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Tools and Models for Group Collaboration

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Abstract

This paper provides a brief introduction for the minitrack on Tools and Models for Group Collaboration. As organizations are beginning to embrace the concept of being virtual, they increasingly need to provide technology to support group problem solving when group members are dispersed. Many theories have been developed to advance knowledge in this area, but the experimental results provide inconsistencies across the full range of tools and tasks. The development of a full range of tools and models that support a comprehensive set of collaborative activities is in the embryonic stages. The goal of developing such models will result in a more solid understanding of what virtual groups need to collaborate on various types of tasks.

Background

As organizations are beginning to embrace the concept of being virtual (Handy and Mokhtarian 1996), they increasingly need to provide technology to support group problem solving when group members are dispersed. Dispersed members can collaborate using computer-based decision and communication technology that is a key enabler of virtual organizations. This is affecting various dimensions of new organizational forms (Fulk and DeScanctis 1995).

Tools that support group collaboration can range from a simple email system to a sophisticated virtual reality system that supports group decision making in a particular domain. Often referred to as a Group Decision Support System (GDSS), it is a tool whose design, structure, and usage reflect the way in which members of a group interact to make a decision. A GDSS supports group decision processes that include communication, file sharing, modeling of group activities, aggregation of individual perspectives into a group perspective, and enabling human interaction at a distance by creating a sense of being present at a remote site.

GDSS research has typically considered idea generation tasks (Fjermestad and Hiltz 1999, Dennis 1991, Connolly et al. 1990, Watson et al. 1988). The results of a comprehensive study of 230 articles (Fjermestad and Hiltz 1999) show that only one of these articles used a mixed-motive negotiation task. We reviewed other sources that were not in the scope of the study conducted by Fjermestad and Hiltz (1999); our results confirm their finding that generally few GDSS studies have focused on mixed-motive tasks (Sheffield 1992, Zack 1993, Foroughi et al. 1995, Barkhi et al. 1998).

Research has generally shown that for ideation tasks, computer mediated communication groups perform better than face-to-face groups. However, it is important for the technology to fit the task (Zigurs and Buckland, 1998). Performance can improve by using electronic brainstorming tools that provide a task-technology fit (Zigurs and Buckland, 1998, Valacich et al. 1994, Valacich et al. 1993, Chidambram and Jones 1993, Dennis 1991).

Different groups may need different types of collaborative tools. Collaborative tools are often used for virtual groups where the geographical distance makes it difficult to meet at the same place and the same time. Hence, it becomes important to design features that can help reduce geographical barriers as well as features that aid the group to produce a common product efficiently and effectively.

The theoretical frameworks most commonly applied to study media effects include media richness (Daft and Lengel, 1986, 1987), social presence (Short, Williams, and Christine, 1974), and social influence (Fulk et al., 1987, 1990). While the theories that deal with media richness or social presence suggest that media matters, others (Fulk et al., 1987, 1990, Markus, 1994) suggest that the effects of media are subject to the social context. Technology may make it possible to mimic face to face interaction for virtual groups (i.e., advanced video conferencing systems) and the users may employ media with different levels of richness depending on the message they are trying to communicate.

Because of the extensive research conducted on idea generation tasks (Fjermestad and Hiltz,

1999), collaborative tools that support idea generation have been developed in research laboratories and have proliferated into practice as commercial products. In addition to collaborative tools for support idea generation, some collaborative tools such as Dolphin and Mermaid have been developed to facilitate collaborative authoring (Rada, 1996). Lotus Notes is a general purpose collaborative tool that allows group members to exchange files, post messages, and manage their work flow. More specialized workflow management tools include InConcert (Marshak, 1997). Many collaborative tools have been developed in research laboratories to examine the effect of specific features on various measures of virtual collaborative work.

Economics of Collaboration

The design and implementation of a system that supports interacting groups is more complex than that of a system that only supports an isolated decision maker. Members in a group may have an economic incentive to compete or cooperate. If group members tend to cooperate, they may be more willing to share truthful information as they collectively try to solve the problem. If they are motivated to compete, they may engage in untruthful information exchange making the collaborative tools less effective.

Members of a group may take "free rides" from other members. The communication channel and the anonymity of the members can enhance this dysfunctional behavior. For example, a computer-mediated communication channel may make free riding easier than a traditional face-to-face channel.

