Conceptual Design of the Web-Based Case Method - A Pedagogical Perspective

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Abstract

Social, technological and economical change make it necessary for individuals to continuously develop and advance themselves and their competences. As a result of these changing conditions, students need to receive a comprehensive education. Learning in times of dynamic change calls for methods which teach large audiences up-to-date topics in a cost efficient way for companies and public education carriers are exposed to rising costs. Computer supported solutions, also referred to as e-learning, are perceived as a possibility to increase the quality of education while simultaneously lowering costs.

The case method is a found pedagogical teaching and learning method which focuses on the application of knowledge and promotes group work. It provides the opportunities to analyze, make decisions and formulate plans upon the decisions. In recent times this method has been subject to change for extensions and further developments regarding state of the art technologies have been developed and implemented. Within this thesis a conceptual design for a web-based case method is developed. Technological aspects are considered, however in accordance to the shift in paradigms concerning e-learning, the pedagogical and didactical perspective is focused on. The pedagogical perspective of this thesis is manifested through the procedures used within it. The development of the conceptual design builds on empirical studies which were conducted for the scope of this thesis. The outlined conceptual design is realized within a specific context. This specific setting is within a university concentrating on the subject Operations Research. The implementation of the conceptual design emphasizes its realizability.

Zusammenfassung

Sozialer und technologischer Wandel bedingen es, dass sich Individuen zunehmend weiterentwickeln müssen. Aufgrund dessen benötigen Studierende eine ganzheitliche Ausbildung. In heutigen Zeiten des dynamischen Wandels ist es wichtig, dass ein großes Publikum durch kosteneffiziente Methoden unterrichtet werden kann. Daher werden computerunterstützte Lernmethoden häufig als Alternative zu traditionellen Bildungskontexten in Betracht gezogen.

Die traditionelle Fallstudienmethode ist eine fundierte pädagogische Lehr- und Lernform, welche die Anwendung des Wissens in den Vordergrund stellt. In jüngerer Zeit hat diese Methodik durch aktuelle Informations- und Kommunikationstechnologien einige Änderungen erfahren. Innerhalb dieser Dissertation wird ein Konzept für eine web-basierte Anwendung der Fallmethode entwickelt, welche aktuelle Informations- und Kommunikationstechnologien in einem systematischen, reproduzierbaren Konzept integriert. Technologische Aspekte werden im Rahmen dieser Arbeit berücksichtigt, jedoch in Anlehnung an sich verändernde Paradigmen bezogen auf E-Learning wird der Schwerpunkt auf pädagogische bzw. didaktischen Überlegungen gesetzt. Die didaktische Perspektive wird durch die eingesetzten pädagogischen Methoden manifestiert.

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Acronyms and Abbreviations

AIM	AOL instant messenger
ARPA	Advanced Research Projects Agency
ASTD	American Society for Training & Development
BL	Blended Learning
BMBF	German abbreviation for "Bundesministerium fuer Bildung und Forschung" which means federal ministry of education and research
CAI	Computer Aided Instruction
CAL	Computer Aided Learning/Computer Assisted Learning
CAT	Computer Aided Teaching
CBT	Computer Based Training
CD-ROM	Compact Disc – Read Only Memory
CIP	German abbreviation for "Computer Investitionsprogramm" which means Computer Investment Program
CM	Case Method
CMC	Computer-Mediated Communication
COLIS	Case On Line Information System
CSCL	Computer Supported Collaborative Learning
CSCW	Computer Supported Collaborative Work
CUL	German abbreviation for "Computerunterstuetztes Lernen" which means computer supported learning
DCU	Daimler Chrysler Corporate University
DE	Distance Education
DIN	German abbreviation for "Deutsches Institut fuer Normung e.V." which means German institution for normation
DLC	Distance Learning Consulting GmbH
DS&OR Lab	Decision Support and Operations Research Laboratory
DVD	Digital Versatile Disc
DSW	German abbreviation for "Deutsches Studentenwerk" which means Ger-

	man student council
e.V.	German abbreviation for "eingetragener Verein" which means registered association
ECCH	European Case Clearing House
E-learning	Electronic Learning
ESL	English Second Language
FAQ	Frequently Asked Questions
GSS	Groupware Support Systems
HBA	Honors of Business Administration (in general)
HBA1	Honors of Business Administration year 1 of studies
HBA2	Honors of Business Administration year 2 of studies
HM	Hypermedia
HRMS	Human Resource Management System
HT	Hypertext
HTML	Hypertext Markup Language
HTTP	Hyptertext Transport Protocol
IDC	International Data Corporation
IMD	Institute for Management Development
IRC	Chat program "Inter relay chat"
IT	Information Technology
IV	Interview
KB	Kilobyte
LAN	Local-Area Network
LCMS	Learning Content Management System
LMS	Learning Management System
MB	Megabyte
MBA	Master of Business Administration (in general)
MBA1	Master of Business Administration year 1 of studies

MBA2	Master of Business Administration year 2 of studies
MSN	Microsoft Network
MUD	Multi User Dungeon/Dimension
NACRA	North American Case Research Association
OpenSMT	Open Study Management Tool
OR	Operations Research
OR/MS	Operations Research/Management Science
PGP	Pretty Good Privacy
RAM	Random Access Memory
SMS	Short Message System
S-R Theories	Stimulus-Reaction Theories
TEO	Taxonomy of Educational Objectives
TEO I	Cognitive learning goals classified according to TEO
TEO II	Affective learning goals classified according to TEO
TOM	T-Online Messenger
UPB	University of Paderborn
URL	Uniform Resource Locator
VLE	Virtual Learning Environment
VORMS	Virtual Operations Research/Management Science
vs.	versus
WACRA	World Association for Case Research and Application
WAN	Wide-Area Network
WAP	German abbreviation for "Wissenschaftlicher Arbeitsplatz" wich means scientific working place
WBCM	Web-Based Case Method
WBT	Web-Based Training
WS	German abbreviation for "Wintersemester" which means winter term
WWW	World Wide Web

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1 Introduction

Today's society is subject to various social and economical changes. Literature refers to these developments as "megatrends". Megatrends describe phenomena such as globalization, internationalization, individualization of the society and furthermore the change to a knowledge and information society [Sloane 00]. Social, technological and economical change as well as continuously changing demands of the market makes it necessary for individuals to continuously develop and advance themselves and their competences. Learning can be seen as an investment into the future.

On the one hand learning in times of dynamic change calls for methods which teach large audiences up-to-date topics in a cost efficient way. Computer supported solutions are perceived as a possibility to increase the quality of education while simultaneously lowering costs. Increasing interest is demonstrated by the rising implementation of computer supported learning and teaching arrangements. On the other hand there is also some critique concerning these approaches. Evaluations of computer supported learning come to differing results. Nevertheless, it can be remarked that computer supported learning can be implemented in a successful way.

State of the art literature describes that there is a shift in paradigms concerning computer supported learning, also referred to as e-learning. At the beginning developments of e-learning applications focused mainly on the technologies involved. Today, the trend is developing towards a stronger involvement of pedagogics and didactics. Involvement of these factors can be realized by integrating people with the respective education into the design of such learning arrangements as well as by building on found pedagogical concepts of existing methods when designing new e-learning arrangements.

A long known pedagogic method is the case method. The case method is a teaching and learning method which is built around a case. The case resembles a story. A far spread belief is that stories are the oldest and most natural form of sense making. Humans appear to have the ability and a predisposition to organize and represent their experiences in form of stories. This is mainly caused by the fact, that stories require less cognitive efforts than exposition. Stories surround us everywhere within our everyday and professional lives. Telling stories can have many functions, e.g. they are a method to negotiate, to help us find a place in our culture, to assist us in sharing human diversity, to help us learn and conserve memory, to help us remember, to mediate a process of articulating our identity, and to allow us to explicate [Jonassen/Hernandez-Serrano 02].

Even though stories played a key role in the recounting of human affairs the narrative form of learning has only recently been examined. The preferred media for scientific discourse are formal and empirical proofs. Narrative has not seriously been considered an alternative to teaching problem solving skills. "Stories represent a scientifically unacceptable form of logic" [Jonas-

sen/Hernandez-Serrano 02, 68]. Recently, due to a shift in paradigms "[…] narrative has begun to play a more important role […]" [Jonassen/Hernandez-Serrano 02, 69]. The new concern has shifted to "meaning-making" rather than generating scientific rational explanations to problems. Furthermore, professional contexts expect people to solve problems. Polkinghorne found out, that practitioners prefer to work with narrative knowledge when asked to give explanations [Polkinghorne 88]. This opinion is backed up by Schon whose research on architects, engineers and psychotherapists revealed that experiences were often encoded by using case histories or narrative explanations. He also found out, that intuitive understanding of practitioners was not supported as much by logical and technical expositions as it was by "[…] their repertoire of familiar examples and themes […]" [Schon 93, 166].

As shown above, the narrative form of telling stories plays an important role in settings such as workplaces. This shows that stories could very well also be used as vehicles within formal learning settings to promote problem solving competences. "Given this mismatch between the kinds of problem solving being learned in formal settings and the methods used to solve problems in non-formal settings, we propose the use of stories as a primary instructional method." [Jonassen/Hernandez-Serrano 02, 71] Case-based teaching assumes that when confronted with a problem (a case) learners try to remember a case in which they were faced with a similar situation. If they can retrieve a comparable case they will try to reuse the solution. If the momentary problem is alike they will attempt to revise the solution to the prior experience and use it. They will memorize the new story and remember it as being applicable within the situation. If the solution turns out to be inappropriate the learner faces failure and will seek to find another explanation. Within these moments learners will learn through listening to someone, reading stories that describe experiences about other solutions to this problem or by researching this topic.

Jonassen/Hernandez-Serrano propose to educate professionals by letting them deal with cases from their workplaces. This should be done because many skills taught in schools do not match the complexity found in work places. Formal education facilitates well structured problems. In workplaces employees often encounter ill structured problems. One characteristic of an ill structured problem is that it does not necessarily only have one right solution. An assumption of all the above mentioned researchers is that "[…] stories can function as a substitute for direct experience, which novice problem solvers do not possess. Supporting learning with stories can help students to gain experience vicariously" [Jonassen/Hernandez-Serrano 02, 71]. Some researchers extend this assumption and believe that hearing stories is equal to experiencing the situation yourself [Ferguson et al. 91]. They imply that the memory structures responsible for understanding a story are the same ones as actually carrying out the task. "Given the lack of previous experiences by novices, experiences available through a case library are expected to augment their repertoire of experiences by connection with those they have experienced. Their prior experiences serve as a basis for interpreting current and future stories, forewarning us of potential

problems, realizing what to avoid, and foreseeing the consequences of our decisions or actions." [Jonassen/Hernandez-Serrano 02, 72]

1.1 Goal of the thesis

As described above the case method is a pedagogical method which is based on the concept of narrative learning, which in turn is a long known and successful pedagogical method. Two special advantages the case method unfolds within learning processes are the focus on actually solving problems as well as on the application of knowledge [Leenders/Mauffette-Leenders/Erskine 01]. These competences correspond with up-to-date demands placed upon individuals through society. Mediating these competences to a broad spectrum of learners in a cost efficient way is desirable. While on the one hand e-learning is seen to be a solution to the increasing educational demands on the other hand it also has such a short history that potential can still be discovered and new forms of e-learning can still be developed. The goal of this thesis is to examine how it is possible to organize case-based learning according to the case method through the web.

In order for general conditions concerning this goal to remain manageable, the main focus within this thesis is placed on organizational- and design-aspects of a German university setting within the quantitative subject of Operations Research/Management Science (OR/MS) within the further context of this thesis referred to as Operations Research (OR). Goal of the subject OR is to analyze and support decision making processes for complex, multidimensional (decision making) problems mainly in economic areas, but other disciplines such as engineering or private life decision making can be addressed as well. While regarding uncertainties this is done through application of analytical approaches (e.g. mathematical, statistical and information technological models and procedures). In addition to the OR procedures, aspects of behavioral sciences as well as psychology are also considered because OR problems very often contain aspects of interpersonal relationships. Decisions are often dependent on individuals or groups of people. Effective implementation of OR instruments calls for competences in the area of the instruments in general and in the ability to implement the instruments in an efficient and productive way. This calls for the ability to define problems as well as to use the right procedure to solve them. Furthermore, implying OR techniques in enterprises often requires convincing several human actors.

To sum up constructing new, web-based learning methods is essential for the further development of e-learning. Besides enriching teaching and learning within universities the goal of this thesis also contributes to the general progress of e-learning.

1.2 Methodological approach

To which extent this thesis contributes to the advancement of e-learning depends on the viewpoint and on the methods used to pursue its goal. As it was described at the beginning of the introduction a shift in paradigms within e-learning is increasingly concentrating on the pedagogics and didactics involved rather than exclusively on technology. The pedagogical perspective of this thesis is manifested through the procedures used within it. Therefore the emphasis of this thesis is placed on pedagogical procedures and methods. Technological aspects will also be regarded although they will not be placed in the main focus. The combination of pedagogics and technology characterizes this thesis as interdisciplinary. The topic of interest can profit from this interdisciplinary design e.g. because new points of view are considered or because so far un-thought of ideas are generated. Interdisciplinary topics often include complications. Complications arise from the fact that representatives, methods, basic assumptions, styles, prerequisites, positions, procedures and interests of different scientific areas are unclear and are confronted with each other in one context. In order to standardize expectations concerning the thesis it is clearly stated that a technological realization and implementation of a web-based case method, which is applicable to varying scenarios, is not given within this thesis. The focus is placed on the development of the conceptual design for the web-based case method – from a pedagogical perspective. This development is guided by seven empirical studies which were conducted for this thesis. The majority of these empirical studies were conducted through the qualitative procedures interview and group discussion. These methodological approaches are derived out of the area of the social sciences. The method used most within this thesis is the semi structured interview technique called the guideline interview. Because results of interviews are integrated throughout the entire thesis an overview of the procedure is already given in this introductory section. This structural element may seem untypical although it is due to the above mentioned interdisciplinary nature.

Before describing the methodology of the guideline interview Table 1.2-1 gives an overview of the seven empirical studies which were conducted for the scope of this thesis. The table provides information concerning the name of the studies and the respective goals. Altogether 66 people were interviewed in single interviews, 110 people took part in group discussions and 52 people were involved in a questionnaire evaluation. The empirical method used is described as well as the number of participants involved. References to where the results of the studies can be found within the thesis are given. Detailed descriptions of the studies can be found in the appropriate appendix.

