CONSIDERATIONS FOR A FRAMEWORK FOR CATeam RESEARCH

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ABSTRACT

This document discusses the goal of productivity improvement for groups and ways to obtain that goal. It adresses the terminology used for this concept and issues related to CATeam (Computer Aided Team). The paper describes the assumptions that determine the outlined framework of research for CATeam that is used to guide the Hohenheim research programme in Computer Aided Teams (CATeam). The framework is presented as a springboard for discussion rather than a final ending point of CSCW research.

1 Introduction

The emergence of the term Computer Supported Cooperative Work (CSCW) illustrates the interest in group computing. However, the specifics of where computer support for group work would be advantageous, useful, and acceptable are very difficult to determine. The difficulties of the research to be undertaken to answer the above question is well described by Kerr: "Social interaction in decision-making groups is characterized by such variety, complexity, and apparent disorder that it seems to defy neat analysis. The key difficulty seems to be choosing an appropriate aspect of the groups behavior for observation".[1] Expectedly, the fragments of research undertaken to date to answer these questions are not easily linked to each other, due to the fact that incompatible research frameworks and those of limited coverage are used in this complex and multidisciplinary field.

To guide research in the field numerous frameworks have been developed.[2] An often cited model for group research as such is that of McGrath.[3] This model has been developed to combine small group research and has significantly influenced the construction of the above research frameworks.

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[1] Kerr, Social Transaction 1982, p. 62.

[2] Huber, Issues in Design 1984a; DeSanctis, Gallupe, Foundation 1987; Dennis et al., Electronic Meetings 1988; Kraemer, King, Computer-Based Systems 1988.

[3] McGrath, Groups 1984.

A driving force to discuss a research model for CSCW was a study trip to existent laboratories for CSCW research in the United States.[4] One conclusion of this evaluation was, that though the different approaches cover the field of CSCW, some of the experimental results are unlikely to be compared and easily combined with each other, as the specific research frameworks used are incompatible or do not provide "linking pins". A similar conclusion can be drawn from a systematic collection of empirical research studies; within each school of thought results are, even though often contradictory, at least comparable whereas between schools even contradictions can hardly be proven.

Even though the nature of the problem might not allow an all encompassing research framework for CSCW, it is necessary to lay out the considerations used while identifying questions for study to guide the research. This is admittedly a subjective process dependent on certain assumptions. As many research questions are possible, this is necessarily a meta-discussion in which after the premises have been set, the detailed research questions almost automatically follow.

2 Improving Group Productivity as a Goal

2.1 Group Productivity, Meetings and the Development of Organizations

A significant portion of time spent in organizations is spent working or trying to work in groups. The estimates range from 60-70% for IS managers to 30-80% for general managers, according to American publications.[5] A recent german study determined that managers spend on average 40% of their 59 hour work week on communication, 38% at the desk and 22% on tour.[6] Their detailed analysis yielded these results for time usage patterns:[7]

19% meetings
13% telephone
11% reading documents
11% preparing documents
8% official meetings
8% incoming mail
7% outgoing mail.

Other than for meetings themselves, a large amount of time is used for communication in a variety of forms. The majority of this communication will be used for coordination: coordination of people working together to try to accomplish goals they alone could not accomplish. The trend towards team work and project orientation is unlikely to stop, with global and flatter organization structures in place.[8]

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[4] Krcmar, Besuchsbericht 1989.

[5] Dennis et al., Electronic Meetings 1988, p. 591.

[6] Müller-Böling, Klautke, Ramme, Manager-Alltag 1989.

[7] Müller-Böling, Klautke, Ramme, Manager-Alltag 1989.

[8] Huber, Post-Industrial Organization 1984b; Drucker, New Organization 1988.

At the same time a plethora of complaints are voiced about the productivity of white collar work in general and about the productivity of group work and meetings especially. Specific problems hindering group productivity are described by Ranftl.[9]

Thus the time spent in group work, whether it be in classic meetings or in coordinating group activities, as well as the envisioned organizational changes, make improving group productivity a key issue for the productivity of knowledge workers.

2.2 What is Productivity

Productivity is often defined as the ratio of valuable output to input, describing the efficiency and effectiveness with which resources are utilized to produce a valuable output. Key terms are "efficiency", "effectiveness" and "value". Efficient work can be ineffective and of no value; effective work can be highly inefficient.[10] This understanding of productivity does not prescribe what the valuable output should be.

