

Domain-Based Classification of CSCW Systems

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Abstract: CSCW systems are widely used for group activities in different organizations and setups. This study briefly describes the existing classifications of CSCW systems and their shortcomings. These existing classifications are helpful to categorize systems based on a general set of CSCW characteristics but do not provide any guidance towards system design and evaluation. After literature review of ACM CSCW conference (1986-2010), a new classification is proposed to categorize CSCW systems on the basis of domains. This proposed classification may help researchers to come up with more effective design and evaluation methods for CSCW systems.

Key words: Classification, CSCW systems, domain-based, groupware

INTRODUCTION

Computer Supported Cooperative Work (CSCW) is a term commonly used for group activities that are performed using a system capable of it. Such systems that are used in group activities are often called CSCW systems, collaborative systems, groupware, or simply multi-users systems. These systems are more complex in nature than single-user systems as these are used by multiple users at same or different locations to fulfill different individuals' needs as well as common organizational goals. Besides it, these systems are synchronous or asynchronous i.e. used at same or different time. Today these systems are widely used in different domains e.g., education, healthcare, and entertainment. Although CSCW systems have some common characteristics like coordination and communication but each domain has its own specific objectives and needs that make CSCW systems different from each other.

CSCW systems have been categorized (Johansen, 1988; Penichet *et al.*, 2007) in terms of their characteristics and support for group activities. In our point of view, although these classifications categorize systems but do not provide any help in effective design and evaluation of CSCW systems. The main objective of this paper is to propose classification for these systems that may help in better design and evaluation activities. The proposed classification, on the basis of domains, would help system designers to think and design new systems according to their own unique requirements and objectives. Secondly, this classification would help to

conduct more effective evaluation (i.e., to propose new effective evaluation methods/techniques for domain-specific systems). For example, usability heuristics are proposed to evaluate large screen information exhibits (Somervell *et al.*, 2003). Development of specific evaluation methods for CSCW systems is an important issue due to number of factors like individual cognitive factors, cooperative and collaborative factors, usability issues for individual and groups, the organizational and social impact, and the larger context that situates others factors (Neale *et al.*, 2004).

LITERATURE REVIEW

The oldest classification of groupware systems is on the basis of time and space (Johansen, 1988). It classifies groupware systems into four different types; synchronous in the same place, synchronous in different places, asynchronous in the same place, and asynchronous in different places. In recent years, groupware systems are improved and many systems e.g. SharePoint Portal Server (Microsoft, 2010) can be used for synchronous and as well as for asynchronous interaction (Penichet *et al.*, 2007). For such systems, another method is introduced by Penichet *et al.* (2007) for more generalize classification of these systems. It is based on the typical characteristics of groupware systems i.e., information sharing, communication, and coordination along with traditional time and space aspects.

Johansen (1988) classification is too simple for today's systems because these systems support both types of communication at same and/or different places. It does

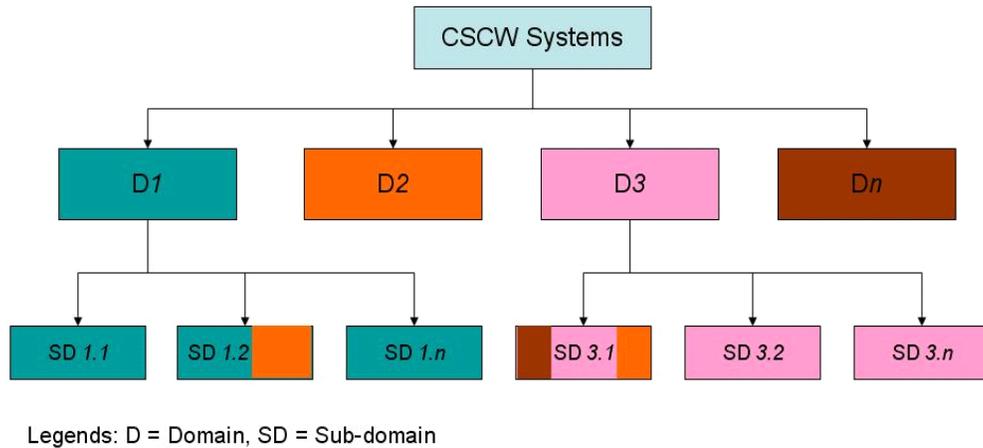


Fig. 1: The proposed classification

not describe what type of a system is except its support for communication in time-space matrix. On the other hand, Penichet *et al.* (2007) classification provides information on other aspects of systems (coordination and information sharing) but it is too generic. For example, 'G-15' ('G' means that a system supports communication, coordination, and information sharing whereas '15' means that a system supports synchronous and asynchronous communication in time and space dimensions) does not make any sense if someone is not well aware of this classification (Penichet *et al.*, 2007). Even if someone wants to memorize the classification then the correct sequence of CSCW characteristics and time-space possibilities (Penichet *et al.*, 2007) is extremely important. Otherwise, description of any system can be totally changed as a result of incorrect sequence.