Table 1.2-1: Overview of empirical studies conducted for this thesis

Identification of the key factors of the traditional case method	
Goal	Identification of key factors of the traditional case method
Method	Guideline interviews
Participants	Eight students studying at The Richard Ivey School of Business in London, Ontario, Canada were interviewed
Location within thesis	Chapters 2.1.7, 3.4, and 4.2
Evaluation of the automated case method	
Goal	Identification of the influence of the automated case method on the learning behavior of students
Method	Guideline interviews
Participants	Nine students studying at the Freie Universitaet Berlin were interviewed
Location within thesis	Chapter 2.3.2
Alumni requirements concerning learning scenarios	
Goal	Recognition of students' awareness of mediated contents as well as implemented learning and teaching methodologies at a German university focusing on the area of OR
Method	Guideline interviews
Participants	Eight alumni of the University of Paderborn were interviewed
Location within thesis	Chapter 3.2
Student requirements concerning virtual learning	
Goal	Determination of requirements students have concerning virtual learning
Method	Group discussion
Participants	110 students took part in the group discussion
Location within thesis	Chapter 3.3
Success and hindering factors of traditional and virtual communication	
Goal	Identification of success and hindering factors of traditional and virtual communication
Method	Guideline interview
Participants	Fifteen students at the University of Paderborn were interviewed
Location within thesis	Chapter 6.3.1
Distribution of traditional and virtual communication within the web-based case method	
Goal	Identification of an appropriate distribution of traditional and virtual communication forms within the web-based case method
Method	Guideline interviews

Participants	Eleven students studying at the University of Paderborn were interviewed
Location within thesis	Chapter 6.3.2
Evaluation of virtual group work in a university setting	
Goal	Determination of strengths and weaknesses of virtual group work
Method	Combined approach: guideline interviews and questionnaire
Participants	15 students were interviewed, 52 students answered the questionnaire
Location within thesis	Chapter 6.4

As the preceding table clarifies research conducted within the scope of this thesis uses three kinds of empirical methods: the quantitative questionnaire, the qualitative guideline interview and group discussions. While quantitative methods have quite a long tradition the trend towards qualitative thinking within social sciences was first recorded in the 1970's. At that time it was described as a countermovement to quantitative thinking. In the meantime developments have gone into a direction which places the focus on adequacy of the particular approach rather than on generally preferring one approach opposed to another [Flick 91]. Research which places a large focus on generating new ideas and alternatives is carried out through qualitative research methodologies rather than quantitative research methodologies (see [Kromrey 00], [Mayring 95]). Due to the fact that qualitative procedures do not have a long tradition within the discipline of economic science but were used frequently within the empirical studies, the methodology of the guideline interview as well as the interpretation of data collected through this method are described in the following excursus.

Excursus: Guideline interview

The qualitative guideline interview belongs to the semi-structured interview methods. It typically consists of about 4-6 guideline questions each including up to 4 ongoing questions. Important thoughts and terms of the interviewees are clarified and explicated. A typical guideline interview takes place in approximately 30-60 minutes [Koenig/Volmer 97].

The guideline interview is a qualitative, empirical method which is used to give the interviewees the freedom to state what they think, without pressing them into predefined categories. Interviewing people is a very suitable methodology when the researcher wants to capture the "social reality" of the participants. Questions such as: "What do you associate with …?", "Which ideas do you generate concerning this topic?", "Which potentials for improvement can you imagine?", or "Which improvements need to be made in order to increase the productivity?" can be asked within interviews. The answers can be analyzed and scrutinized. Unclear statements which evolve out of the context of the dialogue can thus be clarified [Atteslander 03]. Techniques such as free

associating are used to identify topics of importance, and other techniques such as focusing are used to explain these topics further. After identifying and defining topics of importance, additional questions can be asked to make out further topics of interest. The results of the interviews are rated systematically according to a category system (see [Kromrey 00], [Mayring 95], [Schnell/Hill/Esser 92]). The main weakness of this design is the large effort needed to conduct and evaluate the results of the interviews. It is not possible to interview a lot of people this way because the amount of data would quickly exceed the amount which could still be evaluated in a reasonable amount of time.

The representation and evaluation of the results reconstruct the structures of the opinions of the interviewees (see [Mayring 95], [Lamnek 93]). Koenig/Volmer describe the analysis of the results as being the most problematic phase of the qualitative procedure. The analysis is confronted with large amounts of data, which need to be systemized and compressed. The collected data are evaluated by seizing the structures and reconstructing them. The analysis phase of interviews contains an evaluation according to a content analysis. The content analysis is based upon the reconstruction of the category system of each interviewee. The subjective opinions and attitudes are represented by explaining key points of the interviewees. The overall evaluation of all interviews is based upon the single evaluation of each interview [Koenig/Volmer 97].

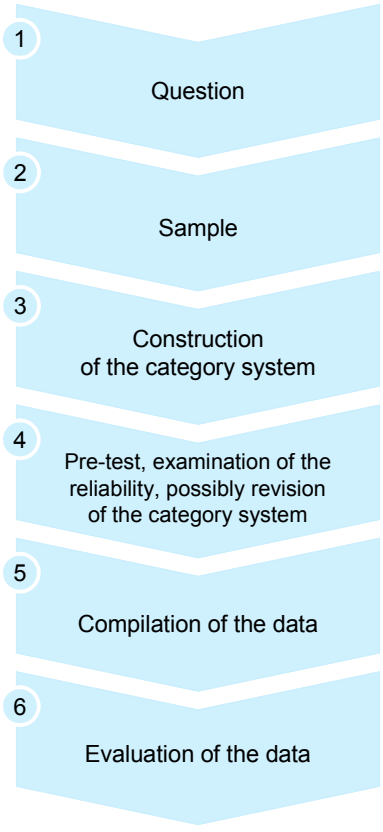

Fig. 1.2-1: Adapted illustration of the phases of a content analysis (according to [Diekmann 02, 494]).

The main advantage of the content analysis is that the interpretation is divided into steps according to predefined specifications. Thereby it becomes comprehensible for others.

Koenig/Volmer describe four fixed points, according to which one should proceed within a content analysis:

1. Transcription of the interview
2. Construction/specification of the category system
3. Single evaluation of the interviews
4. Total evaluation of all interviews.

Procedures described by Lamnek and Mayring are similar to this of Koenig/Volmer (see [Koenig/Volmer 97], [Mayring 95], [Lamnek 93]). The four steps according to Koenig/Volmer are described in the following section.

There are various forms of transcribing interviews. The transcriptions which are made within this thesis simply want to transfer the contents into normal writing, done in accordance to [Mayring 95].

The creation of a category system is the main part of a content analysis. A category system can be created through summarization, explication or structuring. These analysis techniques are basic forms of interpretation [Mayring 95]. Simply summarizing the results illustrates the population of the study. Explicating results focuses on offering additional material for questionable quotes. By structuring data, the data is brought into a form which makes it comparable. It makes the most sense to structure data within the category systems, due to the goals of the studies conducted for this thesis.

According to Mayring there are four possible ways to structure data. Formal structuring filters the interior structure of the material according to formal considerations. Content structuring extracts and summarizes material according to certain topics. Typical structuring searches for striking specifications/characteristics within the material and describes these. Scalable structuring defines specifications by allocation of scale points and estimates the material accordingly [Mayring 95]. Formal structuring places too much emphasis on formal criteria and neglects the contents. Structuring according to types only concentrates on salient statements. Scalable structuring is also not the choice for the evaluation within this thesis, for it is not the main goal to measure contributions according to points. For evaluations within this thesis the procedure of structuring according to content is chosen – this enables the researcher to focus on everything that seems to be important. The methodologies of summarization as well as explication are components of this methodology.

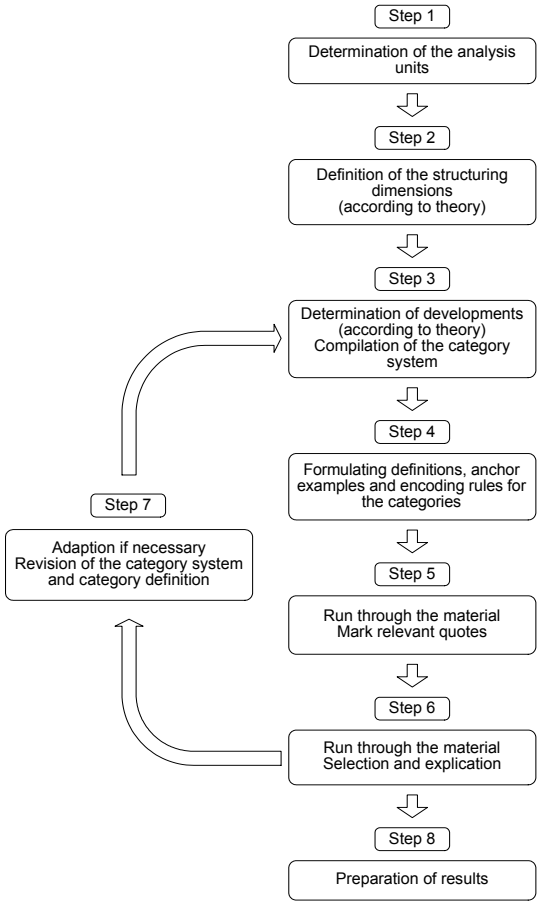

Fig. 1.2-2: Procedural model of structuring content analysis (according to [Mayring 95, 78])

Developing and modifying the category system (step 4 and 7) are the most important steps for the evaluation of the results. The categories must be defined as clearly as possible in order to enable an allocation of the quotes or of summarizations of quotes. Some categories can be built upon the guideline or the ongoing questions. Building categories according to one's own experience or through literature are also common possible procedures, as well as designing the category system according to single interviews. Within this approach one or two single interviews are picked out and are analyzed intensely. The categories are then built inductively.

In order to define the categories relevant quotes from the text are marked and associated passages of the text are combined and named. A definition of the category describes the contents that belong into the category. Subcategories structure the contents which belong to the main category. The completed category system should be tested by the interviewer by conducting a trial run and by adapting the categories if necessary.

Within the single evaluation all interviews are evaluated according to the category system. Statements, quotes or summarizations of text passages are assigned to one or more categories. The total evaluation takes place on the basis of the single interviews. Differences and similarities as well as estimations of interviewees are emphasized. Quantitative data can be used to support

statements where necessary. This kind of evaluation shows weak points as well as solution alternatives for a certain topic. Based on the relevant categories items for questionnaires can be generated.

Group Discussion

The interpretation of data collected through group discussions is conducted in accordance to interviews. The collection of data is different, for interviewees are not interviewed alone but in a group. This group situation has advantages and disadvantages compared to the single interviews. The main advantages are the synergies which develop when the interviewees influence each other. The main disadvantage of a group discussion is that intimidated people may be too shy to state their opinion, or follow the majority. For a closer overview of the methodology of the group discussion see [Atteslander 03].

After giving this overview to the main procedure involved in pursuing the goal of this thesis the next section describes its further structure.

1.3 Proceeding structure

Chapter two gives an overview of the scope of the problem. This includes describing the case method in chapter 2.1 as well as giving insight into the field of e-learning in chapter 2.2. In chapter 2.3 the focus is placed on technology enhanced variants of the case method. After assessing current implementations of technology supported versions of the case method in chapter 2.3.3 the specifications for the goal of this thesis and the further structure are explained in chapter 2.4. This clarification of the objective of the is done place by placing it into context of state of the art findings. Thereby the main aim can be described much more precisely. Furthermore, this main goal is broken down into steps which need to be conducted to reach it.

Basics and important components necessary for the development of the web-based case method are described in the chapters 3, 4 and 5 and followed by the actual conceptual design of the web-based case method in chapter 6. Chapter 7 contains the description of an exemplary implementation of the web-based case method. This chapter functions as an example of how to apply the conceptual design which was developed within this thesis. Finally chapter 8 gives a concluding perspective of this thesis. Supporting material for the dissertation is cited in the appendices A to I.

2 The case method in the context of e-learning

The goal of this thesis, namely to develop a web-based approach of the case method, is based on the two aspects: the traditional case method and e-learning. After describing these components, this chapter focuses on the deficits of existing technology enhanced versions of the case method, thereby pointing out the existing gap concerning research within this field. Furthermore, this chapter includes the systematic demarcation of the research project conducted within this thesis. Concurrently the precise problem of this thesis is also derived within this chapter. Before focusing on the development of the web-based case method, which begins in chapter 3, this chapter gives a general description of the traditional case method in chapter 2.1 as well as an outline of e-learning in chapter 2.2. These are fundamentals which are necessary in order to design the web-based case method. Chapter 2.3 brings these essential basics together by describing state of the art, technologically enhanced variants of the case method. This section includes an overview of two classifications of technology enhanced variants of the case method. Within chapter 2.4 the main aim of the thesis is specified and the further procedure of this thesis is described.

2.1 The case method

The case method, designed to bring students into contact with and learn about actual business situations, is a special teaching and learning method. It provides the opportunities to analyze, to make decisions and to formulate plans upon the decisions. Beginning with the historic development in chapter 2.1.1 this section gives an overview and a description of the case method. A description of the case itself, which is used as an instructional tool, is given in chapter 2.1.2. Afterwards in section 2.1.3 the principles of the case method are focused on. Thereafter chapter 2.1.4 describes the application of the case method. Prerequisite fundamentals which are necessary to work with the case method are considered in chapter 2.1.5. An overview of how to evaluate the case method is topic of chapter 2.1.6. Finally a summarizing comparison of the advantages and disadvantages of this method is given in chapter 2.1.7.

2.1.1 Historic evolution of the case method

The terms case method, case study method, case teaching, case-based teaching, teaching case, problem-based learning, and use of cases are used similarly in a variety of fields. When referring to this method within this thesis the term case method (CM) will be used.

According to Leenders/Mauffette-Leenders/Erskine the case method is based upon the Socratic Method which has been known since antiquity. The Socratic Method involves asking questions that lead the answers to a logical conclusion. This method was used by professors or judges. The

open dialogue within it serves as a repetitive dialogue [Leenders/Mauffette-Leenders/Erskine 01].

The case method was developed upon analyzing the traditional lecture method. The case method was to energize learning and increase active participation within the learning process. The aim was to involve students, rather than letting them be passive participants as their role is conceived within conventional teaching methods [Schmidt 58].

The case method originated at the Graduate School of Business Administration of the Harvard University in Boston, Massachusetts. Since the establishment of the Harvard Business School in the year 1908 the case method has been used within the business studies, where it soon became the prevailing and exclusive teaching method (see [Lynn 99], [Schmidt 58]).

At the beginning of its implementation the experiences of the legal faculty at the Harvard Law School were used because they had always inserted the case method into their studies. Businessmen were invited to the classes to present cases they had actually experienced. The students had to work out their own solutions for the cases and turn them in as written essays. Afterwards the businessmen, instructors and students discussed the cases and possible solution strategies together.