A constricted definition of the key terms assumes a mere factor combination process with value measured in terms of direct contribution to profit of an enterprise as the object of productivity measurement. Research into productivity identified several levels on which productivity can be determined.[11] For each level the understanding of what is "value" is subsequently made larger. In the end, every contribution to a goal a group has to accomplish is important. Goals will be broadly defined, often incorporating results and process conditions. More and more a wide focus of what productivity is, needs to be employed.

2.3 What are Group Goals

If productivity looks at producing some output and to produce that output is the groups' goal, a taxonomy of group goals and possible group tasks is needed. To fulfill the goal is to perform certain tasks. To measure performance of a factor combination process, a clear understanding of the nature of the factor combination process or task performance is necessary.

Tasks can be classified a number of different ways: rational/irrational, complex/simple, type of task contribution, and so on. McGrath has developed a taxonomy with the following eight task types:[12]

- planning tasks,
- performance /psycho-motor tasks,
- contest/battles/competitive tasks,
- mixed-motive tasks,

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[9] Ranftl, Productivity 1978.

[10] Ranftl, Productivity 1978.

[11] Reichwald, Akzeptanzforschung 1978.

[12] McGrath, Groups 1984, p. 61.

- cognitive conflict tasks,
- decision making tasks,
- intellective tasks, and
- creativity tasks.

From a more information oriented perspective, Huber differentiates between (1) information generation, (2) information retrieval, (3) information sharing and (4) information use of numerical, textual and relational types of information.[13]

2.4 How Do Groups Obtain Their Goals

Explanations of how groups get to where they are requires a conceptual framework for the study. Again, the framework developed by McGrath will be used (Figure 1).[14] It provides as major groups of variables: properties of individuals, properties of the environment, group structure or standing group, task situation, behavior setting and the group interaction process.[15]

In addition to the above framework, our view of the group process looks explicitly at time. The model simplifies the work group process into a structure depicted in Figure 2. First, a task is given to or taken by a group. A meeting starts off the following task solution process. This process is a sequence of phases in which members of the group meet and individual members work separately. At all times communication about the task content and about the way to solve the problem (coordination) takes place. Not just during a meeting but also at other times the group is bonded by the task to be solved. Thus group work is characterized by a changing task mix over time and a sequence of meetings and separate working times. During the separate working times members still collaborate in their common role as members of "this group". Coordination for this process can either be driven by the provision of content-based methods or process-oriented methods for communication.

2.5 How to Improve Productivity

To improve the outcome of the described process, every tableau of variables within the McGrath framework could be taken as a starting point. Each change of one variable can have influence on overall group productivity. A study into improving research and development productivity identified, amongst others, the following basic factors:[16]

- all organizations have the potential for improvement,
- the greatest productivity improvements result when an overall systems approach is taken,
- a direct approach is to deal constructively with counter productivity factors,

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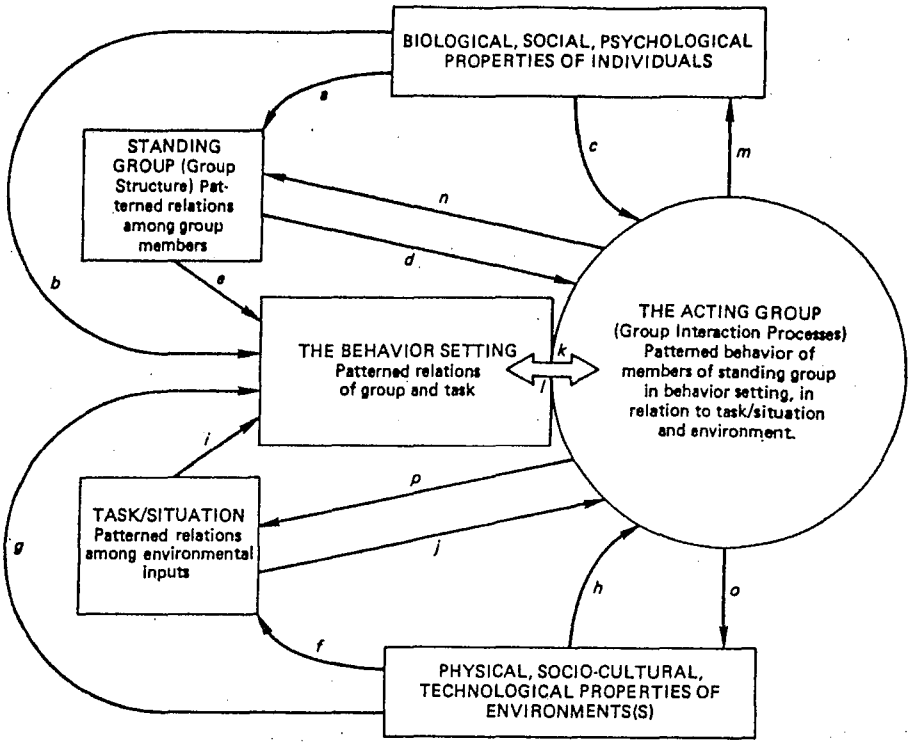
[13] Huber, Issues in Design 1984a.