RESEARCH METHODOLOGY

The proposed classification is based on literature review of ACM CSCW conference from 1986 to 2010. Limited available time does not allow us to review other available resources (e.g., the journal of collaborative computing and ECSCW conference). Secondly, ACM CSCW conference provides good sample of research that is being carried out by researchers. All those papers are selected that describe different systems for any domain. To select the papers, manual search is performed for the all proceedings (1986-2010). In reference section, only those papers are listed that are referred in the text. No explicit references are provided for the systems/tools that are mentioned in next section.

Domain-based classification: Johansen (1988) and Penichet *et al.* (2007) classifications do not describe a system in terms of its specific objectives and features for which it is designed. As described earlier, nowadays

systems are widely used in different fields of life for various purposes. In our point of view, a possible classification can be domain-specific. This section provides detailed description of the proposed classification of CSCW systems.

Definitions: We define domain as a possible field that has its own specific requirements for system design, different possible users, and distinct nature of job. For example, healthcare is a domain that has specific requirements for system design like scheduling and coordination of surgeries at an operation ward (Bardram *et al.*, 2006); different users like patients, nurses, doctors, and other staff; and nature of job varies from routine work to emergency services. We also treat some systems that are commonly used in different fields of life as different domains. For example, social networking sites are common platform for everyone. These sites have many features (e.g., personal updates, addition/deletion of contacts/friends) that make them different from other domain systems (e.g., healthcare systems).

Domains can be further divided into sub-domains. For example, tagging systems and blogs are possible sub-domains of social networking sites. Similarly, graphic editing systems can be a sub-domain of co-authoring systems. There may be some systems that belong to more than one domains and it will lead to overlapping sub-domains. Many games are developed for healthcare and learning. For example, SIDES (Piper *et al.*, 2006) is a game for social skills development that serves as a game and a mean of learning. Fig. 1 shows the proposed classification; domains are presented in different colors to differentiate from each other e.g. D2 is presented in orange color. Sub-domains have the same color as their parent domain e.g., SD 3.1. Overlapping sub-domains are presented with multiple colors e.g. SD 1.2 that belongs to D1 and D2 domains.

Table 1: Domains and related systems discussed in CSCW 1986-2010

Domains	No. of papers	Examples (Systems)
Messaging/Email systems	30	QnA, Andrew message system, Corona, GestureCam, CLUES, HomeNote, reMail
Conferencing/Meeting systems	30	MMConf, GROUPKIT, MERMAID, HyperMirror, Range, Meeting mediator, FreeWalk, MAJIC, DOLPHIN, Meeting central
Online Communities/Social networking sites	27	EatWell, BodySpace
Healthcare	23	AwareMedia, Abaris, UMHC, Shared Speech Interface, Prism, COW
Entertainment/Games	14	World of warcraft, There, Flashlight jigsaw, Sandboxes, Poker, SIDES, FishPong
Software development	13	ICICLE, DCWPL, Hipikat, COAST
Group writing/Co-authoring	13	BIBDB, Flexible Diff, Duplex
Wiki systems	11	Wikipedia, Research Wiki, Geowiki
Education/Learning	10	Team Work Station, Algebra Jam, CLARE
Research and development	7	BSC
Decision systems	5	Plexsys Planning System, gIBIS, Cognoter, SIBYL
Aerospace/Airline industry	5	No specific system is discussed.
Document management systems	4	Quilt, SYNVIEW
Geographic systems	2	No specific system is discussed.

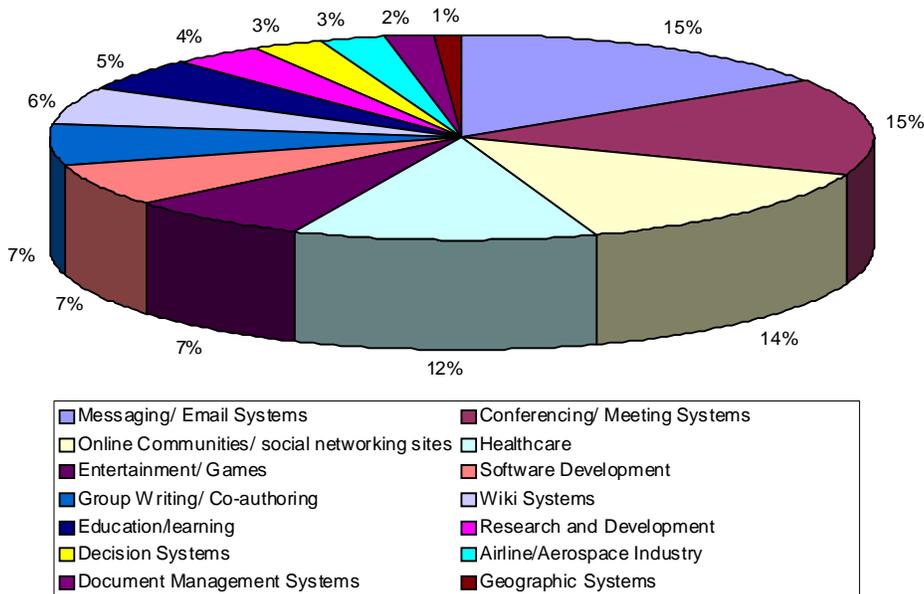


Fig. 2: Domain-specific papers in CSCW conference (1986-2010)

Domains discussed in CSCW conference: This subsection enlists domains and systems that are discussed by researchers in ACM CSCW conference from 1986 to 2010. On the basis of literature review, many papers are found domain specific. Domains that are discussed in these papers are healthcare, entertainment/games, education/learning, software development, research and development, airline/aerospace industry, online communities/social networking sites, group writing/co-authoring, document management systems, geographic systems, wiki systems, decision support systems, messaging/email systems, and conferencing/meeting systems.

