E–Collaboration Support Systems: Issues to be Addressed

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INTRODUCTION

Removal of communication impediments and provision for techniques that systematically direct the pattern, timing, and content of cooperative processes are two key prerequisites in the contemporary organization. Their establishment has been proven to facilitate the solution of ill-structured problems by a set of individuals working together as a team, through the interactive sharing of information between them. E-collaboration involves a variety of both communication and cooperation issues, in that it leverages the connective powers of a computer network to coordinate the efforts of a group of people. By using e-collaborative capabilities in an organization, people can operate as a single business entity, thus making joint decisions of added value.

Issues to be addressed in the establishment of an e-collaboration environment should have a strong organizational focus. These include work structuring in order to improve coordination, use of communication technology to make collaboration more efficient and effective, enforcing of rules and procedures for achieving consistency, and automating data processing in data intensive situations. One should further consider the conceptual, methodological, and application-oriented aspects of the problem. Conceptual focus is associated with the consideration of the nature of individual and organizational processes, methodological focus with the integration of existing computer-based tools, techniques and systems into the human decision making context, and application-oriented focus with the consideration of the real organizational needs by extending decision support to business teams (Angehrn & Jelassi, 1994).

BACKGROUND

The environment in which a collaborative process takes place sets different communication requirements. Issues to be taken into account in the design and implementation of an e-collaboration system include the following:

- The *spatial distance* between team members. This refers to whether full face-to-face communication among team members is possible. Depending on the group size and the proximity of members during a decision-making procedure, the following settings have been identified (DeSanctis & Gallupe, 1987): (i) the *decision room*, where an electronic version of a traditional meeting situation is established; (ii) the *legislative session*; (iii) the *local area decision network*, where group participants can communicate with each other and with a central processor through a local-area network; and (iv) the *computer-mediated conference,* where communication is provided between two or more remote groups by linking decision rooms together through audio and video facilities.

- The *temporal distance* among the activities performed by the individual group members. This refers to whether collaboration is taking place through meetings at a particular time, such as in conventional meeting or teleconferencing environments, or whether participants submit their input at different points in time, based on electronic mail, bulletin boards, newsgroups, and computerized conferencing concepts.

- The *type of participants' goals* distinguishes between an environment in which a group wants to solve its common problem cooperatively, and another in which bargaining takes place. Issues arising in the first case concern knowledge sharing, preference aggregation, and negotiation support. Depending on the degree of cooperativeness among the decision makers, three modes of reaching a decision have been reported (Jelassi & Foroughi, 1989): (i) the *pooled mode*, where there is so much cooperation that the individuals act almost as a single decision maker; (ii) the *cooperative mode*, where decision makers may have difficulties in understanding and accepting each other's positions; and (iii) the *noncooperative mode*, where a series of negotiations must integrate the diverse, often conflicting and incompatible individual problem representations into a common solution.

- The type of *control* over the collaborative process. There may be cases where the participants follow a democratic process in order to reach a solution, and

cases where the system is supported by a human group leader or mediator. In the former, communication and coordination are achieved by the users or directly by the system. The latter can be further distinguished in those where the human mediator cannot impose decisions on the participants, and those where there is compulsory arbitration from a group leader. Referring to a Group Decision Support System, for instance, three levels of control have been identified, namely, democratic participative decision making, semi-hierarchical decision making, and third-party arbitration (Jelassi & Foroughi, 1989).

- *Separating people from the problem.* The system designer has to evaluate the individual and group characteristics of the participants, as well as their motivations, disagreements, and conflicts, in order to reduce (if not avoid) the negative impact that misunderstandings, emotions, and bad communication may have. Different approaches to conflict resolution include (i) *contending or positional bargaining*, where a party is trying to convince the opponent(s) to accept its favorite position; (ii) *accommodating*, involving a party's effort to help another party meet its objectives; (iii) *compromising*, meaning a splitting of the differences between interested parties, that is satisfying but not optimizing; (iv) *collaborating*, involving parties working together to optimize their joint outcome, such as in group problem solving settings; and (v) *avoiding* the negotiation process for various reasons such as fear of conflict, not worth bargaining issues, or intention of negotiations' postponement (Lewicki & Litterer, 1985).
- The *type of communication* between the participants. Collaborative environments can be based either on *point-to-point communications* or on *broadcasting* of messages.

Furthermore, approaches for the development of a framework for e-collaboration have to address both behavioral and technical aspects (Zigurs et al., 1988). Behavioral issues concern the diffusion of responsibility, pressures toward group consensus, and problems of coordination. A framework that integrates behavioral and technical perspectives may reduce the negative impact and enhance the positive effects of the former ones. Issues involved in the design of such a framework are (i) support (or not) of anonymity, depending on the type of discussion; (ii) enforcement of participants' self-awareness; (iii) display of group inputs at any stage of the discussion; (iv) structure of the decision process (the actions the participants should follow may improve the efficiency of the system in terms of accuracy and response time); (v) ability to support communication, information sharing, and democratic control (provision of communication and information sharing helps participants to create a shared workspace on which the discussion will be based.

COMPUTER-SUPPORTED COOPERATIVE WORK

Computer-supported cooperative work (CSCW) has been defined as computer-assisted coordinated activity, such as communication and problem solving, carried out by a group of collaborating individuals (Greenberg, 1991). The multi-user software supporting CSCW is known as *groupware* (Ellis et al., 1991). Sometimes this term is broadened to incorporate the styles and practices that are essential for any collaborative activity to succeed, whether or not it is supported by a computer. CSCW may also be viewed as the emerging scientific discipline that guides the thoughtful and appropriate design and development of groupware (Greenberg, 1991). Key issues of CSCW are group awareness, multi-user interfaces, concurrency control, communication and coordination within the group, shared information space, and the support of a heterogeneous open environment that integrates existing single-user applications.

The most successful CSCW technology to date is undoubtedly electronic mail. Other well-developed technologies so far comprise computer conferencing, teleconferencing or desktop videoconferencing (the act of conferencing at a distance with the aid of audio and video links), group authoring (enabling cooperative writing with additions, revisions, comments, and annotations), and group decision support systems (problem solving is directed at the organization of the issues involved). The last category comprises mediating systems that support discussion, argumentation, negotiation, and decision-making in groups.

As illustrated in Table 1, most taxonomies of CSCW technologies distinguish them in terms of their abilities to bridge time and space (the table is a more elaborate version of the one appearing in Baecker (1993). As cited in Baecker (1993), groupware technologies of the future need to span all quadrants of this table. This is usually described as anytime/anyplace groupware. During the last few years, CSCW has been strongly supported and explored by both industry and academic research. Everybody speaks for the shifting role of computers in that they do not merely handle information processing issues, but they appear as tools for managing commitments and their fulfillment and as tools for producing and "listening to" the assertions and assessments that structure the organization (Winograd, 1992). Computers can make explicit the structure of human interaction in an organization,

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