Electronic Group Support Systems: Lessons from Business for Education

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Abstract

Electronic group support systems (GSS) are distributed computer technologies, developed to support cooperative work in organisations, predominantly in a business environment. Electronic meeting systems (EMS), for example, are GSS specifically developed to support meetings. The considerable experience gathered from the use of GSS in business is briefly summarised and discussed, with the aim of determining the potential use of this technology in university education. The current transfer of the GSS technology into universities is critically examined, in particular in the perspective of the rapidly emerging global platform of distributed multimedia technology. The discussion is exemplified with the *GroupSystems* EMS developed at the University of Arizona, USA.

Keywords

collaborative learning, group support system (GSS), technology transfer

1. Introduction

Organised attempts to use computer and communication systems as support for human cooperative work go back to the late 70's (Bonczek et al., 1979; Huber, 1980; Kerr and Hiltz, 1982). Such systems have been known under several names, largely depending on the mode of their use. There are, for example, systems for computer-supported cooperative work (CSCW), group decision support systems (GDSS) and electronic meeting systems (EMS). All these systems are collectively referred to as electronic group support systems (GSS), in recent years colloquially called *Groupware* (DBA, 1992; Spriggs, 1994). Most of such systems were developed for commercial use, usually to support some "decision making" processes, whence GDSS. In recent years, however, the same GSS have been experimented with in universities in the context of "collaborative learning". The EMS, for example, have been found to greatly enhance collaborative classroom activities (Aiken, 1992), giving rise to the concept of "electronic collaborative classroom" (Marjanovic et al, 1995).

Here we view GSS as a technology in the process of diffusion from the business environment into universities. Section 2 reviews some basic facts about the GSS technology, its current use in business, and the recent experiments to use it in university education. The problems of adoption of the GSS technology in universities are discussed in Section 3. Caution is recommended when using existing GSS products in an academic environment. The GSS is also put into perspective of the approaching global revolution of university learning (Bonner et al, 1995). Finally, Section 4 informally summarises the total business experience of GSS for the educators willing to experiment with the systems. A specific GSS, the University of Arizona *GroupSystems* EMS (Valacich et al, 1990), illustrates the general discussion, and is presented in the Appendix. The *GroupSystemsV* is currently used in education experiments at Griffith University.

2. The background

As a social species, we (people) are a product of our interactions. The forms and extent of our interactions have always been limited by the available technology. The "electronic age", however, is rapidly removing technological limitations, in time potentially re-defining the human social species! In this light, a GSS is a fundamental concept, an electronic system supporting peoples' interactions, and it is not naturally restricted to any particular field of application such as commerce or education. However, most of the currently existing GSS do have commercial roots.

2.1 Current GSS technologies

Technologically, the GSS of today are computer networks (local or wide area) with sophisticated special-purpose high-level software applications, designed to enhance tasks traditionally performed by groups of people. The performance of GSS today is not any more limited by the underlying technological platform, but by the software defining its operations. For example, since today's high-speed computer networks support interactive multimedia, so too can GSS. Further, the relatively low cost of PC local area networks, has made sophisticated DSS accessible to most business organisations.

The CSCW systems, for example, support "cooperative work" such as the administration and management of a business firm. The Lotus *Notes* is an example of such a system, rapidly becoming an industry standard. The system is supplied as a "shell" to be adapted to any particular organisation. It eventually provides an integrated electronic "computer-mediated" environment for all the computing, document storage, and communication functions in the firm.

Electronic meeting systems (EMS), on the other hand, specialise in supporting face-to-face meetings. The University of Arizona *GroupSystems* concept (Valacich et al, 1991) of an EMS, for example, is to provide support for specific "group tasks" in a meeting. These tasks '...can include communication, planning, idea generation, problem solving, issue discussion, negotiation, conflict resolution, systems analysis and design, and collaborative activities such as document preparation and sharing' (Valacich et al, 1991, p. 261). The tasks are accomplished by using the systems "tools", the full list of which is provided in the Appendix. For example, the tools "electronic brainstorming", "idea organisation" and "group writer", could be used in succession to prepare a business report.