[14] McGrath, Groups 1984.

[15] See McGrath, Groups 1984, for a detailed description of the relationships between the groups of variables or variable tableaus.

[16] Ranftl, Productivity 1978.



Arrow in the Model	Relations Implied
a	Member composition of focal group.
b and *c*	Extramember effects of individuals on Behavior Setting and on Group Interaction Process.
d and *e*	Effects of Standing Group (group structure) on Behavior Setting and on Group Interaction Process.
f	Environmental factors as they structure the Task/Situation.
g and *h*	Extratask effects of Environment on Behavior Setting and on Group Interaction Process.
i and *j*	Effects of Task/Situation on Behavior Setting and on Group Interaction Process.
k and *l*	The dynamic relation between the Behavior Setting and Group Interaction Process.
m and *n*	Effects of Group Interaction Process on members, and on the Standing Group.
o and *p*	Effects of Group Interaction Process on Task/Situation, and on the Environment.

Fig. 1: A group research framework (McGrath, Groups 1984, p. 13, Fig. 1-1)

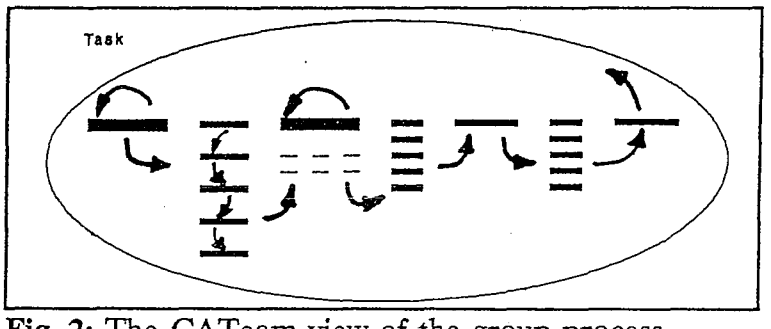


Fig. 2: The CATeam view of the group process

- seemingly small individual improvements can add up to significant improvements,
- sufficient, continuous innovation is preferable, and
- maintaining proper perspective and pace of innovation.

With information and communication technology being widely adopted, one needs to consider if information technology could be used to improve the conditions for group work. The following chapter discusses some of the issues in using information and communication technology to improve group productivity. In the context of group productivity, the concept of CSCW and CATeam changes the environment of groups. Other variables remain unchanged at first sight. However, it is certain that feedback will occur between the different variable tableaus.

3 Issues in CATeam

3.1 CATeam, CSCW, GDSS, EMS and Other Terms

In 1987 Johansen listed close to 10 terms all describing computer support for groups.[17] He referred to the difficulties finding a "good" name for this concept. Common names now in use are groupware[18], Computer-Supported Cooperative Work (see the conferences named accordingly and these proceedings), Group Decision Support System[19] and electronic meetings systems.[20]

To define Group Decision Support Systems (GDSS) Huber suggests "a set of software, hardware and language components and procedures that support a group of people engaged in a decision-related meeting".[21] Within the tradition of Decision Support Systems (DSS), GDSS is defined by Desanctis and Gallupe as "an interactive computer-based system which facilitates solution of unstructured problems by a set of decision makers working together as a group".[22] Later, DeSanctis and Gallupe write "a GDSS aims to improve the process of group decision making by removing common communication barriers, providing techniques for structuring decision analysis, and systematically directing the pattern, timing or content of discussion".[23] Noting that there is little agreement among the people working in the field about the definition of a GDSS, King and Kraemer conceive a GDSS as a sociotechnical "package" comprised of hardware, software, organizationware, and people and propose to include any computer and communications-based support of group work, including but not limited to decisionmaking.[24]

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[17] Johansen, User View 1987, p. 58.

