

# USAGE OF GROUPWARE IN SOFTWARE ENGINEERING EDUCATION AT THE CSCW LABORATORY OF UNIVERSITY DUISBURG-ESSEN: POSSIBILITIES AND LIMITATIONS

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## ABSTRACT

*This paper analyzes the application level in CSCW laboratory there are Electronic meeting rooms, Video Conferencing, Desktop Conference (Passenger), and BSCW system which conducting in The University Duisburg – Essen Germany. This analysis included short analysis and discussion about possibilities and limitation of each experiment followed by outlook how this lab can be further developed.*

*Multi-user to Multipoint Videoconferences is introduced to cover all of devices join to the conferences. A computer network, PSTN (Public Switched Telephone Network), ISDN Phone, Wireless Infrastructures (accessed by laptop, smart phone, PDA) and videoconferences systems is proposed to be integrated*

**Keywords: CSCW, Electronic meeting rooms, Video Conferencing, Desktop Conference (Passenger), and BSCW**

## 1. Introduction

Computer Supported Collaborative Work (CSCW) is a multidisciplinary field that studies and looks for new technologies to communicate and process information. Its main goal is to achieve efficient communication, collaboration, and coordination of group activity [1]. CSCW research has led to a better understanding how to support electronic cooperation within groups in various environments. The importance of joint information spaces (often called shared workspaces/groupware) particularly in locally distributed loosely organized groups. The groups use such workspaces for the collection and structuring of any kind of information they need (e.g., documents, graphics, spreadsheets, tables, or software) to achieve the goals of their collaboration. The workspaces support primarily asynchronous and synchronous modes of communication. The asynchronous mode is normally the most important one for cooperation between members since in such an environment cooperation consists often in parallel, loosely coupled activities of the individual group members. Synchronous types of cooperation such as audio/video conferencing or chat sessions are usually of less importance but should also be supported to some extent.

In this paper, the application level in CSCW laboratory there are Electronic meeting rooms, Video Conferencing, Desktop Conference (Passenger), and BSCW system which conducting in The University Duisburg – Essen Germany are analyzed. The analysis included short analysis and discussion about possibilities and limitation of each experiment followed by outlook how this lab can be further developed. These efforts have led to a greater understanding of the complexity of group work and the implications of this

complexity, in terms of the flexibility required of supporting computer systems, have driven much of the recent work in the field. Despite these advances, however, it is still the case that few cooperative systems are in widespread use and most exist only as laboratory-based prototypes. This is particularly true for widely-dispersed working groups, where electronic mail and simple file-transfer programs remain the state-of-the-art in providing computer support for collaborative work.

## 2. Theoretical Background

For each laboratory there was theoretical reading. On laboratories there were strict hands on section that described how the laboratories were meant to be performed. Some laboratories included writing a paper or preparing a presentation of the experiences in the laboratories.

### 2.1. Electronic Meeting Rooms

The meeting include to face to face meeting (traditional meeting) and electronic meeting room. The face-to-face meeting with everyone present at the same time in one room. Such meetings are often not easy to organize; schedule conflicts make it difficult to find a time when all participants are available. Also, face-to-face meetings can be dominated by one or a few individuals to the point where valuable comments by others may never be expressed. Some people may remain silent for fear of criticism. Another drawback is the sequential nature of input in traditional meetings. There can be only one person speaking at a time while, presumably, the other participants are listening intently to the person speaking. Sometimes, an inordinate amount of time must be allotted spent if all participants are to be heard [2]. The electronic

meeting room which overcome many of the drawbacks of traditional meetings is similar to a standard meeting room with the addition of specialized equipment to improve communication among participants (to improve the productivity of decision making meetings, either by speeding up the decision-making process or by improving the quality of the resulting decisions). Although there exist different designs for electronic meeting rooms, all of them must have a minimum configuration:

A set of interconnected computers (one for each participant including the meeting facilitator) controlled by a central server, printers, and audio-visual supports such as electronic boards, video cameras, and video projectors.[1,3]

Starting 2001 a multimedia training classroom was established by the media centre. This multimedia seminar room LB 239 was equipped with special furniture and training classroom techniques.