Applying the case method to further fields within the Harvard Business School was connected with some difficulties, because many other professors were skeptic about this method. It was the students, however, who endorsed it. By the 1930s and 1940s the case method had become widespread within business education. "In ensuing decades, other professional fields began adapting case teaching to their own teaching and training needs" [Lynn 99, 3]. The case method developed and adapted to other disciplines and therefore was turned into an effective, mainstream instructional tool. "[…] [T]he interactive, argumentative style of the typical case discussion imitates the style of argument and interaction that is the rule in a wide variety of professional work settings. Far from being an artifact of an educational environment, case discussions prepare participants for the pressures and demands of professional practice" [Lynn 99, 25]. Cases may be used for "[…] discussion purposes, for assessing candidate qualifications for employment, and for examining student achievement and skill development" [Lynn 99, 24]. The case method is used in such traditional areas as law [Lynn 99, 4], medicine [Lynn 99, 9] or business [Lynn 99, 3] but also in areas such as public administration and public management [Lynn 99, 11f.]. Case-based learning is also a popular method in teacher education, in instructional design and technology. This method can be used at virtually every level of experience and prior knowledge, from secondary school through college and programs for practitioners. According to Wassermann "[…] teaching with cases has now become a viable modus operandi in virtually every secondary subject area, from mathematics, biology, and general science, to English, government, history, law and family life" [Wassermann 94, X].

The first time the case method was used in Germany was by Kosiol in 1954. He had become acquainted with this teaching method in the US. Because there were no German cases Kosiol used American cases. This however caused some problems. In addition to copyright issues there were also problems with differences in cultural background, economics and legal issues [Kosiol 57]. The first bibliography of German-language cases was published in 1974 by the "Zentrale fuer Fallstudien e.V." (Organization for case studies). Today, the "Case On Line Information System" (COLIS) presented by "The European Case Clearing House" (ECCH) provides "[…] the most comprehensive electronic bibliography of business cases in the world. COLIS contains abstracts of cases and supplementary materials from the major case producing management schools of the world […] in addition to information on cases submitted by individuals" [Erskine/Leenders/Mauffette-Leenders 98, 44]. New technologies e.g. the internet have simplified access to cases. Two major associations, which can be joined to discuss the case method, are e.g. NACRA (North American Case Research Association, http://www.nacra.net/) or WACRA (World Association for Case Research and Application, http://www.wacra.org/).

After having described the historical development in this section, the following section focuses on the instructional tool used within the case method, the case itself.

2.1.2 The case: an instructional tool

The most obvious feature of case method is the use of an instructional tool called a case. "In essence, cases are to management students what cadavers are to medical students – the opportunity to practice on the real thing harmlessly." [Erskine/Leenders/Mauffette-Leenders 01, 6]

In the 1930s Gragg believed a case to be a record of a business issue that has actually been faced. Besides the business issue, the case includes surrounding facts, opinions, and prejudices upon which the executive's decision depends on. Basically, the description Gragg gave in the 1930s has since then only been modified, never changed completely [Gragg 54].

Haehling von Lanzenauer believes in a similar definition which, in parts, extends the definition of Gragg: A case "[…] is a description of a situation that required decisions and action. Typically, the issues to be resolved are unclear, or are perceived differently by those involved; thus, the description of the problem in the case may be ambiguous. Personal feelings, and the emotions and attitudes of the people reflect the human aspects in every case. Furthermore, the information and data presented could be incorrect, inconsistent, or even irrelevant. In other instances the required information is not given in the case and must be acquired, if necessary, by making reasonable assumptions" [Haehling von Lanzenauer 75, 1].

Erskine/Leenders/Mauffette-Leenders describe a case as a "description of an actual situation, commonly involving a decision, a challenge, an opportunity, a problem or an issue faced by a person, or persons, in an organization" [Erskine/Leenders/Mauffette-Leenders 98, 8]. They as-

sume that a case is based on actual field data, and not on fictional assumptions. Depending on the educational purpose, the contents of a case can vary and special aspects of the situation can be highlighted, underplayed or deleted. Similar descriptions are given by [Lynn 99], [Wassermann 94], and [Mateijka/Cosseé 81].

Cases allow students to take on roles and responsibilities of people in organizations (see [Carlson/Schodt 95], [Gragg 54]). This enables students to become deeply involved into decisions which actually need to be made (see [Lynn 99], [Levin 95]). Thereby students can actually feel the pressure and recognize the risks connected to this certain decision. "Cases allow students to accumulate experience while addressing issues across a wide range of functional areas, levels of responsibilities, types and sizes of organizations and industries, as well as locations throughout the world. It is the cumulative impact of these different case challenges that will permit students to take on future tasks knowing that the process of tackling decisions effectively has become a major personal asset." [Erskine/Leenders/Mauffette-Leenders 01, 5]

Features of a case specified within this thesis are:

- A case is a record of a business issue, including surrounding facts.
- Cases have a definite teaching purpose in mind.
- Information given within a case is not complete or structured.
- Issues described in a case can be perceived differently by different individuals.
- Cases are authentic they are based on actual field data, not on assumptions.
- Cases never have just one right solution although they can have one optimal solution.

The features listed above describe the tool used within the case method. The actual use of this tool is greatly influenced by the principles underlying the case method. These are described in the next section. In chapter 4.1.3 the principles of the case method will be consulted in order to allocate this teaching and learning method to a learning theoretical position.

2.1.3 Principles of the case method

The case method stresses the importance of authentic, multiple and social contexts, as well as instructional support. The following introduction of principles of the case method is structured in accordance to Hesse/Friedrich [Hesse/Friedrich 01].

Learning should take place in an authentic context. A relevant problem should be the starting point for a learning process. Ideally, this problem can be viewed from several perspectives. Learning should also consider multiple contexts. This implies that learning contents are to be embeddable into different situations. This promotes flexible handling of the contents and also supports the ability to transfer knowledge. The social contacts also play a large role within prob-

lem oriented learning environments. Learning within social learning arrangements supports abilities to learn cooperatively and promotes the development of a learning community. Problem oriented learning environments offer instructional support. The complexity of the learning material is reduced by structuring it and by supporting the learners within the solving process [Hesse/Friedrich 01]. Furthermore, the needs of the learners are regarded within a learning process. Additionally, learning in a problem oriented setting depends on cooperative learning, which includes that the learner shows initiative, motivation and activity [Doerr/Juengst 98].

How the described principles are implemented within the application of the case method is clarified in the next section by describing the actual application of the case method.

2.1.4 Application of the case method

Traditionally the CM is implemented repeatedly, not only one time in a class. "For instance, the average Harvard MBA has the opportunity to read and prepare between 500 to 700 business cases before graduating." [Ronstadt 80, 3] These numerous opportunities/approaches to diverse cases prepare learners to become truly professional in their field of work.

The process of working through a case can roughly be divided into four steps. The first step is to recognize the problem. This means the study of the given case, the procurement of necessary additional information, analysis and systematization of circumstances and recognizing causal relations and regularities. The second step is concerned with the analysis of the problem. This means working out what the central problem is and determining a solution for it. Preparing variants of the solution and comparing these is what happens in the third step. The fourth and final step is the actual decision making and problem solving. This step describes the decision made and also the reasons for it [Pilz 74]. The following diagram illustrates these steps.

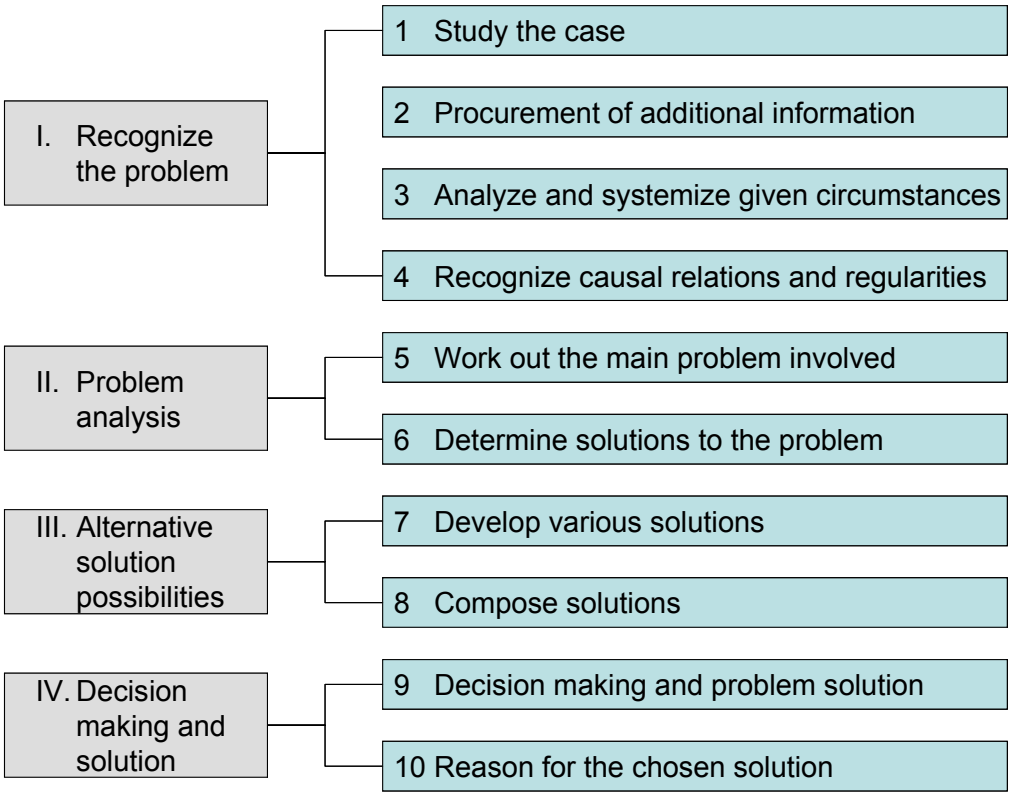

Fig. 2.1-1: Work-through process of a case (according to [Pilz 74, 143])

Learning through the case method takes place in three interrelated stages: individually, in small teams, and in a large group discussion. Each of these three steps is important for the effectiveness of learning. Each contributes in its specific way to maximize the quantity and quality of learning.

1. Individual preparation:
   The first stage is the individual preparation. This preparation requires a high amount of self-discipline. The learner needs to motivate himself to analyze the case and to find a satisfying solution. In most cases the student will not be able to solve the case completely. This is stressful for the student. The exposure to this kind of stress makes it possible to remain relaxed and go on with routine processes when exposed to this kind of stress in future situations.

2. Small group discussion:
   The second stage is the discussion in small teams also called small groups[1], by which the learner can examine whether he understood the case correctly. Additionally, the student has the possibility to compare personal understanding, estimations and personal development of

[1] Small groups or teams are also referred to as learning teams or study groups.

the case with other group members. This presupposes that the other group members listen attentively and critically. They are to present their own opinion. Discussion in small groups leads to the fact that the learner becomes more acquainted with the material, than if he would have only read it on his own. Large groups offer possibilities to hide behind others, but a deficient preparation cannot be concealed within a small group. Small group discussion makes it possible for everyone to express their opinion about the case. Practical experience in speaking and listening can be acquired.

3. Discussion in the plenum:
   The discussion in the plenum is similar to the small group discussion and gives the learner another possibility to present the solution the small group came up with, and compare it to the solutions of others and discuss it. Participating in the discussion offers the possibility to learn to articulate oneself in public. This is a stimulus for the students to prepare themselves individually as well as with the small groups. Confrontation with results of other small groups includes realization and reconstruction of their solution process.

Discussions in form of small or large group discussions are always used within case classes. Levin describes that discussions within the case method can either act as a catalyst for reflection (for experienced participants), or allow to clarify or elaborate the own perspective on the case (for less experienced participants) [Levin 95]. Proponents of the case method argue that discussion is the key to the case process (see [Erskine/Leenders/Mauffette-Leenders 98], [Welty 89]). Authors supporting the use of discussion rely largely on anecdotal evidence for empirical research within this field is limited (see [Siciliano/McAleer 97], [Knechel 92]).

To date, little empirical research has been done to examine the influence of discussion on performance and motivation within the case method [Flynn/Klein 01]. While research on the use of discussion groups within the case method is limited research on use of small groups within classrooms, however, has consistently reported gains in achievement. Astin describes that research done on 200 colleges found out that a key predictor of attitudinal and cognitive changes in college students is the student-student interaction. When done effectively, small group learning fosters student-student interaction [Astin 98].

While advocates of case-based learning suggest that group discussion is the key to the case method others have the opinion that individual preparation is basis for succeeding work on cases and the foundation of learning from cases [Mauffette-Leenders/Erskine/Leenders 98]. Within an experiment conducted by Levin it is described that the control group, which simply read through a case without discussing it, reiterates its original thinking, rather than gaining new perspectives, which was the case in the group which discussed the case [Levin 95]. Results of the study of Flynn/Klein suggest that small group discussion enhances student performance within cases only when discussion is combined with individual preparation [Flynn/Klein 01]. Within this thesis it

will neither be discussed nor determined which parts of the process of the case method are the most successful. In accordance to the findings of Erskine/Leenders/Mauffette-Leenders this thesis assumes that the combination of all phases leads to success [Erskine/Leenders/Mauffette-Leenders 98].

Implementing the case method is subject to restrictions. These limitations are described in the next chapter by introducing the prerequisites which need to be fulfilled in order to conduct the traditional case method.

2.1.5 Obligatory prerequisites of the case method

When implementing the case method it needs to be adhered to certain prerequisites. An overview of crucial prerequisites concerning teachers, students and facilities is given in this chapter. These are formulated in accordance to the principles of the case method described in chapter 2.1.3.

The main qualification a case teacher needs is the ability to lead a discussion. It is this key feature that lets the entire pedagogy of the case method stand or fall (see [Wassermann 94], [Christensen/Hansen 87], [Ronstadt 80]).

Case teachers must make sure that students receive cases ahead of time, in order to adequately prepare these for class. In class, the teacher is the leader. He "[…] assigns material, recognizes students, uses blackboard, and distributes grades […]" [Matejka/Cosseé 81, 31]. A case teacher also needs to be properly prepared, in order to offer the learners the chance to learn effectively. The teacher needs to be familiar with the contents of the case. He needs to have analyzed them, and made judgments regarding the case information. A very common way to ensure all of the above is to engage in a "case teaching plan". Elements of the case teaching plan are: agenda, time plan, participation plan, board plan, and eventually complementation of the case teaching plan. A detailed description of these elements of the case teaching plan is given by Erskine/Leenders/Mauffette-Leenders [Erskine/Leenders/Mauffette-Leenders 98, 185].

Furthermore, teaching cases requires the teacher to have a certain mentality regarding control in the classroom. Case teachers must be willing to allow students to play a major role in class. In case classes it is mainly the students who define content and pace of the course [Lynn 99].

According to what the case requests, a case teacher needs to be able to adapt flexibly to different roles. It is the teacher who needs to completely be indulged in the case, which will in turn motivate the students to do so as well. Roles of teachers can be "[…] facilitator, coach, quarterback, demonstrator, prod, referee, dance master, choreographer, prosecutor, evangelist, judge, conductor, soothsayer, lion tamer, district attorney, senior airline captain, […]" [Matejka/Cosseé 81, 15].