Table 1 shows domains that are discussed in ACM CSCW conference, total number of papers found related to each domain, and examples of domain specific systems

that are discussed. Of course, we do not claim that these are the only possible domains for CSCW research as there are lots of other domains e.g. showbiz and manufacturing industry. The reason is that literature review is limited to ACM CSCW conference.

The analysis of the selected domain-based papers (194 in total) presents interesting results. Messaging/email systems and conference/meeting systems have largest share i.e. 30% papers are related to these systems. Out of these 30% papers, half of the papers are related to messaging/email systems whereas the remaining papers are related to conference/meeting systems. Second largest share of papers (14%) are about online communities and social networking sites that are also an area of interest for last several years. Healthcare domain is also a major area of work with 12% papers. Entertainment/games, software

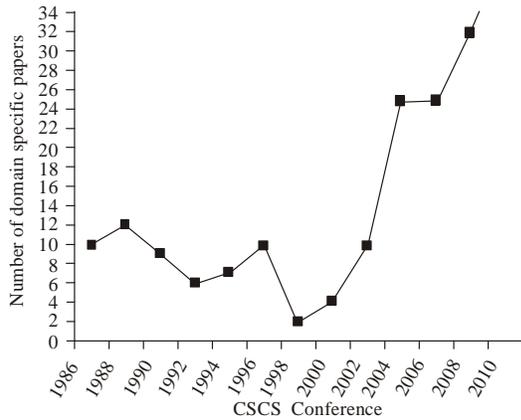


Fig. 3: Trend of domain-specific papers in CSCW conference

development, and group writing/co-authoring have equal share i.e., 7% papers for each domain (in total 21%). Papers related to wiki systems are 6% whereas education/learning related papers are 5%. 4% papers are about research and development organizations whereas 3% papers are related to decision support systems. Airline/aerospace industry, document management systems, and geographic systems have 3, 2, and 1% papers respectively. Figure 2 shows the complete distribution of papers related to each domain.

Figure 3 shows number of domain-specific papers that are published in ACM CSCW conference from 1986 to 2010. The trend line represents that CSCW research community is moving towards domain-specific topics. Domain-specific papers are increased particularly after 2000.

DISCUSSION

Since the mid 80's, a lot of work has been done to address the different aspects/issues of CSCW by the research community. A comprehensive overview of the selected literature finds various related topics such as, better coordination during collaborative work, issues of public displays, social factors of CSCW systems, under-contribution of online communities, evaluation of these systems, change of work flow due to these systems, and many others topics relevant to CSCW.

In early days of ACM CSCW conference, the main topics of domain-specific papers were conferencing/meeting and messaging systems. In 1980's and 1990's, research community was more interested in issues related to systems for video/tele-conferencing in distributed environment, remote or ad-hoc meetings and other related factors. Nowadays researchers are more interested in issues related to domains like online communities, collaborative games, wiki systems, and healthcare (and this trend is clearly reflected in Fig. 2).

In our point of view, major portion of the study addresses the general issues of CSCW systems. There is a need to do more domain-specific work for the success of these systems. Currently, the available evaluation methods for these systems are general in nature. The authors hope that research community can provide better solution if it addresses the problems of specific domains instead of general solution for all. The requirements and objectives of every domain are quite different in nature and researchers have to focus on those specific requirements instead of a general set of requirements. Moreover, evaluation of CSCW systems is comparatively difficult (Neale *et al.*, 2004) and there is lack of evaluation methods for these systems (Herskovic *et al.*, 2007). The proposed classification could easily address the lack of evaluation methods as it gives an idea to develop new evaluation techniques specific to each domain. For example, researchers may propose evaluation methods for healthcare systems on the basis of specific requirements for this domain.

As discussed earlier, there are some systems that fall into more than one domain. Researchers may explore such systems and identify unique set of such systems' requirements and appropriate sub-domains. This study does not provide review of all available literature except ACM CSCW conference due to limited available time. Therefore it is quite possible that some dominant work/systems are missed. The authors still believe that this paper provides good foundation for domain-based classification of CSCW systems.

CONCLUSION

This study briefly presents the existing classifications of CSCW systems and their limitations. After literature review of ACM CSCW conference (1986-2010), the authors propose new classification i.e., domain-based classification of CSCW systems. The domains that are mostly discussed in the literature are conferencing/meeting systems, messaging/email systems, social networking sites/online communities, healthcare, entertainment/games, software development, co-authoring systems, wiki systems, and education/learning. This new classification may help researchers to focus on particular domain of their interest. The authors hope that researchers will come up with more effective design and evaluation methods of CSCW systems based on the proposed classification.

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