So-called „training isles“ or “student isles“ were established in order to enable working in groups of 4. The student isles consist of four carrels with PC and LCD-monitor. The monitors are counter-sunk to allow a good view on the counterpart or the lecturer.



Figure 1. Electronic Meeting Room in LB239

A digital whiteboard (digital Flip-Chart) enables a variety of applications. In combination with a PC it can be used as digital whiteboard or as interactive presentation wall. The latter means that the desktop displayed on the presentation wall can be operated through the presentation wall. The running application is processed with an electronic pen and changes can be additionally stored as graphic file. All carrels are connected to the university computer network. Through this a data exchange with external computers for video conferences or distributed applications is possible. The digital presentation wall Liesegang HS 700 provides the opportunity of using effective procedure documentations during training courses and presentations. It is comparable with a whiteboard and it has however three applications which will be presented in the following.

a. Traditional Whiteboard

Traditional Whiteboard is used as traditional whiteboard, graphics and drawings can be

edited. A dry soluble whiteboard-marker enables using the whiteboard as a blackboard /chalkboard.

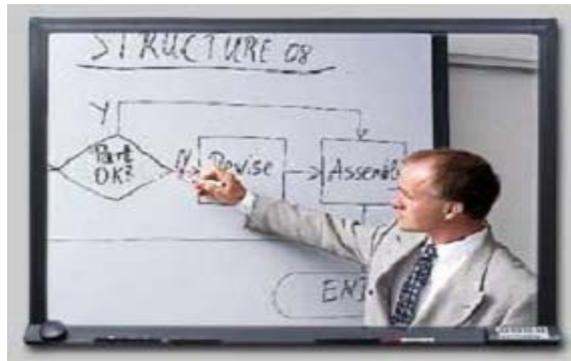


Figure 2. Digital Whiteboard as traditional whiteboard

b. Digital Whiteboard

In combination with a PC graphics can be generated, texts can be written etc. by use of an electronic pen on the board surface. These appear simultaneously on the monitor of the connected PC – but not on the board surface. These notes can be stored as graphic file and edited in other applications.

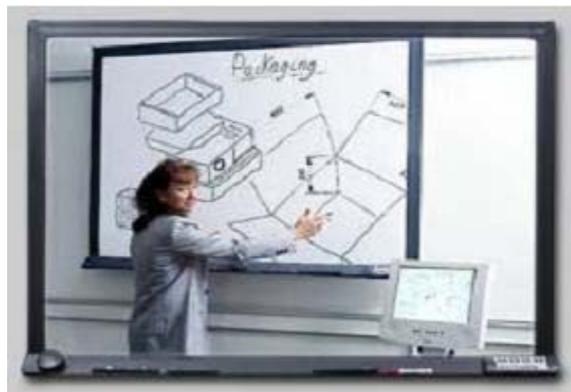


Figure 3. Digital Whiteboard

c. Digital, Interactive Presentation Wall

If a data projector is connected in addition to the PC, then data from any Windows-based program can be represented on a large surface and be addressed comfortably by means of an electronic pen. E.g. Excel tables can be generated, added and evaluated. By means of handwriting recognition handwritten letters and numbers can be directly transferred to the table. The generated comments are storable in a window interface as graphic file except for the used application.



Figure 4. Digital Interactive Presentation Wall

As option for the multimedia seminar rooms the interactive pen-display WACOM PL-500 is available.



Figure 5. The Interactive Pen-Display

Herewith it is possible to write, sketch, draw and construct with the corresponding application like on paper. By dint of the display the navigation can be controlled.