According to Erskine/Leenders/Mauffette-Leenders and Wassermann teachers support and facilitate the learning process of the students by [Erskine/Leenders/Mauffette-Leenders 98], [Wassermann 94]:

- knowing and encouraging the students,
- giving them orientation,
- encouraging small group work,
- including students in the systematic handling of a case.

Teachers must be able to:

- link and record contributions,
- deal with participation problems,
- push for decision and implementation
- manage time and sequence
- maintain order while dealing with tradeoffs.

Students learning through the case method must be highly motivated students. "A case class requires considerable input from the students. Unlike a lecture, where a well-prepared instructor can deliver an informative, interesting talk to an unprepared audience, student preparation and involvement are essential to a successful case class and course. […] Each person in the room contributes to the success or failure of the class." [Matejka/Cosse 81, 31]

It is the responsibility of the students to share their thoughts with the class. By doing this, everyone can learn from each other. Students must be open to develop effective communication skills. These will be fundamental for improving discussion within the class, and also for future success in professional life.

Because effective use of the case method requires students to develop, use and apply critical thinking skills to problem-solving approaches, individual problem solving skills must exist prior to learning with the CM. These skills are enhanced while learning with the CM. They support students to analyze situations and recommend realistic solutions through better understanding of theory (see [Shulman 92], [Greenwood/Parkey 89]). Students must be good listeners and they must be able to feel and present themselves as individuals, but at times, they must be able to feel as one part of a whole. "I believe the principal reason good listening is so important is that the effectiveness of case discussions is determined not only by individual efforts but by the performance of the class as a whole. […] Also, case groups learn to improve their collective performance over time by improving individually but also by improving as a class. Essentially, the class learns

how to police itself, thereby limiting the digressions made by individual members." [Ronstadt 80, 5]

The environment must be conducive to use cases. This means, that e.g. the classroom must encourage discussions by being set up in a way which enables the students to see each other and the teacher comfortably. "If the instructor is unable to identify a student who is talking and if students are unable to identify and face other students who are contributing to the discussion, major blocks exist to effective participation." [Erskine/Leenders/Mauffette-Leenders 98, 20] An ideal classroom setting would be for all participants to gather around a round table. Unfortunately, as the number of participants increases this setting can not be realized. A detailed discussion of characteristics which positively influence the seating order within a classroom is described by Erskine/Leenders/Mauffette-Leenders [Erskine/Leenders/Mauffette-Leenders 98, 19ff.].

Within the traditional case method up to half of the students grades are based on participation in class. Therefore teachers must know all of their students. Getting to know each other can be facilitated e.g. through "name cards" in front of the students. The level of discussion grows as the people involved get to know each other. For this reason teambuilding sequences should be implemented at the beginning of a course, so the participants get to know and trust each other. "There is no room for anonymity in the case method!" [Erskine/Leenders/Mauffette-Leenders 98, 19] Evaluating students' performance is based on participation in class and on grades in the exam. Implementing the CM must be able to adapt – at least partially - to this grading scheme. The next chapter gives details concerning the evaluation of the case method, focusing on both student and teacher evaluation.

2.1.6 Evaluating the case method

Evaluation of the case method can be regarded from the perspectives of the teacher and the student. Both of these aspects will be regarded in this section.

"The habit of a regular evaluation after each case class is an essential part of standard case teaching. Class evaluation has six components: (1) participant evaluation, (2) case teaching plan evaluation, (3) material evaluation, (4) personal evaluation, (5) class assessment and (6) teaching note evaluation and revision." [Erskine/Leenders/Mauffette-Leenders 98, 181] Except for (1) participant evaluation all the other areas mentioned describe evaluation of the teacher or of the teaching process (see teacher prerequisites described in chapter 2.1.5). When evaluating the case teaching plan it is not the main goal to enforce, that the teacher "sticks" to the original plan of the class. Rather than doing that, it is important to think through every step of the course and evaluate whether it was satisfying. Further going elements of the case teaching plan which should be evaluated are materials, personal achievement, class assessment, and teaching note.

Would the case have been different with different material? How much did the teacher talk? How much of the discussion was directed by the teacher? Did the class make progress? Could the teacher relate the points the students made to each other? Are there existing teaching notes to a case? If yes, do these need to be revised with information made in this class? These are all questions which must be answered within the teacher evaluation [Erskine/Leenders/Mauffette-Leenders 98, 185ff.].

Student participation influences a very big part of students' grades within a case class. Typically it ranges from 25% - 50%. When placing this much emphasis on student participation it is essential for the teacher to evaluate contributions of each student after a course. "[…] [E]xperienced case instructors make a habit of evaluating class participation regardless of whether credit is granted. Their purpose is to ensure that all participants over the length of the workshop, seminar, course or program are involved in the learning process. By noting who is strong and who is weak allows them to deal with each person appropriately" [Erskine/Leenders/Mauffette-Leenders 98, 181f.]. Some case teachers additionally let students grade their peer students' contributions within the class to validate their own opinion. "Obviously, no one standard exists for how to evaluate and grade class participation. Whatever system an instructor chooses to use, it should be consistent, as objective as possible and shared with the students." [Erskine/Leenders/Mauffette-Leenders 98, 185]

Because developing the ability to make decisions is a major aim of the case method, this ability is tested within exams. In particular, case exams test the ability to apply knowledge and add personal experience. Case exams fall into two categories: those where the case is unseen, and those where the case is distributed prior to the examination. Typically a class will receive a case and pupils have to describe how they would go about solving the case within approximately four hours. Another kind of exam within case schools is a so called "48-hour case". Within this exam setting a small group will receive a case and have to "solve" it together as a group within 48 hours. Typically the students doing case exams receive very much feedback from the teacher. In some cases they receive up to four written pages of feedback.

"The grading of a case exam is a time consuming task. It may take anywhere from 20-40 minutes per paper, on the average, assuming a 2-4 hour examination period. Despite serious efforts to develop evaluation schemes, much of the grading is still subjective" [Erskine/Leenders/ Mauffette-Leenders 98, 213]. Grading subjective (essay) responses is not ideal for exact numerical scores. When teams are used, instructors frequently assign team grades. In such a situation, it is the responsibility of the individual student to contribute his or her best to the team effort and to attempt to motivate the other team members to do the same. It is common for students who have varying results to receive the same grade. Vice versa, students who have the same

conclusions often earn different grades. When grading an exam the teacher must check if the student has:

1. identified and analyzed at least 80% of the major problems in the case.
2. identified key assumptions.
3. demonstrated that a correct method was used and an analytical tool was applied.
4. demonstrated that arguments used are consistent with assumptions and calculations made.

The preceding chapters described the main aspects of the traditional case method. The next chapter serves as a conclusion of this section by pointing out the main advantages and disadvantages of this method.

2.1.7 Advantages and disadvantages of the case method

The advantages and disadvantages of the case method are identified in this chapter through literature as well as through results of an empirical study which was conducted by the author for the prospect of this thesis. The empirical results described in this section were collected within the empirical study called "Identification of key factors of the traditional case method". This study is described in detail in appendix A[2]. It is anticipated here, that advantages and disadvantages described by literature and those by the empirical study overlap in some areas, sometimes differentiating only in nuances. However, the theoretical viewpoints are often extended by the empirical research.

Advantages described by literature

Proponents of the case method argue that it makes learning relevant and meaningful through participation in analyzing, discussing and solving real problems (see [Levin 95], [Matejka/Cosseé 81], [Gragg 54], [Lawrence 53]). Within the case method teachers can be guide, coach, tutor or facilitator. These roles are frequently advocated by proponents of participatory learning [Wilkerson/Feletti 89]. The case method is able to switch the focus of learning away from memorizing facts to applying concepts, theories, and techniques to actual practical world problems [Carlson/Schodt 95].

Researchers have found that the case method has produced benefits for students in terms of problem-solving abilities, knowledge acquisition, and attitude towards the topic learned. Others reported better understanding and longer-term retention of concepts [Specht/Sandlin 91]. Yet

[2] This empirical study was mainly conducted in order to empirically identify the main characteristics of the case method. The questions asked were designed in a way to also evaluate the advantages and disadvantages of the case method. An overview of all results of this study can be found in appendix A.

other research illustrated the practical application of theories and concepts as tools for problem solving [Carlson/Schodt 95].

Further advantages of the case method are that it is a main task of businesses to make correct decisions. Mental preparation for decision making is a rational process, which is teach- and learnable. The case method can train this type of analytical, critical and constructional thinking [Schmidt 58]. The case method increases the ability to separate important from unimportant information. It improves the skill to read carefully. Memorization is trained. Procurement and processing of information is also improved (see [Decker 83], [Schmidt 58]). Due to the group work involved the case method promotes social capabilities. These phases also promote communication, cooperation and adjustment abilities. Mental agility, creativity and the ability to recognize and correctly judge problems are also trained (see [Pilz 74], [Kosiol 57]). The case method provides the learner with an enrichment of knowledge. The specialty of this learning method is that the student experiences the application of the knowledge within a practical case [Kosiol 57]. The case method is particularly suitable to motivate because the contents are authentic. Theoretical facts are presented in a more descriptive way than in lectures or exercises. Motivation rises because the learner is integrated into the learning process by contributing actively to the solution of the problem (see [Decker 83], [Pilz 74]). Additionally, cases give students the impulse to acquire specific knowledge necessary to solve the problem on their own [Kosiol 57].

Within the empirical study "Identification of the key factors of the traditional case method" interviewed experts also described their opinions of advantages and disadvantages of the CM. For reasons of clarity these statements are described within this section – a detailed overview of this study is given in appendix A.

Advantages described through empirical research

Social aspects, interactivity, communications skills, creativity, validity of learning, learning to make decisions, sharing knowledge, familiarity with different industries and various roles within companies, generating alternatives, taking theory into practice and learning time management were keywords, when asked to describe the advantages of the case method. Learning from classmates was reported as another advantage of the case method. "You learn so much from your classmates." [IV8, l. 93][3] Students could profit from the experiences and cultural diversity of the classmates. "You exploit the knowledge of everyone involved and their personal backgrounds." [IV8, l. 96-97] The case method supported building up relationships among the students.

[3] This reference refers to an interview within the empirical study. This interview is contained on the accompanying CD-ROM. IV abbreviates interview, l. describes the line within the interview and the numbers name the line numbers.

Learning through the case method facilitated learning large amounts. "The amount of knowledge that I have learned in this school is amazing, I have never learned this much in any other program before." [IV1, l. 36-37] Students also reported that they enjoyed learning through this approach. "[…] [T]he case method creates new perspectives. It explains concepts in useful terms, in hands on applications" [IV4, l. 45-46]. Through the case method the individual was exposed "[…] to multiple situations, more situations than you would see in a theoretical course" [IV5, l. 40-41]. In addition the case method "[…] gets you familiar with different roles that you can take on within a company" [IV4, l. 53-54]. The case method "[…] adds validity to what you are learning, because, you never say, well when are you going to use this knowledge… you see it" [IV7, l. 61-63].

"And the knowledge you gain by working through a case sticks better than memorizing facts out of a book." [IV8, l. 43-44] Support of memorization of input was also outlined: "I often don't write anything down, when doing cases. I can remember everything, because I am actively engaging and learning and the cases let me remember" [IV7, l. 164-166]. Within the program at The Richard Ivey School of Business, the workload of approximately 15 cases per week was so great (including single preparation, study groups and the discussion in the plenum) that students most definitely learn time management skills.

Disadvantages described by literature

Besides numerous advantages, the case method also has disadvantages. These are described in this section.

Personnel teaching the case method must be highly qualified to do so. Experience with the case method is a prerequisite to successfully be able to teach it. Teaching the case method calls for a high expenditure of time from students and teachers. Teachers teaching the case method will not be able to teach as many students as other approaches (e.g. the lecture approach) make it possible.

Cases used within the case method are not always up-to-date. It is possible that the historical background of the case is not realized by the student. This can lead to misinterpretation of the respective case.

A situation can never completely be shown within a case. Authority disputes, jealousies or bad working climate can often lead to certain operational decisions or problems. It is hard to represent these factors to their total extent [Schmidt 58].

As addressed in the previous point, nearly all relevant data, circumstances, opinions and conditions are mentioned within the case. This display of overall information contradicts reality, because usually necessary information e.g. about background of the problem is missing. The responsible people have to collect this information. Within the case method the search for infor-

mation is omitted. This is very disadvantageous, since the process of receiving this information is frequently a substantial part of the solution (see [Leenders/Mauffette-Leenders/Erskine 01], [Schmidt 58]).

Group processes generally require a greater amount of time than working individually. The large amount of time needed to use the case method is often described as a disadvantage. Successful learning, however, only occurs if several cases are continuously worked on during a longer period of time. The high expenditure of time frequently leads participants to despair, because it is not possible for them to determine or evaluate their own learning progress. The case method presupposes specialized knowledge and the knowledge of fundamental theoretical concepts. Therefore the case method should only be used if the learners fulfill these conditions. The case method is unsuitable to systematically transfer knowledge [Schmidt 58]. Implementing cases is expensive, for each copy of a case must be paid for. Overemphasis of individual cases and the implied generalization are seen as critical components of the case method [Pilz 74].

The next section describes disadvantages identified through empirical research.

Disadvantages described through empirical research

"It was intimidating at first. A totally different method of learning compared to anything I was ever used to doing. When you do it a while you learn how to learn with it. But it takes some getting used to." [IV8, l. 23-25] Advantages can also be disadvantages: "[…] those advantages bring you down at the beginning, you don't know how to approach anything - you don't have the technical skills to understand what the cases are about" [IV1, l. 41-43]. This was mainly due to the fact that at the beginning of working with the case method new students lacked the appropriate set of skills. This could only be evened out through experience and "[…] if you have a lack of experience it can be difficult to learn with a case" [IV6, l. 37].

Many interviewees mentioned that a mix of other teaching and learning methods and the case method would be of advantage, rather than learning solely through the case method. The students criticized that fundamental, theoretical basics could not be learned through the case method. "[…] [Y]ou know how to do stuff, but you get no knowledge of the basic subject" [IV2, l. 61]. "[…] [S]ometimes you don't get in deep enough into the theory" [IV4, l. 67]. The interviewees believed that knowing the factual basics involved in a case was a necessary prerequisite: "[b]ut if you don't have the theoretical background it's hard to learn theory or new concepts entirely from the case method. For me I would like to start better with theory, and then the case method" [IV7, l. 13-15]. "Technical proficiency lacks. Where you don't have a trained background, the case method is not efficient." [IV8, l. 106]

One student outlined the case method as being a "long term learning program", where the focus does not lie on learning something today, but learning through the entire program. "It can be

frustrating, because you don't feel you are being taught anything by your teachers. You can't say what you learned today, its more like at the end of the program, a light goes on." [IV7, l. 27-28]

The case method gives the learner less guidance, and less control through the teacher than other learning methods do. One student portrayed that within the case method he felt as if he were teaching himself. Additionally, the students were dependent on each other and the contributions of one another. This could be a disadvantage, as the following quote shows: "[…] sometimes it's hard to keep up the quality of input with 'weaker' students" [IV4, l. 64]. This also had something to do with the structure of grading the students within the case method. Besides having had exams the students were graded for their contributions to the class. Some students said the contributions which needed to be made were obligatory, and because it was a requirement to participate the quality of the contributions was lessened. Additionally, it stimulated students to make redundant remarks "[…] sometimes the quality of contributions is bad, because you are forced to contribute. […] sometimes you feel forced to contribute even though someone has said it before you, just to contribute" [IV4, l. 62-66]. Another disadvantage was that there were "[…] no true answer at the end, but just learning points" [IV5, l. 47].