[18] Byte, In Depth: Groupware 1988; Johansen, Groupware 1988.

[19] Huber, Issues in Design 1984a; DeSanctis, Gallupe, Foundation 1987.

[20] Dennis et al., Electronic Meetings 1988.

[21] Huber, Issues in Design 1984a.

[22] DeSanctis, Gallupe, New Frontier 1985, p. 3.

[23] DeSanctis, Gallupe, Foundation 1987, p. 589.

[24] King, Kraemer, Computer-Based Systems 1988, p. 118.

The term "groupware" has recently made it to the trade press. There it is elusively defined as "software for a group" with the purpose to provide both structure and support to aid in working together.[25] It then quickly became the name for a new software product category;[26] this understanding of the term seems too restricted to catch what could be done to support group work with information technology. While a data base search in the CMPT data base (Computer Database) in June 1988 yielded 26 references, a search in the same data base in May 1989 resulted in 84 citations using the term "groupware".

Computer Supported Cooperative Work (CSCW) as a name for the field seems to find wide acceptance within the research community. However, more so in the US than in Europe. Coined in 1984 by Irene Greif it was then intended "to delineate a new field of research focused on the role of the computer in group work".[27] In 1988 Suchmann states, "since that time, the community forming under the heading of CSCW has represented less a close-knit, tightly integrated movement than an eclectic mix of people with roots in different fields. Indeed, it is precisely the diversity of this community, including its disagreements, that offers the promise of new insights into social practice and computer design".[28] Suchmann identified a common interest in designing computer systems which service people working together. The phrase "Computer Supported Cooperative Work" is not without pitfalls: depending on the perspective "co-operative" might be connotated with a positive or negative value judgement.

Furthermore, Dennis et al. maintain, that GDSS are more task-oriented and CSCW is more driven by communication needs.[29] To integrate these two they propose the name "Electronic Meeting Systems " (EMS). EMS is defined as "an information technology based environment that supports group meetings, which may be distributed geographically and temporarily. The information technology (IT) environment includes, but is not limited to, distributed facilities, computer hardware and software, audio and video technology, procedures, methodologies, facilitation, and applicable group data. Group tasks include, but are not limited to, communication, planning, idea generation, problem solving, issue discussion, negotiation, conflict resolution, systems analysis and design, and collaborative group activities such as document preparation and sharing.[30] However, the definition of EMS stretches the term "meeting" to the limits of its Webster's dictionary's meaning of "an act or process of coming together". While that certainly does not mandate physical proximity, time synchronicity as such is often implied. The act of "coming together" can hardly be expanded to those periods of time when people in their role as group members work individually for a group purpose and does not cover communication processes by any stretch of the imagination.

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[25] Byte, In Depth: Groupware 1988, p. 242.
[26] Opper, Toolbox 1988, p. 275.
[27] Suchmann, CSCW 1988, p. V.
[28] Suchmann, CSCW 1988, p. V.
[29] Dennis et al., Electronic Meetings 1988, p. 592.
[30] Dennis et al., Electronic Meetings 1988, p. 593.

We therefore use the term "Computer-Aided-Team" (CATeam) to represent the aforementioned meanings. CATeam is seen as a collection of concepts and computer supported tools to improve the productivity of group work through the use of information and communication technology. This approach implies no prior assumptions about the preference of a work mode (collaborative, competitive or negotiating), and no value judgement about equality in work. It only aims at improvements in productivity. As has been described earlier, that could mean different things in different environments.

Whichever name one uses, they all share in the approach: improving a group's productivity by changing its environment through the use of information and communication technology. Thus environmental changes become a main independent variable of that research; other variable tableaus need to be controlled. Further changes of group structure, group process and even individual behavior would be considered a second order effect of that environmental change.