## 2.2. Video Conferencing

Video conferencing is a method of communicating between two or more locations of group members where sound, vision and data signals are conveyed electronically to enable simultaneous interactive communication.[5] It is one of kind from application level of CSCW which support a synchronous distributed communication between group members.

The Studio planning and creation should involve personnel with responsibility for audio/visual equipment, computer networks and estates. Potential users of the room should be consulted if possible, and a visit to an established studio is helpful when drawing up plans. Video conferencing is a very powerful way to collaborate, with considerable potential benefits for education. However, like any communication technology, video conferencing can be misused. This conference is not limited to two persons and may involve many people at many different venues around the world. Videoconferences are

not limited to the exchange of pictures of the participants. Depending on the videoconferencing technology used it may be possible to switch in a video player or a document imager. Some venues also have data sharing along side the videoconferencing equipment and so it is possible to share PC based presentations or web pages along with a host of other popular applications.



Figure 7. Room from audiences view

## 2.3. Desktop Conference

Desktop conference is systems that let people (multi user computer applications) who are physically distant work together in a shared virtual space at the same time through their computers. These systems typically provide a shared virtual workspace where conference participants can see and manipulate work artifacts, and may also provide audio or Video links, [4] This conference is a combination of real time computer conferencing and teleconferencing.[7] These systems do not yet provide the rich communication and awareness that are possible in a face-to face interaction.

Two of the elements necessary in this conference are group awareness and floor control adjustment. Group awareness is the up-to-the-minute knowledge of other people's activities that is required for an individual to coordinate and complete their part of a group task.

Modern software engineering in any case signifies team work. The world-wide extension of the data networks and the continuing globalization add another component to software engineering: the development in worldwide distributed teams. The usage of this forward-looking work form in university education can render a special contribution to future and practice operations of students. Thus, a synchronous groupware named PASSENGER was developed at the University of Duisburg – Essen throughout the last years. The synchronous groupware PASSENGER can support synchronous meetings with up to four members. It provides video- and audio channels for



introduction to groupware facilities of the University Duisburg-Essen: electronic meeting rooms, desktop conferencing, and video conferencing and BSCW environment.

### 3.2. Laboratory 1 : Electronic Meeting Rooms (1)

#### A. Short Review about Lab. Conduction

At this lab, a meeting in an Electronic Meeting Room is conducted. During that event an Electronic Whiteboard which easily with interesting tools and features is used. First, the whiteboard step by step refers to the manual is calibrated. Furthermore digital pen in the digital mode is used. A table is drawn, put several sentences in to the table, erase them, draw again and save the work. Later, multimedia notepad and the whiteboard are used as interactive presentation wall (interactive mode). Furthermore, compare both of modes and write the result. The next job is the usage and handling of the educational network. Then, the cooperation between the isles of the educational network is tried.

B. Philosophy: The advantages of meeting using electronic & computer system support

#### C. Learning Goals:

- Exploring tools in the Electronic Meeting Room (Digital mode whiteboard, digital pen, Interactive mode whiteboard, Educational Network)
- Face to Face Meeting
- Collaboration among member
- Group Decision

#### D. Possibilities:

- Higher room and more isles to expand the group member which provide more ideas
- For special event (ex : important meeting like annual meeting), a computer member an isle can edit what digital whiteboard displayed.
- Take care of member awareness in the each session with some acoustic gestures from the presenter to specific member which ignore the presentation without breaking the conversation.
- Intelligent Agent. Generally, intelligent agent are responsible for a specific of task (maybe as a translator) or the user interfaces makes their action resembles those of other user.

#### E. Limitation:

- There's no tools to making sure awareness of each member
- Command operational language of the control keyboard TLSDidacNet use Germany
- There's no tools to responsible a specific task like translator, frequently ask question answer or the user interfaces makes their

action resembles those of other user

- There's no session database which record all of action during a session both audio and visual system.

### 3.3. Laboratory 2 : Electronic Meeting Rooms (2)

#### A. Short Review about Lab. Conduction

Within this lab, all of function which learnt in Lab 1 are used to presenting a topic and then make a group decision.