Students were not convinced that fairness and objectivity were converted within exams. Preparation of exams is not homogeneous because different teachers, with different experience prepare students differently for the same exam. Sometimes there were additional assignments, which needed to be worked on and turned in by groups and they received one grade. "Sometimes we have to turn in assignments and they are one grade for everyone and that is often unfair." [IV7, l. 178]

Chapter 2.1 focused on the traditional case method and its special features. The following chapter deals with the basics of e-learning. As it was explained in the introduction within chapter 1 these two topics are the relevant fundamentals which build the basis for the design of the web-based case method. Afterwards chapter 2.3 will merge these two topics by explicating technology enhanced variants of the case method. The precise definition of the steps needed to pursue the main goal of this thesis is then focused on in chapter 2.4.

2.2 Description of e-learning

E-learning, online learning, virtual learning, multimedia learning and computer-based or computer supported learning are terms, which all refer to learning with media. Within this thesis, the term e-learning will be used. The term e-learning is a word creation consisting of the components "e" (for electronic) and "learning". In the 1970s and 80s the term e-learning was seen as a generic term to describe all activities that had to do with electronically enhanced learning. In the middle of the 1980s learning software started to be designed and it spread rapidly. Therefore learning methodologies became medial. In the beginning of the 1990s these programs became multi-

medial [Dick 00]. This enabled computers to combine interaction of different media, e.g. films, pictures, diagrams, texts, language and music. Active and even interactive handling of learning with media was made possible [Schenkel/Holz 95]. For a long time the main emphasis was placed on the "e" (electronic) as a success guarantee of innovative technologies. The "learning" part of the term was often seen as a secondary matter. Didactical concepts were frequently missing, which limited the possibilities of e-learning [Uesbeck 01]. Today, a crucial role is attributed to the actual learning part within e-learning.

In general relevant aspects of e-learning are very numerous. In order to remain in the framework of this thesis it is necessary to focus on those aspects of e-learning which are relevant for the further procedure. The description of e-learning begins with the clarification of the term e-learning in the following chapter 2.2.1. Thereafter variants of e-learning are pointed out in chapter 2.2.2. For clarity reasons chapter 2.2.3 then introduces general strengths and weaknesses of e-learning. Due to the multiplicity of these factors these are listed and explicated only briefly. Allocated references give recommendations for further going details. In chapter 2.2.4 success relevant determinants of e-learning are compiled. According to these determinants a criteria catalogue for successful e-learning is derived in chapter 2.2.5. Chapter 2.2.6 then gives an overview of current trends within the field of e-learning. Within this chapter surveys are focused on. After this general overview the focus of these trends is placed on universities in chapter 2.2.7. Further important aspects of e-learning are the communication and collaboration within e-learning. These two features have great influence on the design of the web-based case method and therefore they are described in detail in chapter 5. This structure benefits and emphasizes the close correspondence between these elements and their design within the web-based case method.

2.2.1 Definition of e-learning

The term e-learning emphasizes the special relevance of technological knowledge connected to professionalism concerning the contents in the learning processes (see [Kraemer/Sprenger/ Wachter 02], [Roffe 02]). Consequently e-learning consists of three connected components: pedagogic-didactic, content and technology. The following graph clarifies this connection:

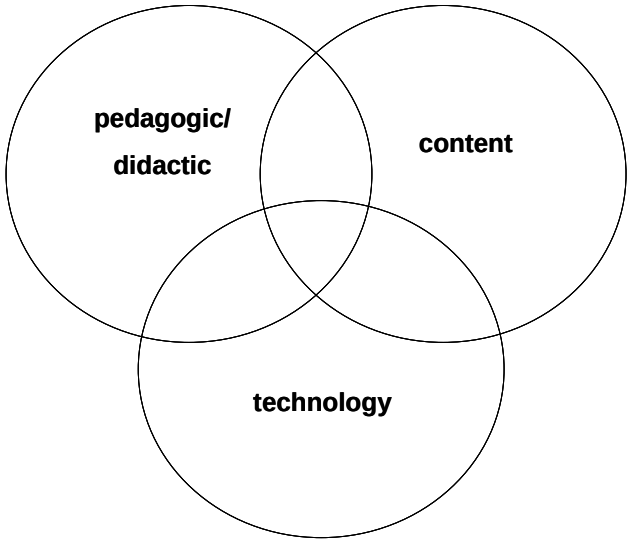

Fig. 2.2-1: Components of e-learning

Therefore e-learning can be understood as learning which is supported and made possible through information and communication technologies and with e-learning systems based on these technologies [Back 01]. The American Society of Training and Development (ASTD)[4] defines e-learning as a term: "[…] covering a wide set of applications and processes, such as Web-based learning […], computer-based learning […], virtual classrooms and digital collaboration. It includes the delivery of content via Internet, intranet/extranet (LAN/WAN), audio- and videotape, satellite broadcast, interactive TV and more" [Learning Circuits 03[WWW]]. This classification includes traditional as well as more advanced forms of e-learning. Rosenberg gives a more modern definition: "E-Learning refers to the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance" [Rosenberg 01, 28]. This definition limits the various forms of e-learning to those, which take place through support of internet technologies. This characterization does not include computer based trainings (CBT), training through CD-ROM or DVD. In the context of this thesis these forms will also be included in the understanding of e-learning.

E-learning offers differ regarding their arrangements. This involves the different possibilities of communication and interaction, as well as the appropriate use of technologies respective the specific learning situations. In order to implement e-learning efficiently into complex learning arrangements it is necessary to have an exact overview of existing variants. Variants of e-learning are described in the next section.

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[4] According to their own references the American Society for Training & Development (ASTD) is the leading source for affairs concerning learning at the workplace. The ASTD is concerned with information, research, analysis and practical information which results out of their own research, the knowledge and experience of its members , their conferences, exhibitions, seminars, publications and partnerships as well as cooperations (see [ASTD 03[WWW]]).

2.2.2 Variants of e-learning

Within state of the art literature varying categories describing variants of e-learning can be found. Within this context the most important variants from a pedagogical/didactical perspective are focused on. In accordance to Kerres these are teleteaching, teletutoring, and telecooperation [Kerres 01, 290]. Teleteaching is a modified form of traditional frontal teaching. Telecooperation is seen as an extension of media supported single learning, for it extends this through feedback possibilities. Telecooperation widens the characteristics of teletutoring by giving the learners the opportunity to interact with each other. The following references give detailed insight into the characteristics of these variants: [Kerres 01, 291] for teleteaching, [Euler 99, 82f.] and [Schwarzer 94, 186] for teletutoring and telecooperation.

These variants can be combined to modules to build complex learning arrangements. The rapid evolution of these variants of e-learning makes it necessary to specify state of the art implementations. The classical form of e-learning is computer-based training (CBT). This can be allocated to the variant teleteaching. Literature describes many synonymous terms for this learning process e.g. computer aided instruction (CAI), computer aided teaching (CAT), or computer aided/assisted learning (CAL). CBT-programs are more or less constructed through multimedia and can be distributed through CD-ROM or the internet. Generally contents of CBTs teach factual knowledge and have a test at the end. Participants work independently, solely interacting with the learning software. The computer takes on the part of learning dialogues, examinations and possibly also the guidance of the learning process. CBTs describe offline learning offers, opposed to online learning offered by WBTs [Global Learning 03^{WWW}]. Commonly a behaviorist model underlies CBT [Schulmeister 97].

The term web-based training is abbreviated by WBT. WBTs cover the internet-supported form of remote learning with and without tutors [Global Learning 03^{WWW}]. Depending on its design it can be assigned to either teletutoring or telecooperation. WBTs can also be constructed in a multimedia way, focusing on the didactic use of the WWW. Within WBT mediating knowledge by learning in groups is concentrated on. WBT supports cooperative learning, e.g. by posting questions which must be solved by groups of learners. The role of the computer is limited to mediating between participants. One advantage of WBT is the possibility to easily update information (see [Dittler 02], [Simon 01]).

Virtual seminars combine the positive factors of presence seminars, e.g. the possibility to ask questions and receive feedback from the trainer, with the advantages of multimedia learning forms. A trainer presents his learning contents in front of a webcam. Video picture, audio and other representations are transferred to the participants of the seminar via internet. Virtual seminars also contain synchronous communication possibilities, therefore enabling simultaneous training of several participants (see [Dittler 02], [Weckenmann et al. 00]). Virtual seminars can be

planned in the tradition of teletutoring or telecooperation, whereby focusing on telecooperation is mostly preferred.

E-learning portals combine various e-learning media "underneath one roof" and can definitely be assigned to telecooperation [Dittler 02, 16]. Learning portals are websites on internet or intranet which offer learners or organizations a consolidated entrance to learning and training resources from various sources. In addition to CBT, WBT and virtual seminars e-learning portals often contain coaching functions which offer learners the possibility to ask experts for their advice via e-mail or chat. Learners have access to various learning material e.g. course documents, scripts, FAQs, or discussion boards. The additional use of learning portals lies in the individual support (see [Dittler 02], [Seufert 02]).

Criteria such as time, social form as well as area, communication form and contents are often consulted in order to systematize the differing developments of e-learning. Within this thesis the model developed by Haas/Hoppe will be used, which uses the criteria time, place and social form [Haas/Hoppe 02]. The dimension time refers to the time of use while the dimension place describes where it is used. The social form illustrates the interaction possibilities between teachers and learners within the e-learning environment. The following graphic shows these differing developments.

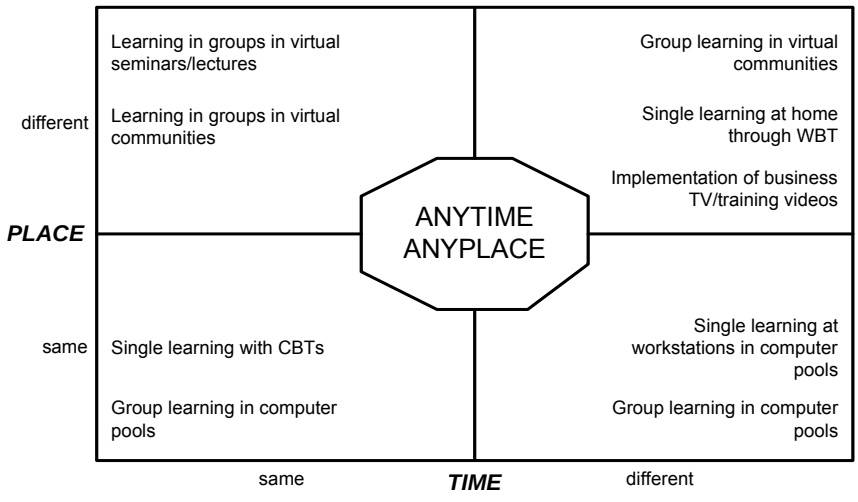

Fig. 2.2-2: Systematization of e-learning according to the criteria: social form, area and time (according to [Haas/Hoppe 02, 96])

Within literature the term virtual learning environment is frequently used to describe a wide variety of variants of e-learning. The definition used within this thesis is in accordance to Kerres and uses the term virtual learning environment (VLE) to describe a set of teaching and learning tools designed to enhance a student's learning experience by including computers and the internet in the learning process [Kerres 01].

When discussing variants of e-learning and their implementation, there are many opinions about advantages and disadvantages. The following section gives an overview of possible advantages which can be obtained by implementing e-learning, but also refers to possible drawbacks which also need to be considered.

2.2.3 Strengths and weaknesses of e-learning

Identification of advantages and drawbacks of e-learning in general needs to be completed prior to the development of e-learning arrangements. It is important to identify these strengths and weaknesses in order to integrate e-learning successfully as well as to contemplate shortcomings. Contemplation can only take place if the weaknesses are recognized as such. The following list gives a summary of the most frequently cited advantages and disadvantages in literature.

Table 2.2-1: Strengths and weaknesses of e-learning

Strengths of e-learning	
Cost reduction	Especially within companies e-learning can help to cut down on travel expenses (see [Neumann 01], [Geyken/Mandl/Reiter 96]).
Independence of time and location	E-learning makes it possible to take part in a course anytime and anywhere. This makes it easy to reach for a target group that is separated geographically.
Reduced personnel resources	E-learning makes it possible to mediate contents to more learners using less personnel resources.
Focus on the learner	Personal learning speed and individual preferences can be respected. The learner learns more efficiently, when he can learn according to his personal learning rhythm. This can save up to 40% of learning time compared to a traditional face to face (face to face) course. This also contributes to satisfaction, for students are less frustrated [Winterer 02].
Consistency of contents	All learners are exposed to the exact same learning materials. These materials can be updated from one central department thus leading to a homogenous knowledgebase throughout the learners. This ensures that contents are always up-to-date [Neumann 01].
Variety of learning methods	E-learning covers diverse methods and applications, which can be used flexibly and always in dependence upon situation and people involved. Depending upon the kind of knowledge individual learning forms can be chosen e.g. CBT, WBT or cooperative learning forms like on-line discussions, chat, on-line tutorials or communities.
Reusability	So-called “learning objects” provide small learning units. These units can be reused in the same, or also in a different context.
Control of interaction	Learners have more control over interaction than in traditional face to face education. Asynchronous communication and anonymity can reduce fear and increase the communication possibilities of introverted and shy people [Issing/Klimsa 95].

Additional motivation	General attractivity of computers is already one source of additional motivation in some cases. Using computers as learning instruments in schools or higher education settings increases the likeliness that learners will use computers in future situations. When implemented early enough this generally decreases fear of the medium.
Pursuit of learning progress	E-learning enables tracking of the learning progress. This can be used by the teacher to recognize which learning deficits exist. Thereby these can be eliminated.
Weaknesses of e-learning	
Requirements of high motivation	E-learning requires self-disciplined and motivated learners. The learner himself is responsible for the learning process. Frequently bad introduction strategies or unsatisfactory quality of the teaching programs lead to demotivation of the participants.
Great amount of prerequisite knowledge necessary	The learner must know about certain methodologies and strategies to be able to successfully use e-learning. Besides knowing about the subject he teaches, the teacher using e-learning must also be educated to handle the new media perfectly [Geyken/Mandl/Reiter 96].
Mandatory special communication competences	Communication within virtual settings is dependent on special competences from all people involved. There are less communication channels within CMC than there are in face to face communication. This can lead to an unequal involvement in the communication process between the people communicating. It is the teacher's task to compensate the lack of social closeness. If he doesn't succeed the participants may feel left alone. This can then cause a higher dropout rate [Kerres 01].
Requirement of high bandwidths	Using multimedia learning software requires high bandwidths. Slow access can de-motivate learners. This is why bandwidth is still considered to be a crucial restriction when producing learning contents.
High demands concerning infrastructure	E-learning calls for a high-performance technological infrastructure. Functioning technology is the basis for the efficient use of e-learning. Both the teacher and the learners need to have access to high-performance technology e.g. a multimedia PC, high speed internet connection, software etc. [Schwarzer 94].
Insufficient security	Since e-learning technologies are often based on the use of the Internet, security concepts are very important to guarantee that contents can only be viewed by authorized people. Issues of data security concerning the learners are often complex and costly but have to be respected by all means [Winterer 02].