3.2 Focus on Environment: Environment as a Tool

The focus of the CATeam concept is to improve group productivity through changes in the group's work environment. Thus, one tries to build tools that assist in the process of group work. Building tools and then evaluating when to use them in the best way is typical for tools research. The research question is to identify the conditions under which the use of these artifacts is most appropriate.

Two perceptions of tools can be applied: First, a tool is something external to its user and exists independently or is an implant, but still is identifiable. Examples are hammers, pencils and implants. This understanding is often used for physical tools. Second, in a wider perception of the tool notion, tools can also be concepts that have been adopted and thereby learned. Such tools need not necessarily be external to the user, but they could be. The use of such a tool does not leave its user unchanged; adaption to the tool and its concept is a prerequisite for successful usage. Tools require an understanding of how they work. However a user of a hammer does not necessarily become a carpenter as well as a user of a pencil does not become a drawer by merely using it, whereas a user of a specific software concept (e.g. spreadsheet) will start to structure the world according to the principles of the tools he uses in a much deeper way. Providing an information technology based environment for group work thus implies changes in the group's behavior through the tool concepts being used.

3.3 Tools, Methods and Models

Discussions about tools for software development implicate a hierarchy and strong connection between models (how does it work and can it be improved), methods (how does one go about to improve it based on the assumptions of a model) and tools (how are the methods brought to bear with a certain technology). In this view, evaluating a tool is also evaluating the method is also evaluating the model. Appraising a tool judges its feature implementation as well as the underlying method: is the implementation

adequate to the user and is the method adequate to the problem? Even though one would probably like to evaluate the model first then the method and finally its implementation, only the instantiation of model and method in a tool can be assessed. Tool evaluation is complicated because of backtracking: to answer model appropriateness by empirical research one has to start by implementing a tool prototype, whose features could be terrible inadequate. Careful determination how feature, method and model appropriateness influence the results is obligatory. Moran proposes, to differentiate the following four approaches: system evaluation, feature evaluation, user factors, and model building.[31]

3.4 CATeam Tools as Artifacts

CATeam tools are artifacts. They are built by people and through their building process and existence they change perceptions about the world. A dynamic relationship between user and tool occurs. CATeam research resembles time-dependent and culture-dependent social research. Also there is an interaction between tool and toolsmith/rebuilder on one side and user/learner/method developer on the other side.

These feedback loops make it necessary to perform a participatory tool development process; toolsmiths need to study their tool users, tool users will need to explore new options for tool building and to gain experience using the tools. One option to improve acceptance will always be to wait for the change of perceptions of computers as tools.

3.5 Classes of CATeam Tools

A number of criteria can be used to differentiate group situations in order to find the most appropriate tool. Amongst the criteria for differentiation are physical dispersion of group members (local - remote), duration and time distance of the event (meeting - mailing), joined goals (collaboration - negotiation), process control (hierarchical - democratic), communication architecture (point to point - broadcasting), amount of IT usage (personal use - decision room use), group size and others.[32]

One could also make a division between content-oriented and process-oriented means. Facilitation of an idea collection session is typically done by a process orientation method; whether these are ideas for parking problems or strategic issues seems to be irrelevant. Content orientation can be defined as when in a software engineering process certain knowledge about the task at hand is being used.

A classic differentiation of approaches is based on the duration of the decision meeting and the dispersion of group members. Thus decision rooms, teleconferencing and decision networks become the basic classes of tools.[33]

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[31] Leitheiser, Experiments 1986, p. 18.

[32] Jarke, Multiperson DSS 1985; King, Kraemer, Computer-Based Systems 1988.

[33] DeSanctis, Gallupe, New Frontier 1985, p. 6-7.

DeSanctis and Gallupe describe three levels of GDSS.[34] Level 1 GDSS provide technical features aimed at removing communication barriers. Level 2 systems provide decision modeling and group decision techniques to reduce uncertainty and "noise" that occur in the group decision process. Level 3 GDSS incorporate machine-induced group communication patterns and include advice in the use of rules during the meeting. Whereas level 1 GDSS exists in the form of "electronic boardrooms", the necessary tools for level 2 GDSS are currently under development.