B. Philosophy: The advantages of meeting using electronic & computer system support

#### C. Learning Goals:

- Synergy: A group member uses an idea in a way that differs from that intended by the originator of the idea
- Better information exploitation: An entire team is better at detecting inherent problems of a proposal that the individual person who introduced the idea.
- Stimulation: Working as part of a team can stimulate and encourage individuals to introduce new ideas. They may build upon already proposed ideas and develop them further.
- Learning process: Individual group member can learn from other participants & thereby improve their own knowledge.

#### D. Possibilities:

- More fun presentation
- Quickly and easy to share data

#### E. Limitations:

- During the experiment, all presented document could be save only on the centre computer (lecture's computer). Therefore share document must be undertake manually by email or USB Stick Memory or other application (joint in BSCW system)
- During computer support model, only one participant at the time (sub member of group). Therefore the resource can received on this group only. The other groups could be get using USB/email.
- There's no audio device like microphone & headset include loudspeaker to facilitating interrupt and speak. It must be done by our self manually.

### 3.4. Laboratory 3 : Videoconferencing Studio

#### A. Short Review about Lab. Conduction

Videoconference (also known as a video-teleconference) is a set of interactive telecommunication technologies which allow two or more locations (geographically dispersed

people) to interact via two-way video and audio transmissions simultaneously. It has also been called visual collaboration and is a type of groupware. The distinguish between videoconference and face to face meeting are : videoconference allowed to undertake communication in the two or more location but on the other hand, when compared with face-to-face, it can be difficult in video interactions to notice peripheral cues, control the floor, have side conversations, point to things or manipulate real-world objects. Within this lab., student focus on video conferences held in special meeting rooms aiming at providing the same high quality personal interaction for geographically dispersed people as that found in face-to-face meetings. Aspects that have to put into account are tele-presence, protection of privacy, eye-to-eye contact, sub-conversations, positioning of cameras & size of video images. The mentioned aspects examined during this experiment. Videoconferencing requires practice and planning. With any laboratory scenario (in the rooms LB 237 and BK 009), it is important to immerse students in the process and set clear expectations concerning behavior in a new situation. Two way video communications is intended to be an interactive experience, and it is important to prepare students to engage and involve themselves in the learning process. The attending join the conference and at least once have acted as discussion leader.

B. Philosophy: Interactions and information sharing between two or more locations (geographically dispersed people) via two-way video and audio transmissions simultaneously

C. Learning Goals:

- Consider the minimum requirement to run and connect a video conference
- Experience in setting and set-up videoconferencing session
- Experience individual roles and responsibilities to starting and during the videoconferencing session.

D. Possibilities:

- To fully enable rich interactions, video should be integrated with other distributed tools that increase the extent and type of shared space in such a way that enables natural collaborative behaviors within those environments
- Prior determined and announced a few guidelines to follow to make sure that all audience are aware of the extra care that needs to be taken in a videoconferencing setting (called Videoconferencing Etiquette).
- Increase multipoint connection more than 4 sides.
- Providing an evaluation form to get a

feedback from the audiences so we can put the issues identified in evaluation and plan how you might incorporate solutions into future videoconferences

E. Limitation:

- Huge bandwidth requirement to carrying out a videoconference.
- IP-based video shares or competes for bandwidth with other Internet data which cause audio clipping or delays that result in jerky video or slow networks
- Very expensive equipment that must be provided to carrying out a videoconference.

### 3.5. Laboratory 4 : Desktop Conferences

A. Short Review about Lab. Conduction

Desktop Conferences is a combination of real-time-computer conferencing and Teleconferencing. The Conferences System can be add-ons (hardware boards, usually) to normal PC's, transforming them into VTC (Video Teleconference) system. VTC system is digital compression of audio and video streams in real time. The hardware or software that performs compression is called a codec (coder/decoder). Compression rates of up to 1:500 can be achieved. A range of different cameras and microphones can be used with the board, which contains the necessary codec and transmission interfaces. Most of the desktops systems work with the H.323 standard.