Deciding whether to implement e-learning should always happen with the context of the situation in mind. It always needs to be evaluated which advantages and disadvantages apply to the situation and whether the advantages outweigh the disadvantages or vice versa. However, not only general advantages and disadvantages determine the success of an e-learning initiative, the consideration and implementation of so called success-relevant determinants is also essential. These factors are described in the next chapter.

2.2.4 Success-relevant determinants of e-learning

This chapter regards which determinants affect the success of e-learning initiatives. This is analyzed according to special views: a general view, view on the organization, and view on the learner[5]. This separation does not imply isolated viewpoints; it rather serves the better overview. It is possible that arguments can also be applied to other sections than to the ones they are mentioned in. A detailed demarcation is not possible, due to the close relations. After these general descriptions a criteria catalogue for successful e-learning is derived in chapter 2.2.5.

This section focuses on general success factors for e-learning initiatives. Gabler illustrates that e-learning initiatives principally strive for effectiveness and efficiency [Gabler 01]. Sassone explains these two terms very descriptively: effectiveness describes "doing the right things" while efficiency means "doing things right" [Sassone 87, 284]. Therefore an e-learning initiative is more effective the more complete the goals which were formulated are reached. This is why formulating goals is very important [Seibt 02].

Another important point is the acceptance of the new learning form. In order for all members of the target group to accept the introduction of e-learning it is important to integrate it transparently and comprehensively. It is not possible to implement changes successfully against the will of the participants [Janson 03a]. The necessary acceptance can be created by integrating all the concerned ones into the process. Careful planning and conversion are the basic prerequisites for acceptance and therefore for successful implementation of e-learning. Next to accepting the general idea of e-learning it is important that there is acceptance concerning the new technological learning forms. This especially applies to people who are not as sure with use of technology and may have a reduced readiness. This group of people should be focused on because they have to feel sure with the computer before they can learn with it.

Furthermore, qualifications of the users, such as competences in working with diverse learning forms must be regarded. Three relevant areas are: self discipline, learning ability, and technological abilities of the learner. Self discipline describes the ability of the user to voluntarily and consciously work with the learning environment on a regular basis. It is important that learners use the offers of the learning environment, which can be used independent of time and place; even though they know they are not being "controlled" to do so. It has been shown that complete autonomic learning is less successful, and therefore it has become generally accepted when it is guided [Muenzer 03]. This is why integrated concepts are necessary (see [China 03], [Muenzer 03], [Einenkel/Hillebrecht 02]).

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[5] Other perspectives are also relevant, but in the context of this thesis only the above mentioned will be specified for these are the relevant aspects concerning the topic of this thesis.

Learning ability describes the ability of the user to actually learn. Learners must be able to realize their skills and knowledge, but also reflect knowledge. The capabilities to motivate themselves and to close knowledge gaps independently are closely related. In order to do this an autodidactic learning ability is necessary. Autodidactic learning describes the ability to independently choose a topic to learn, as well as setting learning goals and –methods. At the same time they must do without directions, guidance or control through a teacher or institution. All pedagogic actions must come from within the learner. Success-promising e-learning concepts should integrate autodidactic learning through suited technological functionalities (bookmarks, notes, minutes, etc.) as well as offering help through tutorial guidance through a teacher (see [Theisen 02], [Arnold 01]).

Technological abilities are another important factor for the success of e-learning. Because the learner is confronted with a technological form of learning he must have the appropriate technological abilities concerning the system. Depending on the learning form the user must know how to handle the computer and relevant software, as well as handling internet/intranet or additional hardware, such as headset, microphone and web cam (see [Reske 02], [Dichanz/Ernst 01[WWW]]).

This paragraph sets the focus on describing the perspective of enterprises and universities, which think of integrating e-learning. A selection of success relevant determinants is regarded closer.

From the point of view of the organization the use plays a key role. An organization can pursue various goals through e-learning, e.g. a shorter duration of courses, more efficient training of students etc. Costs are another important factor. It is only rational for an organization to implement e-learning if the costs are in a reasonable relation to the success. Relevant costs can be costs for hard- and software, implementation, license fees or costs for maintenance and care of the systems. The costs for creating the multimedia learning contents must also be regarded, as well as ongoing costs for tutors and learners (see [Seibt 02], [unicmind 01[WWW]], [Coenen/Seibt 01]).

Contents need to be up-to-date, and in some areas they also need to be company specific. Realization of e-learning is dependent on internal goals of the organization. Mistakes can be avoided by precisely formulating goals. This makes it possible to offer suitable learning material [Kraemer/Sprenger/Wachter 02]. The definition of learning goals as well as the definition of the target group is especially important concerning the didactical conception of e-learning because this has an immediate effect on the success of the initiative. Accompanying controlling or evaluating initiatives show the degree to which the goals are reached, and can make attentive to off track results. Furthermore, the success of an e-learning initiative (e.g. saving money or, increasing efficiency of courses) can be validated through controlling [Coenen/Seibt 01]. Describing the target group is also part of the goal formulating phase.

Another success determining factor is support through the management: "[l]eadership support and a positive culture are so powerful that all other challenges pale beside them. In fact, they are the primary reasons why e-learning strategies fail" [Rosenberg 01, 47].

After describing the general factors and the factors from the viewpoint of the organization this section deals with success factors from the perspective of the learner.

Especially from the viewpoint of the learner it is favorable that learning is respected through the bosses. Otherwise the learner may be afraid to take part in the e-learning initiative. Another important prerequisite to ensure acceptance of an e-learning initiative is that free times are granted for this. In a survey conducted by the DLC – Distance Learning Consulting GmbH[6] 87% of the interviewees mentioned that respecting learning times is a major success factor for e-learning [China 03].

Guiding the learners is another determinant for successful learning. Guidance is understood to be guidance through a trainer on the one hand and on the other hand an exchange with other learners. In the above mentioned survey these areas are described as important prerequisites for 81% respective 72% of the interviewees [China 03]. A study conducted by Mummert + Partner, focusing on obstacles within e-learning from the perspective of users, confirms this. Therefore every second participant feels that the missing social interaction is the largest obstacle to overcome [Bommer 03]. Social contacts are of great importance for the success of virtual learning. By implementing learning platforms which support collaborative aspects the social aspect of learning can be supported, and can thus decrease fear of contact and resistance [Janson03a]. E-learning initiatives need to have recognizable use for the learner (see [Bommer 03], [Seibt 02]). Therefore contents should always be authentic. It is not sufficient that contents are correct and complete, they must also be realistic. Otherwise the learning offer will not be accepted because the learners will not be able to identify themselves with the contents (see [Rosenberg 01] and chapter 4.1.3).

The above introduced clarification of aspects describes the perspectives which are essential for success of e-learning programs. At first glance it may seem amazing that technological components are not considered. This is due to the fact, that at the time being, the technology does not seem to be the problem and therefore the focus has shifted to aspects concerning organisation and contents [Theisen 02]. However, of course technological aspects are also important. Besides aspects concerning hardware (bandwidth, safety criteria, etc.) software of learning platforms must also fulfill certain demands. They must fulfill qualitative aspects such as usefulness (portability, reliability, efficiency, user friendliness) and maintenance (testability, comprehensibility, alternation capability). Support of and adherence to metadata and standards is important. Metadata is data

6 The German abbreviation "GmbH" describes the kind of company, a similar English term is "limited company".

concerning data. They describe learning contents through supplementing information concerning author, target group or difficulty. Consideration of standards enables platform independent solutions and integration and exchange of contents of other offerers, which fulfill the same standards (see [LMML 03^{WWW}], [e-Learning Infothek 03^{WWW}]).

However, as stated before, controlling technology alone does not constitute success for e-learning concepts. The following figure shows factors which are important for successful concepts.

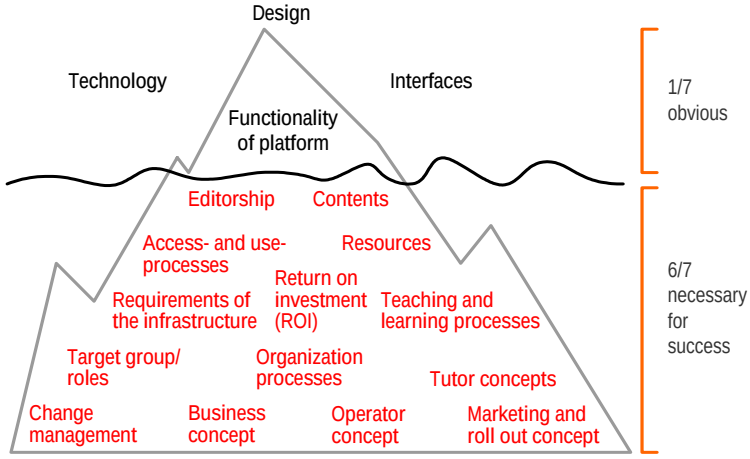

Fig. 2.2-3: Success factors of an e-learning concept (according to [Kraemer/Sprenger/Wachter 02, 50])

It is not relevant to isolate each component, it is rather important to coordinate them. This is why it is important for the components to interact with each other. As described in chapter 2.2.1 an e-learning program consists of a pedagogical, content, and a technological component. When implementing e-learning into an organization the economical perspectives must also be considered. Therefore the five important dimensions are the following:

- pedagogic-didactic dimension
- content dimension
- dimension of technology
- dimension of the organization
- economic dimension.

Usually conflicting aims can be discovered, when all five dimensions are regarded. This thesis does not discuss strategies for the implementation of e-learning. For this purpose [Hohenstein/Tenbusch 01] and [Tiemeyer 02] are named. Nevertheless, it is important to state that consideration of all dimensions is essential for success of virtual learning. After this section has given

a general view of success-relevant determinants of e-learning the next section concretizes this by designing a criteria catalogue for successful e-learning.

2.2.5 Criteria catalogue for successful e-learning

This describes a criteria catalogue of success factors of e-learning. It is structured according to the five dimensions described above in chapter 2.2.4. The perspectives general factors, perspective of organization and learner (described above) are taken up within this overview and can be found within these dimensions. Due to restrictions of volume the success-relevant variables will be introduced in the tabular form of a checklist, without going into further detail. In the left column success factors are stated, the right column assigns different criteria to them. For a detailed view references are given[7]. This table does not claim completeness, even the allocation of aspects to some dimensions can be regarded controversially. However, this listing clarifies which points should be regarded in order to create a successful e-learning arrangement.

Pedagogic/didactic dimension

The learning process is an essential part of e-learning and is shaped by the didactical conception. The quality of the teaching and learning process, as well as the motivation of the participants, and aspects like social contacts determine the success of the program. These aspects are visualized in the following table.

Table 2.2-2: Pedagogic-didactic success factors of e-learning

Success factor	Criteria
Conception	▪ Formulation of learning goals[8] ▪ Determination of the target group[9] ▪ Consideration of prior content knowledge[10] ▪ Consideration of prior technological knowledge [11] ▪ Methodological structure[12] ▪ Flexibility concerning content[13] ▪ Implemented technology and media[14] ▪ Authentic and realistic problems[15]

7 In order not to influence the reading process this table uses a different citation method than the remaining text. References are given in footnotes rather than integrating them into the text for reasons of clarity.

8 [Kremer/Sloane 02, 8]

9 ([Kraemer/Sprenger/Wachter 02, 50], [Koller et al. 01, 8], [Kremer/Sloane 02, 7f.])

10 ([Reske 02, 195], [Kremer/Sloane 02, 7f.], [Koller et al. 01, 8])

11 ([Reske 02, 195], [Kremer/Sloane 02, 7f.])

12 [Klauser/Pollmer 03, 42]

Success factor	Criteria
Motivation	▪ Arouse interest and curiosity[16] ▪ Creation and preservation of durable attention of the learner[17] ▪ Possibilities to relax[18] ▪ Recognizable use[19] ▪ Recognize own deficits[20] ▪ Visible learning process[21] ▪ Feedback[22]
Social contact	▪ Support and guidance through teachers[23] ▪ Exchange of ideas with other participants[24]
Teaching and learning process	▪ Design of the teaching and learning process[25] ▪ Learning theoretical assumptions[26] ▪ Degree of activity between learners and teachers[27] ▪ Characteristics of the teaching process[28] ▪ Autodidactic support[29] ▪ Balance between training and information[30] ▪ Support of self steered learning[31]

13 ([Einenkel/Hillebrecht 02, 30f.], [Rosenberg 01, 15f.])

14 [Kremer/Sloane 02, 9]

15 ([Rosenberg 01, 43], [Severing 01, 9f.])

16 [Klauser/Pollmer 03, 41f.]

17 [Klauser/Pollmer 03, 41f.]

18 [Klauser/Pollmer 03, 41f.]

19 ([China 03, 17ff.], [Einenkel/Hillebrecht 02, 29])

20 [Arnold 01, 145]

21 [Einenkel/Hillebrecht 02, 29]

22 ([Klauser/Pollmer 03, 42], [Rosenberg 01, 49f.])

23 ([Muenzer 03, 47f.], [China 03, 17ff.], [Bommer 03, 43f.], [Kraemer/Sprenger/Wachter 02, 50], [Einenkel/Hillebrecht 02, 30])

24 [China 03, 20]

25 [Kraemer/Sprenger/Wachter 02, 50]

26 [Coenen 01, 28ff.]

27 ([Kremer/Sloane 02, 17], [Schroeder 00, 61])

28 [Kremer/Sloane 02, 17]

29 [Arnold 01, 145f.]

30 [Rosenberg 01, 15]

31 ([Muenzer 03, 47], [China 03, 17ff.])

Content dimension

The success factors concerning content are described in Table 2.2-3: content factors. The thematic area of the e-learning program is relevant as well as the quality of the contents. Of course the success is also connected to the accessibility of the contents.