2.2 The business experience

The role of GDSS and EMS in the commercial environment is today fairly well understood, see (Kraemer and King, 1988; Gallupe and McKeen, 1990; Vogel and Nunamaker Jr., 1990), for example, and successful implementations of such systems in firms are abundant (Rochester, 1989; Beauclair, 1990; Dennis et al, 1990). Numerous laboratory and field studies (Pinsonneault and Kramer, 1990**;** Rochester, 1989; Valacich et al, 1991; Vogel et al, 1990) show how GSS can facilitate group interactions and improve group performance.

The business experience of the much more recent CSCW systems such those based on Lotus *Notes*, has not yet been evaluated (Opper and Fresco-Weiss, 1992). The current "boom" in the adoption rate of such systems by firms (Lotus reports 2.5 million *Notes* licences world-wide) makes evaluation difficult, especially in view of the resulting global effects.

2.3 GSS in universities: the experience so far

Although EMS do exist at many universities, they are typically associated with Information Technology departments, and have traditionally been used as research sites rather than as learning environments.

More general CSCW systems on the distributed multimedia technology (DMT) platform will support students and teachers also outside the classroom, and are likely to re-define university education altogether (Bonner et al, 1995). Their current implementation, however, has not reached the stage to allow evaluation.

Despite this lack of tradition, the EMS technology, for example, seems to have already been given 'thumbs up' in collaborative learning (Aiken, 1992; Jessup and Valacich, 1993; Alawi, 1994). The identified benefits include: (i) broader student participation and their more active involvement, (ii) increased cooperation and teamwork among students, and, (iii) dynamic evaluation and modification of students' mental models through rapid feedback from group members.

Further, Vasi and LaGuardia (1994) notice that EMS can improve students' ability to give and receive criticism, and to synthesise ideas. The teacher is now a collaborator who's task is to empower the students. Whenever active exploration, construction of knowledge, cooperation and teamwork, and problem solving, result in superior learning to that involving passive, competitive, and individualistic approaches, the collaborative electronic classroom is a suitable learning environment, which furthermore results in a more satisfying classroom experience (Alawi, 1994).

3. Problems with GSS transfer

There are two radical ways of viewing the relationship between information technology and education: the first view adapts technology to education, the second does the opposite. From a strategic perspective of five to ten years, the first view would be utterly misleading (Bonner et al, 1995). However, when we think of the universities 'catching up' with the *present* use of the GSS technology in the industry, our time horizon is actually zero, and the first approach is quite justified.

The question is then: *how could one <u>today</u> use the <u>present</u> GSS technology in university education?*

In fact, rather than discuss the GSS technologies in general, we focus in the space allowed on a specific EMS, the *GroupSystemsV.*

Could one then use an EMS such as *GroupSystems* "as is" in a classroom? Yes, it has been done, and with considerable success (Aiken, 1992; Marjanovic et al, 1995), as reported in Section 2. One should, however, keep in mind its fundamental limitations in a traditional university environment. These limitations originate from the quite different roles which "knowledge", and hence "knowledge work", play in business administration and in academic learning. Roughly, the knowledge developed by a student through university learning is a tool to be later used in making business decisions. Clearly, developing tools and using them are quite different activities. To exemplify, consider the standard connotations of the word "problem" in the two environments.

3.1 The business environment

One is in business to make money, not to solve problems. A problem is therefore an obstacle to be quickly circumvented. A business meeting does not "solve" problems, it "resolves" (= terminates) them. 'Skills are all that matters: if you know you can "do it", why ask "how?" and "why?"?' Practice and "hands-on experience" are paramount. Consensus in a business meeting is often political. Decisions are arrived at rapidly, typically with a small information base.

The business EMS such as *GroupSystems* were developed to support collaborative activity in the business environment. Their general philosophy is simplicity and effectiveness, with emphasis on making decisions and reaching consensus. The business CSCW such as Lotus *Notes* were developed to streamline operations, reduce costs, increase effectiveness and competitiveness. Essentially, business systems aim at organising large numbers of loosely connected and fairly trivial operations.

3.2 The academic environment

In academic learning, on the other hand, one is traditionally concerned with knowledge as such. The applicability of the knowledge determines "what" you learn but not so much "how" you learn. One learns to understand, to develop personal knowledge (and, yes, skills). A "problem" is welcome as an opportunity to learn more. One does not stop by observing that things work, one asks "how?" and "why?". Academic consensus is cognitive, not political. Decisions typically require considerable information base, and may therefore take considerable time to reach.