Johansen lists a total of 17 approaches to support groups and classifies them into what type of meetings and what problems are supported.[35] For face-to-face meetings he lists facilitation services, group decision support, presentation support software and computer-supported meetings. As support for electronic meetings he lists extensions of the telephone, sharing screens with PC-software, computer conferencing, text filtering, assistance for audio and video conferencing and on-line resources and "demons". For support between meetings he lists project management software, calendar management software, group writing software, conversational structuring, text filtering, spontaneous interaction on a computer network and comprehensive, content-oriented support systems. We call this a problem-support taxonomy.

More recently Dennis et al. proposed the following taxonomy for an EMS environment.[36] This taxonomy differentiates along the dimensions of:

(1) group proximity (multiple individual sites, one group site, multiple group sites),
(2) group size (small, large), and
(3) time dispersion (all meet at one time, asynchronous "meeting").

Also it is necessary to consider the amount of change and/or innovation brought into the meeting and group work process. Revolutionary or evolutionary approaches to improving group work might lead to differing results.

It seems appropriate to let the taxonomy for CATeam tools be guided by a task and subtask, the EMS tool and Johansen tool list taxonomy. To determine a suitable tool or set of tools one could not only look at the problem to be supported or at the task type but also look at elementary problems such as analytic, search, constellation, consequence and selection problems. All of these together provide a very granular and refined taxonomy of tools.

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[34] DeSanctis, Gallupe, Foundation 1987, p. 593-595.

[35] Johansen, Groupware 1988, chapter 2.

[36] Dennis et al., Electronic Meetings 1988, p. 608-611.

4 Proposal for a Research Framework for CATeam Research

4.1 The Framework

The framework for CATeam research is grounded in business administration and information systems with reference to research in group theory, organizational theory, and decision support systems. Its purpose is to help identify relevant research questions, to contribute to a linked body of research results in the field of CSCW, and to classify empirical research. The framework combines:

- group productivity as the driving force for CATeam,
- a holistic view of group work,
- a contingency approach for the appropriateness of computer support,
- a general group research model,
- an evaluation approach, and
- the notion of pragmatic usability.

Improving group productivity is an obvious goal for the CATeam concept. The measurement of that improvement is difficult and different approaches to determine the change of results and processes have been proposed. It becomes necessary to identify task-dependent measures. Additionally to computer support as such, video conferencing, education, facilitation, and other techniques for group work improvement need to be compared with the use of the CATeam concept.

A holistic view of group work takes into account as well the process of group work in meetings as the group members working separately, but in their role as a group member. This "total" approach to group work is oriented towards the work flow within the group from task start to finish and resembles some aspects of office automation. A major concern is media breaks between working alone and working in the meeting. Seamlessness results as a major possibility for improvement in the work flow of those groups that meet more than one to solve a task and that deal with a topic more than once.[37] The different degrees of seamlessness all suggest a multimedia approach, to allow group members to most appropriate use of tools.

The contingency approach for tool usage is paramount to the framework presented. Adequateness will be judged in the realm of improving productivity of groups. The contingency will be seen from task types, elementary problem types, problem types, group size, proximity and synchronicity. More research is necessary to reduce these dimensions of contingency. Also it is important to view the appropriateness of computer support in the light of the major group productivity obstacles. Providing voting support for cognitive conflict tasks in a hierarchical environment as a mean to end a debate might not be adequate at all. Improved social skills and individual training could well be prerequisites for using CATeam tools and also better alternatives than CATeam tools at certain times.

[37] Stefik et al., Beyond the Chalkboard 1987.

In the context of group research, the CATeam concept uses an existing framework within that area. It builds basically on the McGrath model for variable tableaus and follows the research designs outlined by McGrath. Within the CATeam framework the environment variables will be extended to reflect the different CATeam tools and their combinations. The other variables, which are contained in McGrath's framework need to be controlled.

Tool evaluation is approached in layers. First, if a CATeam tool should be used even at all. The assumption is, one should try it. Second, under what conditions are the tool type and its underpinnings as such useful. The assumption is that within a general tool type it is better to use it, than to look at very specific details (that could be proven wrong later!). Third, within a certain tool type, which one is best. And, finally which features of a tool or tool type are well accepted. In the end one would like to identify features of tools that link with elementary (sub)tasks of groupwork and work from there to construct improved instruments.