Table 2.2-3: Content success factors of e-learning

Aspect	Characteristic
Thematic area	▪ Editorship to generate contents[32] ▪ Available content resources[33] ▪ Use of standardized contents[34] ▪ Use of specific contents [35] ▪ Use of target-group-fair contents[36] ▪ Extent of the contents[37]
Quality	▪ High-quality contents[38] ▪ Up-to-date contents[39] ▪ Useful and relevant contents[40] ▪ Recognized degree[41]
Accessibility	▪ Availability of relevant information and contents[42] ▪ Time and place independent access possibilities[43]

32 [Kraemer/Sprenger/Wachter 02, 50]

33 [Kraemer/Sprenger/Wachter 02, 51]

34 [Nacke/Neumann 02, 21]

35 ([Nacke/Neumann 02, 21], [Seufert 02, 21], [Janson 03a, 29])

36 [Rosenberg 01, 44]

37 [Rosenberg 01, 14]

38 [Seufert 02, 21]

39 ([Einenkel/Hillebrecht 02, 30f.], [Seufert 02, 21])

40 ([Arnold 01, 145], [Bommer 03, 44], [Rosenberg 01, 14])

41 [MMB 02[WWW], 4]

42 [Einenkel/Hillebrecht 02, 30f.]

43 [Seufert 02, 21]

Dimension of technology

The features of technological success factors described in Table 2.2-4 are assigned to the chosen technological form of e-learning. Fulfillment or non fulfillment of the described issues affects the success of the e-learning project. Next to functionalities aspects of design are also essential for the success.

Table 2.2-4: Technological success factors of e-learning

Aspect	Characteristic
Functionalities	Basic functionalities:[44] ▪ Administration and use of qualification offers ▪ Administration and use of courses ▪ Administration and use of learning material ▪ Administration of personal data
	Additional functionalities:[45] ▪ Skill-Management ▪ Tracking users ▪ Communication possibilities ▪ Calendar
Requirements	▪ Redundancy-free storage[46] ▪ Data security[47] ▪ Modular structure[48] ▪ Quality: usefulness and maintenance[49] ▪ Integration into existing IT-infrastructure[50] ▪ Import and export of data[51] ▪ Support of standards and metadata[52]
Design	▪ Adaptation and personalization[53] ▪ Medial design[54] ▪ Navigation- and orientation functions[55]

44 [Hagenhoff/Schumann/Schellhase 01, 4f.]
45 [Hagenhoff/Schumann/Schellhase 01, 13ff.]
46 [Janson 03a, 29]
47 [Klauser/Pollmer 03, 42]
48 [Hagenhoff/Schumann/Schellhase 01, 7]
49 [Pressman 89]
50 ([Bilhuber/Isler 03, 13], [Janson 03a, 29], [Seufert 02, 22])
51 ([Klauser/Pollmer 03, 42], [Kraemer/Sprenger/Wachter 02, 50])
52 ([Hagenhoff/Schumann/Schellhase 01, 6], [von Kiedrowski 01, 249])
53 [von Kiedrowski 01, 246]
54 ([Klauser/Pollmer 03, 41f.], [Einenkel/Hillebrecht 02, 29], [Rosenberg 01, 43ff.])

Dimension of the organization

Success of e-learning programs is influenced by organizational factors. Two main aspects are the introduction of e-learning as well as the following use. In addition there are criteria which are closely connected to the necessary enterprise- and learning cultures. These aspects are described in Table 2.2-5.

Table 2.2-5: Organizational success factors of e-learning

Aspect	Characteristic
Introduction	▪ Complete and collective introduction into the organization[56] ▪ Marketing- and roll-out-concepts[57] ▪ Definition of goals and target groups[58] ▪ Acceptance[59] ▪ Change management[60]
Use	▪ Operator concept[61] ▪ Access and use processes[62] ▪ Controlling[63] ▪ Evaluation[64]
Learning culture	▪ Development of an organization as well as a learning culture[65] ▪ Support through management[66] ▪ Free space for learners[67]

Economic dimension

Out of the perspective of an enterprise the economic perspective is often of special importance. Table 2.2-6: names characteristics that influence the economic side of e-learning projects. Next to costs and use of the e-learning program effectiveness and efficiency of solutions are also relevant.

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55 ([Klauser/Pollmer 03, 41f.], [von Kiedrowski 01, 246])

56 [Bilhuber/Isler 03, 13]

57 [Kraemer/Sprenger/Wachter 02, 50]

58 ([Kraemer/Sprenger/Wachter 02, 51], [Theisen 02, 728], [Coenen/Seibt 01, 94f.])

59 ([Janson 03a, 29f.], [China 03, 20], [Einenkel/Hillebrecht 02, 31], [Theisen 02, 728f.])

60 ([Janson 03a, 29], [Kraemer/Sprenger/Wachter 02, 50], [Neumann/Reichert 02, 199f.])

61 [Kraemer/Sprenger/Wachter 02, 50]

62 [Kraemer/Sprenger/Wachter 02, 50]

63 [Coenen/Seibt 01, 94f.]

64 [Bommer 03, 44]

65 ([China 03, 17ff.], [Neumann/Reichert 02, 03], [Reske 02, 195f.], [Rosenberg 01, 46f.])

66 ([Bilhuber/Isler 03, 13], [Bommer 03, 44], [Reske 02, 195f.])

67 ([China 03, 17ff.], [Theisen 02, 728f.], [Arnold 01, 146])

Table 2.2-6: Economic success factors of e-learning

Aspect	Characteristic
Costs[68]	Costs for design, development and implementation processes: ▪ Costs for Is-Analysis, strengths and weakness analysis as well as target concept ▪ Costs for content production ▪ Costs for implementation
	Costs for integration and testing processes: ▪ Costs for hardware and operating system ▪ Costs for knowledge management ▪ Costs of teaching and learning arrangements
	Costs for operational, maintenance and developmental processes: ▪ Continuous operating costs ▪ Costs for loss of work-time ▪ Costs for maintenance and actualization of the contents
	Costs for evaluation processes: ▪ Costs for controlling the effectiveness ▪ Costs for controlling the economical aspects
Effectiveness	Extent of reaching the set goals[69]
Efficiency	Relationship between success and expenditure of the e-learning-program[70]
Use[71]	Use for the learners who are taking part: ▪ Increase in knowledge, talents and qualifications ▪ Reduction of learning times while learning success remains the same ▪ Increase of learning competences
	Use for all teachers, lecturers and responsible people: ▪ Use in the preparation ▪ Use through transparency ▪ Use in the transfer of knowledge
	Use for the organization: ▪ Reduction of costs for training purposes ▪ Reduced duration of training courses ▪ Increased practice orientation of the training program

68 [Seibt 01, 24ff.]

69 [Seibt 01, 4]

70 [Seibt 01, 4]

71 [Seibt 01, 27ff.]

Aspect	Characteristic
Use	Use for the professional program developers: ▪ Increase compatibility ▪ Increase standard conformities ▪ Increase user friendliness

For a successful e-learning concept all success factors, with their accompanying criteria must be considered, weighed, and placed in relationship to each other. The criteria catalogue for successful e-learning clarifies that technological solutions are not the major success factors within e-learning.

To answer the question how successful state of the art e-learning applications are the next section gives insight into state of the art trends and developments within the area of e-learning.

2.2.6 Current developments within the field of e-learning

After giving an overview of general momentary conditions concerning e-learning this chapter focuses on describing state of the art trends within this field. Due to the context of this thesis these findings focus mainly on e-learning developments in Germany, especially within universities. In order to determine current happenings this section mainly summarizes and compares up-to-date studies[72].

A study conducted by unicmind.com Aktiengesellschaft[73] verbally interviewed the TOP-350[74] of the German economy concerning e-learning and knowledge management. 100 companies additionally participated in the written questionnaire. Of these companies 90% use e-learning. Most companies regard e-learning as the implementation of CBT and training videos, only 25% implement WBT. E-learning initiatives focus mainly on data processing-oriented topics such as trainings for application programs. Product training is only implemented in 31% of the companies. Company specific topics, quality management and customer satisfaction are only used in 18%, 8%, respective 6% of the companies (see [Riekhof/Schuele 02, 116ff.], [unicmind 01[WWW], 12ff.]).

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[72] It must be considered that studies may be subject to subjective distortion, due to the fact that they may be laid out in the perspective of a user or a provider [Wang 02, 5ff.]. The studies chosen for demonstration purposes within this thesis were chosen with care and upon close examination.

[73] The German term "Aktiengesellschaft" describes the kind of company, a similar English term is "joint stock company".

[74] 300 of the largest companies out of the Top 500 ranking of German companies from 1999 out of the newspaper "DIE WELT" (http://www.welt.de/wirtschaft/ranglisten/500_1999.htx) were selected. Additionally, 70 companies out of the financial sector were integrated. Out of these 370 companies, 350 were interviewed.

The DLC – Distance Learning Consulting GmbH and the magazines "Personalwirtschaft" and "management & training" focused on the topic e-learning. They interviewed 233 experts concerning their opinions of success factors, environmental conditions and conceptions of e-learning. They also found out, that mainly CBT and some WBT are implemented. The opinion that there are no plausible connections between implemented technologies and learning success outweighed. When asking for the main success factors it became clear, that aspects such as "self discipline" and "recognizable use" determined the success opposed to "technology" [China 03, 16ff.].

The trend to increase the importance of pedagogy is also evident in popular-scientific contexts. Olav Blasberg, executive committee speaker of the IC eLearning Aktiengesellschaft and Uwe Beck, joint founder of the Learntec[75] both believe that: "technology is out, education is in" [Reppert 02[WWW]]. The magazine "c't" also follows this thesis. The initial euphoria concerning e-learning has subsided. A reason for this disillusionment is that the development of multimedia learning software placed the focus on the technical aspects for too long, and the needs of the users were neglected [Schneller 03]. Successful e-learning can not be based on technology alone, it is important that a founded pedagogical and methodological basis is created.

Berlecon Research GmbH conducted a study in August 2001 with the title: growth market e-learning – requirements, actors and perspectives of the German market. This study was concerned with the analysis of the e-learning market. Among other things the size of the market in Germany was examined. The authors came to the results that the market size would continuously grow until 2005. A market volume of 300 million € was set for the year 2001. An optimistic perspective believes this will increase to over 2.000 million € until 2005. A conservative perspective prognosticates 1.500 million € [Berlecon 01[WWW]]. This shows that even though it is disillusioned e-learning is still relevant.

In July 2002 a study was conducted concerning the acceptance of e-learning by the Cognos GmbH in cooperation with the Institute for Innovation Research, Technology management and Entrepreneurship in July 2002. They found out, that 90% of the interviewees believe in an increase of relevance of e-learning in the future [Cognos 02[WWW]]. The following graphic shows the results of the study.

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[75] The Learntec, a European congress and trade fair for education and information technology, is the oldest and largest e-learning event according to their own statements.

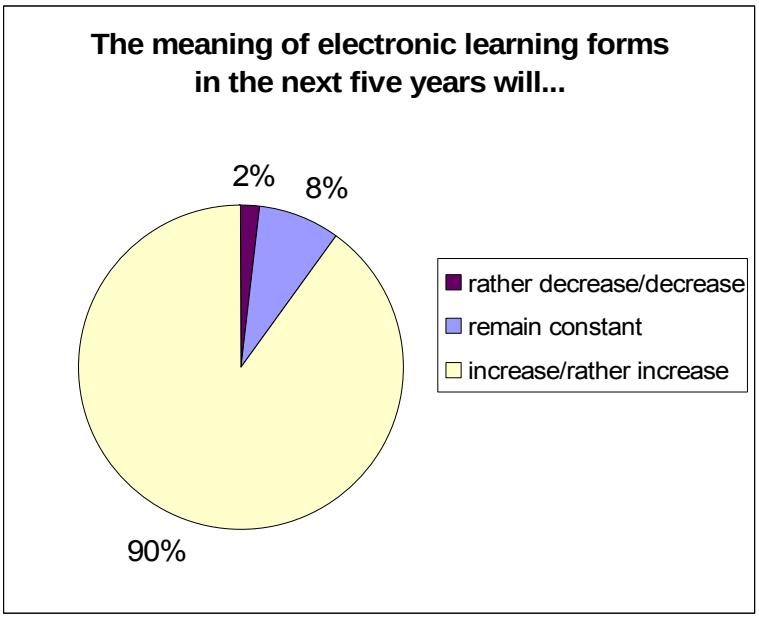

Fig. 2.2-4: Expected upcoming relevance of electronic learning forms (according to [Cognos 02[WWW]])

Janson is of the same opinion. He believes that traditional learning forms such as CBTs will be supplemented or replaced by modern variants (WBT, virtual seminar). The contents which are mediated will also be subject to change. While at the moment mostly standardized contents are offered, this will change in future. The integration of technology and didactics will increase. New technological possibilities will be combined with suitable didactical concepts. It will also be possible to integrate e-learning conceptions into existing portals or intranets [Janson 03b].

The already mentioned study by unicmind.com Aktiengesellschaft expressed the assumption that the relevance of e-learning will continue to increase. It is interesting that training of company specific knowledge will only increase slightly. This is astounding, for company specific know-how is a main prerequisite for competition advantages (see [Riekhof/Schuele 02], [unicmind 01[WWW]]).

According to the International Data Corporation (IDC) 77% of every training activity in 1998 was held in a traditional presence course. Experts estimate that this number will decrease down to 35% until the year 2004. Other researchers estimate that online education will increase approximately 30% each year.

This data raises the question: To what extent can e-learning extend, or can it even replace traditional teaching and learning methods in the future? It is certain that not all areas of training offer the same favorable conditions to be supported by learning through multimedia. While some areas are suitable for virtual learning, other fields are dependent on traditional education methodologies. According to Schulmeister every subject has learning processes that require traditional learning sequences – but these sequences can be designed to be supported by multimedia. The main reason to implement media into learning processes is not to simply replace the teacher. No

medium can do this. Media can, however, be used to increase the quality of the learning process. Media are to be implemented into areas where it can support learning processes [Schulmeister 01]. E-learning can extend traditional teaching, or it can be combined with traditional teaching to create a new, or so called new teaching form called "blended learning" [Winterer 02].

According to Reinmann-Rothmeier and Winterer the terms "blended learning" or "hybrid learning" are defined through a combination of virtual and traditional learning (see [Reinmann-Rothmeier 03], [Winterer 02]). Within this thesis the term blended learning will be used. Traditional learning settings continuously seem to be less able to satisfy needs of the modern business world. This results from the facts that traditional instruction is time- and place dependent and needs a great amount of organizational and logistical planning. This in turn leads to higher costs. Pure e-learning offers do not have the ability to replace traditional education. The most effective learning approaches combine traditional sequences and new technology to facilitate learning of relevant content while addressing the needs of the student (see [Reppert 02^{WWW}], [Schneckenberg 02]).

Blended learning combines the effectiveness and flexibility of electronically supported qualification with social aspects of joint learning. In addition to teaching and learning, traditional teaching scenarios fulfill the elementary function to establish a structure within the group of learners. Group-finding and group-building processes cannot take place sufficiently within settings of virtual learning. If a phase of "getting to know each other" is missing, groups cannot work together constructively and efficiently, for communication barriers frequently influence the communication process [Brunn/Frank 02]. This means that cooperative learning can't take place. To successfully implement collaborative learning methods into online learning the participants must become acquainted with each other in a traditional, personal setting [Esser/Twardy/Wilbers 00].

