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A Taxonomy of Collaborative Applications

Robert C. Nickerson
San Francisco State University, rnick@sfsu.edu

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Robert C. Nickerson
College of Business
San Francisco State University
San Francisco, CA 94132
E-mail: rnick@sfsu.edu

Abstract

This paper presents a taxonomy of collaborative applications based on the temporal, spatial, and modal dimensions of communication between members of a workgroup. The taxonomy satisfies the characteristics of being concise, sufficiently inclusive, comprehensive, and extendible. The taxonomy can be used to analyze collaborative applications and software. Common collaborative applications and representative software are summarized.

Introduction

The past few years have seen a significant increase in collaborative computing applications. In these applications, members of workgroups collaborate using groupware. A number of collaborative applications have appeared recently, including electronic messaging, information sharing, electronic conferencing, and electronic meeting support. New groupware is being developed continually and collaborative features are being added to new versions of personal computer software.

With this increase in collaborative applications, it becomes increasingly difficult to identify application categories. Researchers, developers, and users need to be able to determine where a new workgroup program fits into existing application categories, or whether a new category is being defined so that appropriate use can be made of the program. A concise, sufficiently inclusive, comprehensive, and extendible taxonomy of collaborative applications would be useful for those involved with workgroup computing. The purpose of this paper is to explore the characteristics of and to present a taxonomy of collaborative applications.

This paper is concerned with a collaborative *application* taxonomy, not a collaborative *software* taxonomy. By *application* we mean a use of information technology for a particular purpose, such as sharing information between members of a workgroup or sending messages electronically to other workgroup members. Any specific program can normally be used for a number of applications, making it difficult to classify the program into a single category of a software taxonomy. For example, Lotus Notes can be used for information sharing and electronic messaging, as well as other applications. A software taxonomy identifies the main application of a program, and ignores other applications that may be important in understanding the uses of the program. An application taxonomy, on the other hand, allows us to identify all applications found in a program.

A collaborative application taxonomy is useful because it provides a basis for classifying applications, determining software uses, and identifying areas of inadequate software

coverage. Researchers can use an application taxonomy to describe group systems used in research studies and to compare commercial software. When a new application is proposed, an application taxonomy can be used to identify to which category, if any, the application belongs, whether a new category is being created, or whether the application does not even belong in the collaborative application domain. When new software is developed, users can identify which categories of applications are implemented in the software so that appropriate use can be made of it. Developers can also use an application taxonomy to identify areas in which there is no or limited software implementation, providing opportunities for new products. Thus, a collaborative application taxonomy would find a number of uses.

Collaborative Application Taxonomies

Most taxonomies in the collaborative domain focus on software rather than collaborative applications. Johansen (1988) provides seventeen categories of group software. Coleman (1997) classifies groupware into twelve categories. Ellis, Gibbs, and Rein (1991) describe a taxonomy with eight categories, but acknowledge that their taxonomy is not comprehensive and that categories overlap. Dyson (1992) presents two ways of categorizing groupware. McGrath and Hollingshead (1994) have four categories of group systems. One of their categories, group communication support systems, contains six major types of systems which have some characteristics in common with the taxonomy presented in this paper. Although software taxonomies can provide some insight, we feel that, as stated in the introduction, they are not as useful as application taxonomies.

Several collaborative application taxonomies have been proposed by others. DeSanctis and Gallupe (1987) discuss a taxonomy based on group members' proximity (face-to-face, dispersed), group size (smaller, larger), and task type (planning, creativity, intellective, preference, cognitive conflict, mixed motive). Johansen (1988) presents a taxonomy involving meeting time (synchronous, asynchronous) and meeting place (face-to-face, electronic). Mandviwalla and Olfman (1994), while not giving a taxonomy as such, describe the social and economic dimensions of collaboration, which could be used as the basis of an application taxonomy.

An application taxonomy should have certain characteristics to make it useful. First, it should be *concise*. An extensive classification scheme with many categories and subcategories would be difficult to comprehend and difficult to apply. Second, it should be *sufficiently inclusive* in the sense that it contains enough categories to be of interest. A taxonomy with only two categories, while concise, would be uninteresting. Third, it should be *comprehensive*, meaning that it includes all current categories. A scheme that does not include common categories would be discomforting to those who try to apply it. New categories may evolve after a taxonomy is adopted, so finally a taxonomy should be *extendible*, allowing additional categories to be easily added.

The few application taxonomies that have been proposed do not meet all these criteria. The DeSanctis and Gallupe (1987) taxonomy comes the closest to our criteria, but is not sufficiently comprehensive because it leaves out the dimension of meeting time. The

Johansen (1988) taxonomy, while often cited, perhaps because of its conciseness, is not sufficiently inclusive. We propose an application taxonomy that meets all these criteria.