To the extent a learning process is a collaborative enterprise, the GDSS such as *GroupSystems* will do well in supporting the *collaboration*. In its present form, however, it will do less well in supporting the *learning*. There are no good tools in such systems to support knowledge construction processes occurring, for example, when defining and analysing problems. Typical university learning is an extended cumulative process, which requires extensive interaction with knowledge bases to gradually build up an integrated "personal" knowledge structure. Such processes would not be well supported by systems centred on group interaction and decision making. Similarly, document production and management systems such as Lotus *Notes* are a clear improvement of the pen and paper technology, but they were never meant to support knowledge work as such.

3.3 The convergence of cultures

One of the more easily observable global effects of information (and other) technology is, on the one hand, an increase in the sophistication of the business environment, and, on the other hand, a more flexible and pragmatic approach to education in universities. Aided by a global multimedia Internet, the two may in time evolve into a common form of "seamless" learning through cooperative work with authentic problems, real or simulated. The extent to which this is possible, or indeed desirable, is however an open question. Until that happens, the "ideal" GSS for the two environments should not be the same.

4. Using GSS: some points to keep in mind

4.1 Mess + GSS = more mess

This is common wisdom re-stated for GSS. On the conceptual level, a clarity of purpose, and basic rationality of the environment should be a prerequisite for its use. On the operational level, all the information required in group work should at any time be available in suitable electronic form.

The use of EMS, for example, requires careful preparation of the agenda and of the information base required in the meeting (Marjanovic et al, 1995). Note, however, that once properly implemented, the GSS technology is likely to help maintain and increase order!

4.2 To meet or not to meet?

Technological infrastructure in universities is growing rapidly (Reinhardt, 1995), but has not developed enough to implement asynchronous GSS for the students on any major scale. It is therefore natural that one first studies EMS technology for "classroom learning". However, the place of classroom learning in the general scheme of "computer supported learning" is uncertain. If students can interact freely with a global multimedia knowledge repository, would they need as much as before to interact with one another? And if they do interact with one another, do they need to do it in a classroom? And if they do it in a classroom, should they insist on using computers also then, or should they take the opportunity to socialise without the impediment of technology?

4.3 Think "tools" and experiment!

Characteristic for EMS systems such as *GroupSystems* is their task-centred approach to group work, whence its presentation as a set of "tools" (Appendix). This may suggest a fairly "mechanical" philosophy, but the general question *when and how to use the tools?* is still largely open (Davison, 1995), also in application to business meetings. A healthy approach in learning is to experiment: explore the possibilities the tools offer, never mind the goal! Incidentally, the "electronic brainstorming" tool should be useful in generating creative suggestions.

5. Conclusions

Electronic group support systems for university learning are best understood in the "big picture" of the rapidly emerging global distributed multimedia technology. The current process of diffusion of the GSS technology developed for business use into university learning must be seen with caution, considering the quite different roles of collaborative work in the two environments. Particular caution is justified when transferring special-purpose products such as electronic meeting systems. However, extensive adaptations of these products to special needs of current university learning should be weighed against the developments in the global multimedia technology, which can rapidly render such investment redundant.

6. References

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Appendix

Activities Menu (Source : User Manual, GroupSystemsV, Ventana Corporation, May 1991)