This conference carried out via dispersed PCs in 3 rooms on different floor during Lab-4. A group work as single team in a session. In each floor, conducting 3 sessions with located one member of the session (Group). A member of a session only can communicate with the other member in the same session. They are login in the fixed User Name, Password, Server Address and Control Port was given by Tutor. Within this lab., each member try to experience The Passenger function as a synchronous groupware. They are set several points at first and then login and use it to communicate with the other member in the same session. They try to change something which related with performance of the software. And the finishing touch is experience the CASE (The Computer-Aided-Software-Engineering) tools of The Passenger.

B. Philosophy

Team work collaboration in the different places to solve a problem which support by computer systems.

C. Learning Goals:

- Working in a Groupware environment
- Experience The Passenger
- Group Decision

D. Possibilities:

- Increasing symbol and diagram that can be draw in the CASE tools, like UML diagram, database diagram....etc...etc
- Increasing member that can be join to the session, more than 4 member.
- Passenger for business purpose (enterprise edition)
- SIP standard implemented in Passenger
- User friendly manner to join and use Passenger

E. Limitation:

- Only used by 4 member in the each session.
- Limited edition.
- Can not connected to the other session.
- Noise was found in the sound quality.
- A member join a session with complicated authentication.
- Nobody can develop and changes the Passenger (Not open source).
- There's no hierarchical of user privileges to control user action.

### 3.6. Laboratory 5 : BSCW (Basic Support for Cooperative Work)

A. Short Review about Lab. Conduction

BSCW is one of application level of asynchronous groupware in CSCW with privacy protected shared workspace. It's a web providing share information space features for upload document, version management, and group administration. A member works in he/she private workspace and then sharing with the others.

B. Philosophy

Sharing content and information from member both face to face or distance meeting.

C. Learning Goals:

The goal from this experiment are as media education and by focusing at share information in member/student group for developing knowledge and science as mutual advantage each other.

D. Possibilities:

- We can see and modified (add, copy, paste, delete) all document and make comment automatically in our group
- We can see a document is still original or have modified by some member in our group with seeing available icons.
- With the BSCW system send email to member is available

E. Limitation:

- We can't invited group-mates if we don't know their email address
- We can open document in the public access but can't modify

### 3.7. Laboratory 6 : Working with BSCW

On the sixth laboratory we concentrated using the BSCW system to start writing groups' common final paper and preparing to the presentation. On sixth lab common workspace was established with draft documents and presentation. On laboratory it was agreed that communication will be done in the BSCW system and everyone will update own parts of the Final Paper to the BSCW workspace.

Our experience is that the BSCW system wasn't so suitable for starting the common paper, because there were lots of details that had to be discussed on the beginning. First drafts were done in front of one computer, but then submitted to the BSCW system. During the laboratory we didn't use the BSCW system for collaboration, but after the laboratory all processing of the document and the presentation was in the BSCW system.

BSCW system gives possibilities to maintain version history and concurrency control of documents, but when it is known that several persons probably process the same document at the same time, the BSCW system loses its usability. If document is divided to several documents, it is possible to divide workload to different parts concurrently. In this case you have to combine parts of the document as one and decide when the combining is done. If there is need for alterations afterward, combining must be done again and it might lead to problems, for example, if the combined document is changed. BSCW system gives also possibilities to communicate within the group and maintain calendar events for the group, but advantages using the calendar or discussion would occur, if the usage of the system were more comprehensive. In small group for a short period of time the BSCW system is too heavy to use for communication. Simple email or phone conversation works better.