A Proposed Taxonomy

The taxonomy we propose is based on the view that the principle collaborative activity of workgroup members is communication. Many activities performed by a workgroup are done by individual members, perhaps with communication from other members. For example, setting up a spreadsheet is an individual activity. If spreadsheet requirements are needed from other group members, the requirements must be communicated to the spreadsheet developer. Similarly, analysis of the spreadsheet by group members involves communication of the spreadsheet from the developer to others, and communication of the interpretation of the spreadsheet among group members. Activities typically associated with groups, such as group planning, problem solving, and decision making, also mainly involve communication between group members.

We start by adapting Johansen's taxonomy of meeting time and meeting place. We extend meeting time to a general temporal dimension of communication--the time that communication takes place. Communication may take place synchronously (at the same time) or asynchronously (at different times). We extend meeting place to a general spatial dimension of communication--the places from which group members communicate. Communication may be proximal (group members in the same place) or distal (group members in different places). These dimensions provide four communication scenarios: synchronous, proximal; asynchronous, proximal; synchronous, distal; and asynchronous, distal. With a group of more than two members, some communication may be synchronous, some may be asynchronous, some may be proximal, and some may be distal. We note that a number of others have presented similar approaches involving time and place dimensions (e.g., Ellis, Gibbs, and Rein (1991)).

To this basic scheme we add a modal dimension of communication, which is the mode or form that the communication takes between workgroup members. Three main possibilities are: audio communication, in which a person's voice or other sound is communicated; visual communication, in which the sight of a real object such as a person is communicated; and document (or data) communication, in which text, numbers, diagrams, graphs, or other written representations of information is communicated. These modes may be used alone, as when two people use audio communication over a telephone, or in combinations, such as when people use audio and visual communication in face-to-face talks. In total there are seven possibilities: audio; visual; document; audio and visual; audio and document; visual and document; and audio, visual, and document.

The complete collaborative application taxonomy we propose combines the temporal, spatial, and modal dimensions into a two-by-two-by-seven space creating twenty-eight categories of group communication. Applications in many categories are easily recognized. For example, asynchronous, distal, document communication is found in e-mail applications. Some categories, however, are not useful. For example, synchronous, proximal, visual communication is of little use without audio communication.

To explore the use of this taxonomy, we have identified nine common collaborative applications implemented in various groupware programs. Table 1 summarizes these applications, giving their temporal, spatial, and modal characteristics along with one example of a program that incorporates each application. Note that some applications fall into the same category in the taxonomy (e.g., electronic messaging, and group calendaring and scheduling are both asynchronous, distal, document communication applications) and that some programs include several applications (e.g., Lotus Notes includes electronic messaging and group workflow management, as well as information sharing applications). We also note that many well-known programs have not been included in this table because of space limitations.

This taxonomy of collaborative applications is concise, providing only three dimensions with two possibilities in two of the dimensions and seven possibilities in the third dimension. (Although twenty-eight categories may not seem concise, not all categories are useful, as noted above.) The taxonomy is sufficiently inclusive in that it contains enough combinations to provide an interesting scheme. It is comprehensive in that it includes all current categories, although this contention needs further research. It is extendible because new possibilities can be added to each dimension, and new dimensions can be added to the taxonomy.

The proposed taxonomy can be used to analyze collaborative applications and software. The two-by-two-by-seven space provides interesting categories of applications that could be examined. For example, an application that provides synchronous, proximal, audio, and visual communication could be explored in a collaborative virtual reality system. Other categories in the taxonomy may lead to other interesting software. Applications in new collaborative software can be classified in the taxonomy to see how they relate to applications in existing software, and applications that are not adequately covered by existing software can be identified for potential new software development.

Conclusion

This paper presents a taxonomy of collaborative applications based on the temporal, spatial, and modal dimensions of communication between members of a workgroup. The taxonomy satisfies the characteristics of being concise, sufficiently inclusive, comprehensive, and extendible. The taxonomy can be use to analyze collaborative applications and software.

References

References are available upon request from the author.

Table 1. Summary of collaborative applications

Type of collaborative application	Temporal dimension	Spatial dimension	Modal dimension	Example

								software
	Synch	Asynch	Proximal	Distal	Document	Audio	Visual	
Electronic messaging		X		X	X			Novell GroupWise
Information sharing		X		X	X	X	X	Lotus Notes
Document conferencing	X			X	X			DataBeam FarSite
Audio conferencing	X			X		X		Quarterdeck WebTalk
Video conferencing	X			X		X	X	Intel ProShare
Electronic conferencing	X			X	X	X	X	Silicon Graphics InPerson
Electronic meeting support	X		X	X	X			Ventana GroupSystems
Group calendaring and scheduling		X		X	X			Campbell Services OnTime
Workflow management		X		X	X			FileNet Visual WorkFlo