner/managers in implementing collective actions on pricing, inventory management, or investment of resources. Rewards can be tied to the sales volume and profitability of each task entity, for example, of each office in a multi-office firm. Also, in professional service federations, the quality of work and the competence of each provider can be assessed by a committee of owner/managers using tools like Balanced Scorecard systems and EIS.

A Mobile Structure.

This information-oriented structure can be visualized as a “mobile” organization. It is mobile both in the sense of being transportable or movable (at an economic cost and in a short period) and in the sense of being responsive or changeable, like an abstract sculpture with parts that can move rapidly and easily in response to the slightest breeze. Portable and handheld computing technologies, the Internet and Web, and cell phones and public telecommunications networks increase the viability and practicality of implementing mobile organization structures.

A Skyscraper Structure.

Concerns about status and prestige may motivate managers to increase the number of upper-middle and top management positions in a company. Communication and information technologies can facilitate this type of multi-level structure. The structure that results could be called a “skyscraper.” Managers at the top would supervise very few people, and the number of management levels in the organization would be very large. Computerized systems would do much of the routine transaction processing and would create value for the organization. The number of operating personnel would be a much smaller percentage of all employees than is currently found in the most automated manufacturing and oil refining companies. Centralized and integrated communications and information systems help ensure that everyone knows about everyone else’s actions and performance. Information technology makes this structure possible and potentially efficient for some organizations like financial institutions.

EVALUATING COMMUNICATIONS AND GROUP SUPPORT TOOLS

Implementing communications-driven DSS in a traditional organization or implementing these tools to create a virtual organization or innovative organization structure is a major technology decision. Because these tools are purchased and installed rather than built by information systems staff, the evaluation focuses on products from vendors. The following six criteria should be carefully considered when evaluating any of the group support tools mentioned in this section.

Reliability. Many companies want a solution that has proven it can meet their needs. Managers want to know what software is going to perform the necessary tasks without failing. Some innovative companies will be early adopters of unproven technologies. Reliability should, however, still be evaluated.

Cost. Given the significant costs of technology and the rapid advances of new technologies, companies want an affordable package. Managers should examine the cost per user for a system as well as the total cost of the system. Also, ongoing operation costs such as hardware and software maintenance and support staff of a proposed communications-driven DSS need to be considered when solutions are compared.

Scalability. Companies need a package that will easily integrate with existing software applications and hardware platforms. Also, the systems should support all of the anticipated users. Managers do not want to purchase separate components to connect legacy systems with new group support applications.

Security. Many organizations and individuals are beginning to increase the amounts of shared data and number of transactions being executed across firewalls and geographic regions through the Internet. With this increase in shared data, there is an increasing concern regarding the security of this information.

Development features. Many vendors produce standard packages to run on many different platforms. It is important to most organizations that the package allows for development of some customized capabilities.

Ease of installation and use. Companies and managers are under extreme pressure to do things rapidly. With this pressure, managers want a software package that is easy to install and requires minimal amounts of training for its users.

CONCLUSIONS AND COMMENTARY

Managers and academic researchers are in the early stages of a process of accumulating knowledge about communications-driven DSS. Much more needs to be learned about how communications-driven DSS affect group meeting processes and team and organizational outcomes. There is some evidence that communications-driven DSS are, however, changing organizations.

Communications-driven DSS help in communication, collaboration and coordination. A fit between task type, group size and group proximity when selecting communications-driven decision support technologies increases the

effectiveness of the decisions and improves group performance. Group support systems succeed when people who do work to support a system are hired for that purpose or are beneficiaries of the system. Also, communications-driven DSS and group support systems succeed when managers, developers, and users adhere to social conventions. Finally, communications-driven DSS are most effective when their use is built around specific structured work procedures that allow or even encourage exception handling and task modification.

Structural changes that are possible from improved information technologies are still somewhat difficult to anticipate. Managers must act now to create changes; they cannot rely on circumstance and chance to create a new organization structure. Information technology facilitates structural changes, and structural changes affect how and when information technology can and will be used in an organization. Aligning organization structures with information technologies is a reasonable but difficult goal. The different types of structural responses to information technologies—the community, the federation, the mobile, and the skyscraper—can help planners and organization theorists design companies that are aligned with and exploit group support systems and information technologies. Often, the most difficult issue facing business strategists when they attempt to align an organization to information technologies is identifying new, interesting, or innovative structures worth investigating and implementing.