### 4. The Proposed Further Laboratory Development

To develop the laboratories there are lots of small features in the equipment and the organization that can be improved, but the important development should be done in theoretical level. Theory of the groupware should be seen on the labs more efficient maybe by discussing about possibilities what the equipment offers for real-life. In the laboratories focus was on the equipment, but we suggest that, it should be directed more on group's interaction and collaboration; how can the equipment help groups in real-life and how suitable the equipment really is.

Also there are additional tools that should be included in the laboratories. New generation world wide web tools like wiki or blogging are more and more used in corporate world and they

should also be discussed in the laboratories. Of course there are wide range of different tools to be analyzed and discussed, but these new tools have different perspective to collaboration and the trend seems to be that they will be widely used in the organizations too. Wiki systems has some great advantages compared to the BSCW system, although wikis are not usually as comprehensive as the BSCW system. Also blogging is one way to interact within the group and from the collaboration view it is little different than the other tools described in the laboratories.

Finally, the possibilities that cover all of devices join to the conferences is introduced. This system is called as "Multi-user to Multipoint Videoconferences". A computer network, PSTN (Public Switched Telephone Network) , ISDN Phone, Wireless Infrastructures (accessed by laptop, smart phone, PDA) and videoconferences systems will be integrated, lay out of the system has shown below :

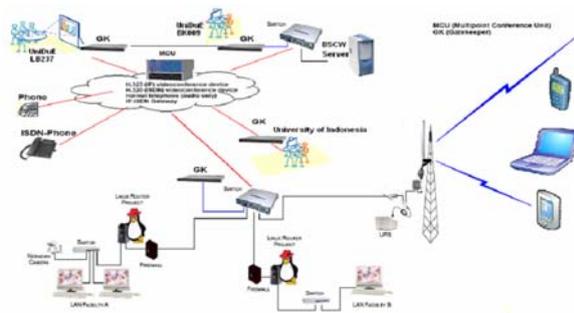


Figure 10. Multi-user to Multipoint Videoconferences

## 5. Conclusion

From the laboratories analysis, wide range of different kind of groupware has known, which were little different to each other and maybe meant for different kind of uses. Media seminar rooms can be used only in the same space, but the others are meant to be used in remote places. Video conferencing and desktop conferencing are tools for distributed synchronous meeting or conference, whereas the BSCW system provides tools for asynchronous distributed collaboration. The BSCW system provides best possibilities for document sharing and document management, but also in desktop conferencing it is possible to share documents and information. Video conferencing is mostly pure conference without any additional tools for presentation, although of course it is possible to use for example BSCW system at the same time.

When planning group's collaboration it should be carefully considered, what is the purpose of the collaboration and how distributed the team actually is and then selects the tools to support the collaboration. If the group is located in the same city, but not on the same office, it might be useful to use video or desktop

conferencing from time to time, but most important planning meetings, for example, should be kept face-to-face. The BSCW system can be used for document management and time management anyway, because it provides good version control for documents and calendar for groups. Also it is possible to share documents to outside of the group.

In the laboratories we noticed many times that when group protocols are not clearly announced, it leads to some misunderstandings and maybe some delays or mistakes during the collaboration. For example, when using the BSCW system it should be clearly decided that where and how the documents are saved. If there are lots of hierarchies in the workspace it must be announced how it is used. With conferencing tools it is good to announce the moderator, if it is not clear, because moderator should be responsible of the conference and maybe interrupt someone or decide that conference is over, when it is time for that. Also if there are quiet moments on the conference, moderator should try to advance with the conference.

Last but not least, to accommodate all devices simultaneously "Multi-user to Multipoint Videoconferences" is proposed. The philosophy of this system is videoconferences for everything and everyone. For user with limited devices they can connect to the network only with audio channel or open off line presentation (in the audio or video streaming format) which saved in BSCW server. Therefore the system looks like too large but in fact it just connect established network with connection devices, prior the MCU. A Multipoint Control Unit (MCU) is a device commonly used to bridge videoconferencing connections. The other devices used are Gate Keeper, Router & Switches.

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