Software Tool	***Function***
Electronic Brainstorming	Electronic Brainstorming is an unstructured idea generation tool which allows participants to share ideas simultaneously and anonymously on a specific question or issue. Once a participant enters an idea, it is electronically passed to another participant who may add to that line of thought or begin a new idea. Optionally ideas can be categorised by creating and selecting keywords. The use of keywords provides an additional level of organisation to the unstructured list of ideas submitted.
Categorizer	Categorizer assists in two common group activities: generating lists and categorising / organizing comments (such as those from an *Electronic Brainstorming* session). In its list generation format, each participant enters ideas related to the topic being considered by the group. These ideas are added directly to the group list. The list can be edited and consolidated to make it more manageable. When organizing comments, output from text files can be loaded into a reference window. Participants can copy the comments to the appropriate ideas / categories, thereby organizing the information. Participants can also directly enter comments into any idea / category on the list.
Vote	Vote is used to cultivate group consensus and to identify areas of differing opinions. It allows the group to rate a list of ballot items using one of seven different voting methods: Rank Order, Multiple Choice, Agree / Disagree, 10-Point Scale, Yes / No, True / False, and Allocation. When participants' ballots are collected, statistical information is automatically generated. Results can be viewed in text reports, graphs, and voting matrices.
Topic Commenter	Topic Commenter helps groups generate ideas on a list of topics. Participants are presented with the electronic equivalent of a set of index cards labelled with the topics titles. Participants can comment on any or all of the topics in any order they choose and may view the comments of others in the group.
Group Dictionary	Group Dictionary allows the group to define a list of terms or phrases. This helps group members share the same basic understanding of the terms being used in a meeting or project It can also help groups work through a disagreement over terminology. Finally, the Group Dictionary input can act as a repository for the group's terminology. In this mode, it represents a type of group memory for recording the working definitions of the group's operating vocabulary.
Alternative Evaluation	Alternatives are items that are evaluated; criteria are the standards by which the alternatives are judged. Alternative Evaluation allows participants to rate a list of alternatives against a set of criteria on a scale from one to ten according to how well it meets each criterion. The results can be viewed in a variety of formats, including text reports and graphical representations. Options for viewing the results include using a weighted or unweighted scale of criteria.
Policy Formation	Policy Formation is a text gathering and editing tool for developing a final statement through iteration and group consensus. It provides a relatively unstructured process for reaching agreement on the wording of a statement. It is designed to be used repeatedly to refine the statement until the group comes to agreement on the wording. Each participant contributes his or her versions of the issues until a group consensus emerges and a policy, plan, or opinion is drafted.
Idea Organization	Idea Organization assists in two common group asseverates: categorising comments (such as those from an *Electronic Brainstorming* session) and generating lists. It includes all the functionality of *Categorizer,* as well as powerful multi-purpose options which can be customized for a wide variety of tasks. It offers the ability to use pre-defined session configurations, such as Nominal Group Technique, to achieve different objectives.
Group Outliner	Group Outliner helps the group generate ideas on topics arranged in an outline structure. The outline can be prepared ahead of time. With the appropriate experts in the group, comments or details can be quickly generated. It is well-suited to filling in the details of a business plan or research proposal, the general outline of which is known. Group Outliner can also be used to organize ideas by allowing participants to suggest topics and then comment on them. This is a more advanced operation, suitable for small groups.
Questionnaire	Questionnaire elicits participant responses on various types of information during a session. It provides a systematic means of gathering data from participants. For example, participants can be asked for personal or company information, or about specific details associated with a problem or issue. Questionnaire responses can be used in a variety of ways, e.g., to help formulate topics for a *Topic Commenter* session or to provide background information about participants.
Stakeholder Identification	Stakeholder Identification offers a comprehensive means of testing the practicability of a plan. By identifying those who affect and are affected by the plan. their assumptions about the plan and whether those assumptions support, resist, or are neutral to the plan, potential problems with the plan's implementation can be addressed. Stakeholder Identification can be used in a single session or it can be an iterative process, with several meetings over the course of weeks or months as a plan evolves and is implemented.
Group Writer	Group Writer is an editing tool which allows members of a group to work simultaneously on the same document(s). Only one participant at a time can work on a particular section of the document, although the section can be viewed by all. When a participant finishes working with a section, it becomes available for editing and annotation by other group members. Group Writer can also be used to generate comments on an existing document, such as a business plan or a company policy.
Group Matrix	A matrix is a rectangular arrangement of rows and columns. typically, the intersections of the rows and columns are used to establish relationships between the items in the rows and columns. Group Matrix allows participants to establish relationships between two sets of items in a matrix format. It displays which settlers of the matrix present a consensus among the group. Cumulative group results are available for viewing in a variety of formats for both the session leader and the participants.
Survey	Survey allows for a polling of group opinion using a variety of methods. A Survey form can combine nine voting methods, including Rank Order, Multiple Choice, Agree / disagree, Variable Point Scale, Yes / No, True / False, Allocation, Open-Ended, and Category. Data can easily be gathered from widespread sites using remote disks. Results can be merged, filtered into subgroups for examination. and exported to spreadsheets. databases, and statistical analysis programs.