Incentive structures influence the strategy that individuals employ to protect their stakes in the organization (Barua et al. 1995). They also influence the decision of whether or not to share information and what type of information to share (Hightower and Sayeed 1996, Barrett and Konsynski 1982). The information sharing decisions may also be affected by the level of trust among members, which in turn, may be affected by the communication channel used for interaction (Barkhi et al. 1998). The communication channel can affect mutual trust and the degree to which a shared cooperative context can be established (Zack 1993).

In addition to the task and the communication channel, the features of the system are important in understanding how a system fits the task and the environment for which it is being used. At the lowest level are the email systems and enhanced email systems such as calendar programs and chat facilities. Then, there are electronic meeting systems that have typically been used to study idea generation tasks. Typical features of these systems include electronic brainstorming, sorting, ranking, and averaging individual perspectives to arrive at the group perspective. For other types of tasks that involve complex operations, each performed by a different member, workflow systems have been developed. When the virtual members need to feel they are co-present, they may be using immersive conferencing technology. Tools and models for collaborative work should provide diversity of media, matched to customers' needs with the appropriate degree of remote presence.

An Application: Software Development Group

Software development has increasingly become a group activity. Software development has become a major industry and some talented software developers are scattered across the globe. This creates a geographic barrier to assign remote members to the same software development group. However, if the members can be provided with effective collaborative tools, they can form virtual groups and eliminate the geographical barriers. In addition, software products are easily transportable by electronic means via the Internet further diminishing the geographical barriers.

Members of a global virtual group can communicate by using collaborative software tools. Collaborative tools or other form of shared-space technologies aim to create distributed electronic environments where participants can manage their communication and collaboration (Benford et al. 1998).

Software development by a group whose members are not co-located may have substantial cost savings if the group members can work effectively despite their physical separation. These cost savings can be achieved only if virtual groups can overcome the potential coordination problems, free riding, and other group process losses and dysfunctions such as role overload, role ambiguity,

and low individual commitment. These dysfunctions may be exaggerated in a virtual context (O'Hara-Devereaux and Johnson 1994).

Effective groupwork requires trust. Trust can allow people to take part in risky activities where members in a group may be disappointed by the actions of others that are beyond their control (O'Hara-Devereaux and Johnson 1994). Trust in virtual groups may be very fragile and temporal (Jarvenpaa and Leidner 1998).

Members in software development groups need to be able to trust each other to be dependable. Periodic face-to-face meetings can make trust less fragile. Software development is typically considered an unstructured and non-routine task and therefore needs informal interaction for coordination (Van de Ven et al. 1976). Companies engaged in software development with virtual groups may benefit from such arrangements if they understand what makes virtual software development groups work and what hinders their ability to work effectively and efficiently. It is expected that collaborative tools will be improved to better support virtual software development groups.

Face-to-face meetings can augment technological tools that groups use to collaborate effectively. Face-to-face interaction can aid in the satisfaction and the quality of the software products that software development groups produce. At the same time, incorporating effective tools that can reduce ambiguity and enforce the maintenance of consistency of activities of the group members may reduce the need for face-to-face interaction. For example, CASE tools can serve as effective collaboration devices and, hence, incorporating such tools into the design of collaborative systems can benefit software development groups (Vessey and Saravanapudi 1995). Providing tools and processes that reduce ambiguity, enforce consistency, and enhance coordination can facilitate the work of software development groups. In addition, allowing periodic face-to-face, video-conferencing, or immersive conferencing can provide an effective source of guidance without social counter-productive effects that may arise from over-adherence to formal methods and tools (Sawyer and Guinan 1998).

Conclusion

There is a rich body of knowledge on idea generation tasks in GDSS literature (Fjermestad and Hiltz 1999). This provides a fertile ground to expand the study of collaborative systems to other types of tasks. The next generation collaboration technologies should support complex tasks that involve negotiation process as well as other domain specific tasks such as software development in virtual groups.

The next generation tools should be general enough to allow members to choose the right degree of media richness and social presence for the specific types of collaborative tasks. The tools should also have enough domain specific workflow tools to support efficient communication among domain experts such as groups of software designers who collaborate to develop a large software project.

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