Two evaluation approaches are often found: the use of natural groups and of artificial groups. Whereas natural groups will solve a problem they are faced with even without the experimental context, artificial groups are brought together for the reason of observation. In addition to consider research economy it is necessary to look at which tool evaluation question to answer with what approach. We propose to evaluate features with artificial groups and the overall tool influence with natural groups.

By providing natural groups with an environment to (possibly) improve group work, we hope to get feed back for tool construction from users that then have experience with the technology and can formulate their wishes based upon that. In addition, the chance of using and implementing CATeam in organizations can more adequately be evaluated.

4.2 Research Questions and Assumptions

As stated in the beginning, finding the relevant questions for CATeam might well be difficult. It is important to note, that this search process rests on assumptions. The assumptions guiding the Hohenheim CATeam effort are, as much as we can be aware of them at this moment, briefly listed in the following:

- evaluate CATeam concepts from the viewpoint of teamwork as a whole;
- classic meetings will not disappear, due to social needs and the richness of face-to-face, local communication ("smell it" on the network?);
- the feedback loop between field research and the development of soft- and hardware should be short and incorporate experienced users as intensively as possible;
- a group and consequently meeting size of 8-12 people is found often in the area of software development, controlling and other project teams;
- tool flexibility is needed for easy changes between discussion and presentation modes of a meeting;
- a tool kit approach that provides many and different instruments in an integrated fashion is preferred to a "single" tool approach;

- considering the problem of change especially on a managerial level, an evolutionary approach of improving group work will be used: once in a decision room, more tools could be offered;
- seamlessness with common means is a goal for tool implementation;
- in general, natural groups should be used for tool evaluation and student groups for feature evaluation;
- no predetermination is made between facilitatordriven tools and tools without facilitators;
- in the absence of facilitatordriven tools the education requirements should be carefully studied;
- a room (laboratory) for evaluation of meeting tools is necessary;
- the size of the research area makes cooperation necessary to the largest extent. Therefore the Hohenheim CATeam research encourages collaboration and already cooperates with researchers within the university in multicriteria decision making, communication science, sociology and psychology;
- expectedly, the social use of the technologies will bring surprises, technology assessment by observation not just by speculating is necessary.

Following their presentation of a foundation for the study of GDSS, Desanctis and Gallupe proposed the following general areas for GDSS research:[38] (1) GDSS design, (2) patterns of information exchange, (3) mediating effects of participation, (4) effect on perceived physical proximity, interpersonal attraction, and group cohesion, (5) effects on power and influence, and (6) the performance/satisfaction tradeoff.

The Hohenheim CATeam research at the moment will address these research questions:

1) How can work in teams be supported, coordinated and improved by the use of information and communication technology (ICT)?
   How could these changes, especially productivity gains be measured and evaluated?
2) Which changes in (classic) meetings are possible through ICT use?
   Which changes in (classic) meetings are necessary for ICT use?
   Which changes in (classic) meetings result from ICT use?
3) How do certain tools work and are they acceptable?
4) To what extent can results of empirical studies performed in the US be applied to Europe, especially West Germany ?
   Do studies need to be replicated due to cultural differences?

To perform the research indicated above, the Hohenheim CATeam room was designed and will be built as a laboratory.[39] During the research process to follow we expect to provide new tools to the knowledge worker and to develop an understanding of group work and how it can be supported with the use of information and communication technology. By using a research framework that combines approaches already proposed, cumulative knowledge could emerge.

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[38] DeSanctis, Gallupe, Foundation 1987, p. 602-606.

[39] Ferwagner et al., CATeam Room 1989.

5 References

Byte: (In Depth: Groupware 1988)
In Depth: Groupware. Editor: Tazelaar, Jane Morrill.
In: Byte, vol. 13 (December 1988) no. 12, p. 242.

Dennis, Alan; George, Joey; Jessup, Len; Nunamaker, Jay; Vogel, Douglas: (Electronic Meetings 1988)
Information Technology to Support Electronic Meetings.
In: MIS Quarterly, vol. 12 (December 1988) no. 4, p. 591-624.

DeSanctis, Geraldine; Gallupe, R. Brent: (Foundation 1987)
A Foundation for the Study of Group Decision Support Systems.
In: Management Science, vol. 33 (May 1987) no. 5, p. 589-609

DeSanctis, Geraldine; Gallupe, R. Brent: (New Frontier 1985)
Group Decision Support Systems: A new Frontier.
In: DATA BASE, vol. 16 (Winter 1985) no. 2, p. 3-10.

Drucker, Peter F.: (New Organization 1988)
The Coming of the New Organization.
In: Harvard Business Review, (January-February 1988) No. 1, p. 45-53.

Ferwagner, Thomas; Wang, Yingdi; Lewe, Henrik; Krcmar, Helmut: (CATeam Room 1989)
Experiences in Designing the Hohenheim CATeam Room. Paper submitted to the EC-CSCW '89. University of Hohenheim (West Germany) 1989.

Huber, George P: (Issues in Design 1984a)
Issues in the Design of Group Decision Support Systems.
In: MIS Quarterly, vol. 8 (1984) no. 3, p. 195-204.

Huber, George P.: (Post-Industrial Organization 1984b)
The Nature and Design of the Post-Industrial Organization.
In: Management Science, vol. 30 (August 1984), p. 928-951.

Jarke, Matthias: (Multiperson DSS 1985)
Knowledge Sharing and Negotiation Support in Multiperson Decision Support Systems. Working Paper # 94 of the Center for Research on Information Systems. New York University, New York 1985.

Johansen, Robert: (User View 1987)
User Approaches to Computer-Supported Teams.
In: Technological Support for Work Group Collaboration.
1987 NYU Symposium Proceedings, New York, May 21-22, 1987, p. 29-62.

Johansen, Robert: (Groupware 1988)
Groupware: computer support for business teams.
The Free Press, New York 1988.

Kerr, N.L.: (Social Transaction 1982)
Social Transaction; Schemes: Model, Method, and Applications.
In: Group Decision Making. Editors: Brandstatter, H.; Davis, J.H.; Stocker-Kreichgauer, G. Academic Press, New York 1982, p. 59-79.

Kraemer, Kenneth L.; King, John Leslie: (Computer-Based Systems 1986)
Computer-Based Systems for Cooperative Work and Group Decision Making.
In: ACM Computing Surveys, vol. 20 (June 1988) no. 2, p. 115-146.

Krcmar, Helmut: (Besuchsbericht 1989)
Besuchsbericht Sommer 1988: Labors für Computer-Supported Cooperative Work Forschung in den USA. Internal working paper of the IS Department University of Hohenheim (West Germany) 1989.

Leitheiser, Robert L.: (Experiments 1986)
Computer Support for Knowledge Workers: A Review of Laboratory Experiments. In: DATA BASE, vol. 17 (Spring 1986) no. 3, p. 17-45.

McGrath, Joseph E.: (Groups 1984)
Groups: Interaction and performance. Prentice Hall, Englewood Cliffs 1984.

Müller-Böling, Detlef; Klautke, Elke; Ramme, Iris: (Manager-Alltag 1989)
Soziologische Studie durchleuchtet: Manager-Alltag.
In: bild der wissenschaft, vol. 1 (1989) no. 1, p. 104-109.

Opper, Susanna: (Toolbox 1988)
A Groupware Toolbox. In: Byte, vol. 13 (December 1988) no. 12, p. 275-282.

Ranftl, Robert M.: (Productivity 1978)
R&D Productivity. 2nd edition, Los Angeles 1978.

Reichwald, Ralf: (Akzeptanzforschung 1978)
Zur Notwendigkeit der Akzeptanzforschung bei der Entwicklung neuer Systeme der Bürotechnik.
In: Die Akzeptanz neuer Bürotechnologien. Arbeitsberichte aus einem Forschungsprogramm. Editor: Reichwald, R. München 1978.

Suchmann, Lucy: (CSCW 1988)
From the Programme Chair.
In: CSCW 88. Proceedings of the Conference on Computer-Supported Cooperative Work, Portland/Oregon, September 26-28, 1988, p. V-VI.

Stefik, Mark; Foster, Gregg; Bobrow, Daniel G.; Kahn, Kenneth; Lanning, Stan; Suchman, Lucy: (Beyond the chalkboard 1987)
Beyond the Chalkboard, Computer Support for Collaboration and Problem Solving in Meetings. In: CACM, vol. 30 (1987) no. 1, p. 32-47.

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