Mainly practitioners have discovered the field of blended learning as a business segment and write about it. Scientific contributions concerning it are rather scarce (see [Heckerott 03], [Sauter/Sauter 02]). The descriptions given by various authors describing blended learning have in common, that traditional teaching and learning scenarios must be synchronized to medial offers. The main profits of blended learning are training offers which are designed according to the needs of the workplace. Additionally, blended learning has the advantage of reducing absent times of employees [Hoppe 00, 116ff.]. Concrete implementations of blended learning scenarios or descriptions are usually not offered within illustrations of it. Heckerott and Skalnik describe that within blended learning alternating presence and online phases are implemented (see [Heckerott 03], [Skalnik 03]). The phenomenon of blended learning, according to Heckerott, is a well established, well known phenomenon of learning processes. Alternating the use of learning methods is not a new phenomenon within pedagogy and didactics. This newly brought up dis-

cussion about this "old" topic, using new terms, makes clear that pedagogical aspects within e-learning were neglected in the past. The focus was placed exclusively on technological aspects.

A study by Kiser launched in 1999 compared the results of 128 learners, divided into three sets of learners. The first group was taught with a mix of online content and simulations, text materials and assistance from teachers. The second group took an online course. The third group was a control group and received no training. Microsoft Excel was the teaching content. Kiser found out, that: "The group taught using a blended curriculum performed the tasks with 30 percent more accuracy than the group that received instruction online and with 159 percent more accuracy than the group that had no training" [Kiser 02, 10]. Besides learning more efficiently, the learners who were exposed to blended learning also needed the least amount of time. Concluding from this study Kiser describes blended learning as being the more efficient teaching method than over a pure online course.

Learners benefit from blended learning because it allows a gradual move from traditional classrooms to e-learning in small steps. This makes it easier for participants to accept the change. It is also of advantage for the instructors, for they can develop the skills needed for e-learning in small steps, rather than learning and implementing them all at once. Even though until now only every second company has a link between e-learning contents and traditional seminars, the discussions with experts show that this will increase in future [Riekhof/Schuele 02]. Blended learning makes use of the advantages of traditional and virtual learning and therefore the advantages of both forms supplement each other. Meaningful combinations of traditional classes and e-learning initiatives must be developed. The future development of e-learning substantially depends on these additive or integrative combinations.

General trends concerning e-learning can clearly be derived from research conducted for companies. However, because the focus of this thesis is placed on universities the next chapter moves away from descriptions concerning companies and focuses on universities.

2.2.7 E-learning within universities

Environmental circumstances of universities and their special characteristics concerning the implementation of new teaching and learning methods, especially e-learning, must be considered within this thesis, for the overall aim is to develop the web-based case method (WBCM) in such a way, that it has potential to actually be implemented. Therefore knowledge and consideration of the special circumstances of universities are especially important. Before describing the present situation at German universities, this section gives an overview of the historical development of learning and teaching methods within universities. A description of the present situation follows, especially concerning e-learning at German universities. To demonstrate the use of e-learning at German universities, different developments of virtual universities are then focused on.

Regarding their learning and teaching methods, universities have hardly changed in the past years. Lectures are still used to transfer knowledge. Students commonly study on their own with help of books. Scientific theories are discussed within seminars. Practical courses are used to train scientific work. Tutorials and "speaking hours" have "consulting" functions. Exams are used to test if knowledge is acquired [Doerr/Juengst 98]. Traditional universities are located on a campus and teach students in face to face classes. The main goal of academic teaching is to teach students specialized knowledge. Due to increasing requirements of university graduates on the one hand and changing social and economic conditions on the other hand a consciousness for a change at universities is slowly awakening even though critics have been propagating it for dozens of years. "It is clear that increasing social expectations are causing universities to rethink their aims" [Molen 99, 143]. Universities as we know them today must change to keep up with advancements in our society. Restructuring higher education seems inevitable because the government is cutting down budgets and business demands faster education with more relation to the real world. Nowadays the main goal of education at universities is to prepare students for the new requirements of the society. The main emphasis no longer lies upon teaching specialized knowledge, but to teach social competences and offer the possibility for life-long learning. The postulation of lifelong learning by the European Commission and within the national level within Germany refers mainly to the ability of self steered learning. The extent of self steered learning manifests itself within the abilities of the learner to steer and control his learning process (see [European commission 97], [BMBF 03]).

Financial problems, a continuously decreasing number of jobs, and deficits within room resources, libraries and technical equipment worsen learning and teaching conditions at universities [Doerr/Juengst 98]. Reductions and shortenings are so serious, that some universities are hardly able to keep up teaching and research. Missing institutional and legal conditions which could enable universities to offer their educational products to a global market and thus make profits are missing [Encarnacao 00]. These factors combined with the very high number of students leads to a very unfavorable ratio of teachers to learners. This development and continuously decreasing periods of validity of knowledge lead to an increased demand for flexible and life-long learning offers at universities (see [Hesse/Friedrich 01], [Hoellinger 86]).

A computer investment program[76] launched in 1985 by the government of the Federal Republic of Germany, intended to enable German universities to enhance teaching with computers. From 1987 to 1992 new computers with an overall value of 291.7 million Deutsch Mark were bought. This equals approximately 1120 "computer pools" with 17.824 computers. Another 567 clusters

[76] This program is referred to as CIP which is the abbreviation for "Computer Investitionsprogramm" which is the German term for computer investment program.

with 5300 computers were purchased in the context of WAP[77] (Scientific Working Places) [Schulmeister 97].

The study "Szenario 2005", researched by "Bertelsmann Stiftung" in the year 2000 in coordination with 15 high-ranked scientists, came to the results that within the next five years approximately half of all students would prefer to learn with the WWW. This way students would no longer have to take their courses at only one university. Studying world wide or e.g. the parallel attendance of on-line courses at the Universities of Munich, Harvard and Cambridge would be made possible. If one gives faith to this scenario, then there will be a serious change within the field of teaching: "[…] it seems that the learning society, as we will call the domain of education, will change more in the coming decades than it did in the past few" [Molen 99, 68].

The implementation of new media is often seen as a solution to the current problems at universities. "The use of multimedia, local networks, shared communication systems, the Internet, shared electronic databases, video conferencing facilities, electronic self-study materials, study support and guidance through networks, progress assessment systems, intake and monitoring systems, and so on, will enhance the development of new teaching and learning strategies." [Molen 99, 68] Through the use of the internet interaction possibilities can upgrade the quality of distance education.

Using computers to support learning belongs to the everyday life of university students, a study conducted by the German student council[78] found out in 2002. This study evaluated that almost all students (97%) had the possibilities to work with a computer and 87% used the WWW. Computers were used an average of 8 hours a week for study-referred purposes. This expenditure of time was approximately even between men and women [Middendorp 02]. This study further evaluated a positive tendency of students towards computer supported learning (32% agreed, 56% were neutral and 12% declined). The better the personal equipment is and the more time was used for computer supported learning, the more positive the tendency was towards these learning scenarios. However, in general there was a skeptic trend towards the assumption that computer supported learning could replace traditional learning arrangements or that motivation towards learning could be increased through implementation of the new learning arrangements. It was often criticized that the aspect of critical thinking is not promoted enough within e-learning [Middendorp 02].

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77 This is a German abbreviation for scientific working place. In German the term is "Wissenchaftliche-Arbeits-Plaetze" and therefore it is abbreviated through WAP.

78 In Germany this is called "Deutsches Studentenwerk". The abbreviation is DSW. This can be translated to German student council.

A study concerning e-learning was conducted with 139 students from study areas related to business at the Universities Osnabrueck and Leipzig by Klauser/Kim/Born. Approximately half of all students (55.8%) have had experiences with e-learning. Within 46.8% of the cases these were related to CD-ROM based application. 20.9% had experienced web-based learning. This study further evaluated that students thought e-learning was important for their further studies and their future jobs. The majority of the students (90%) were willing to take part in e-learning courses. Main advantages of computer supported learning were time-independent learning and self-determination of the speed of learning. The possibility to occupy oneself more intensely with learning contents was not rated as important. The students perceived the limited communication and possibilities to interact with each other as disadvantages. It becomes clear that interpersonal communication is still preferred. It was also mentioned as being a disadvantage to be solely responsible for the own learning process. This is due to the missing learning pressure [Klauser/Kim/Born 02]. The trend that the internet will increase in importance is recognizable (see [Bauer/Philippi 01], [Weckenmann et al. 00]).

The qualitative and quantitative development of e-learning in universities is further advanced in the USA than in Germany. Technological equipment as well as training of professors and students concerning use and development of learning applications are advanced in the USA. Within the discussion of e-learning in universities an increased focus on the concept of the virtual university can be perceived.

Despite all efforts the introduction of multimedia at universities precedes very slowly. Most statements of international and national committees claim that two of the main factors for the slow speed of implementation are lacking abilities and motivation of the teachers [Schulmeister 01]. Additionally, educational systems are extremely stable and only change slowly. Even the implementation of overhead projectors or the use of films took many years, before they were accepted and broadly used [Pfeil/Hoppe/Hahne 01]. A further reason for the slow progress is the difficulty to adjust teaching methods to the fast progress. This creates more difficulties than this was the case in former times. The development of new technologies carries on so quickly that new equipment generations are already are on the market before the results, which were won with devices of the first and second generations, could be processed. Additionally, promotion of research always has priority before actual teaching. Therefore universities always lack behind businesses concerning development and implementation of communication technologies [Hoellinger 86].

However, despite many problems and barriers, e-learning has been introduced to many universities. Constructivist beliefs, which will be described in chapter 4.1.3, build the basis which is necessary to change teaching and learning within universities. But to really change learning and teaching at universities actual concepts are needed [Doerr/Juengst 98]. The use of e-learning at

universities has many variations and the term "virtual university" is used with a wide spectrum in mind [Esser/Twardy/Wilbers 00].

- The first form of virtual university replaces the “presence university”. An example of this type is the University of Phoenix (http://www.uophx.edu/). This type of virtual university combines distance studies with a campus and a learning center.
- The second kind of virtual university adds a virtual university to a traditional university. One example for this is the project “Virtus” (http://www.virtus.uni-koeln.de). The main goal of “Virtus” is to develop a model of organization and an institutional implementation. The implementation of new media leads to improved learning situations. This means that learning is enabled to take place independently of time and location. This helps mass universities to gain room and capacities for direct and personal communication between teachers and learners.
- The third form of a virtual university is the merger of several “presence universities”, which in combination form an additional virtual university. WINFO LINE is an example for this kind of university (http://www.winfoline.de). The universities Saarbruecken, Goettingen, Leipzig and Kassel developed an internet supported learning offer especially designed for the subject business computing. This virtual course of study enables studying independent of location.
- The fourth form of the virtual university is the private-economical addition of universities around a virtual university. Private, company-owned and public universities unite and form a corporate university. Daimler Chrysler, Lufthansa, Bertelsmann and the Deutsche Bank are well-known for the establishment of corporate universities. The Daimler Chrysler Corporate University (DCU) has the Harvard Business School (Massachusetts), the INSEAD in Fontainebleau and the International Institute for Management Development (IMD) in Lausanne as partners for its corporate university.

Different forms and kinds of virtual universities all have the same characteristics which differentiate them from traditional universities. They are independent of location and therefore they enable a global linking of potential learners, teachers, alumni, workers and researchers [Molen 99].

After having described up-to-date developments of e-learning in the preceding part, the next section explains technology enhanced forms of the case method. This is one main aspect of this chapter. Besides establishing a connection between e-learning and the case method the next chapter also emphasizes the deficits of state of the art developments. From these deficits the necessity for the research conducted within this thesis can be derived.

2.3 Technology enhanced variants of the case method

"As our field research methodology becomes more sophisticated, as we expand our cases to include a combination of verbal, numerical, and visual data, one can be certain that the case study of our centennial year, 2008, will be very different from those used today." [Barnes/Christensen/Hansen 94, 44] Even though this statement has proven to be true, there have been many changes, modifications and supplements to the traditional form of the case method, the use of technology enhanced variants is still in a developmental phase. While the use of the traditional version of the CM is spread throughout traditional teaching scenarios the use of cases within electronically supported learning processes is still new ground [Haehling von Lanzenauer/Trela 03]. New developments of the CM are still scarce. However, extensions and further developments as well as changes within the traditional CM can be registered. Use of computer-mediated communication (CMC) within the traditional process is increasing slowly. Computer-mediated communication refers to computer-supported forms of communication. These communication forms are described in detail in chapter 5.1. These extensions of the traditional case method are described in this section. Due to the structure of this thesis as described in chapter 2.2 the terms computer-mediated communication and groupware support systems which are allocated to the topics communication and collaboration in e-learning, are described in greater detail in chapter 5. Descriptions of electronic communication and collaboration forms are anticipated here in chapter 2.3. In order to introduce the new developments in a structured form two classes of implemented variants of the case method were built by the author. These are named "enhanced case method" and "automated case method".

The *enhanced case method* clings to the structure of the traditional case method and extends it partially by integrating components of computer-mediated communication and groupware support systems into the traditional teaching and learning process. There is no predetermined scheme, procedure or systematic to do this. Integrating further technology is mainly dependent on the people involved in the process and their ideas and possibilities. The *automated case method* differs extremely from the traditional CM. All interpersonal interaction processes are excluded. Interpersonal dialogue is substituted completely through automated dialogue through the system.

The next chapter 2.3.1 explains the occurrences of the enhanced case method. These realizations are backed up through literature. Chapter 2.3.2 then deals with the automated case method, and, due to the newness of this approach, and thus the missing publication of strengths and weaknesses, an empirical study which was conducted by the author of this thesis to evaluate this approach. Deficits of both the enhanced and automated approach are then pointed out in chapter 2.3.3. This chapter serves as a connection to the next chapter which describes the specified goal of this thesis.

2.3.1 Enhanced case method

Within this thesis approaches of the case method which enrich the traditional process of the case method through elements of computer-mediated communication are categorized to the term "enhanced case method". Examples of approaches which can be allocated to this term as well as evaluating statements are introduced in this chapter. This section also includes a summary of statements concerning the enhanced case method given by interviewees within the study "Identification of key factors of the traditional case method" in order to emphasize the up-to-date views of the target group concerning these approaches.

The work of Morrissey investigates if groupware enhances the quality of students' case preparation, analysis and decision making. To answer this question, Morrissey evaluates the quality of the decisions made in traditional face to face groups as opposed to groups using groupware to communicate through the web. As a second aspect, he also evaluates the satisfaction of the group members. Within his empirical study, in which 208 people were evaluated, Morrissey found out that "[…] groupware based study groups […] exhibit higher quality decision analysis than traditional face-to-face study groups". However, he also found out that the "[…] implication is that satisfaction is higher in face-to-face groups even though they do not perform as well as computer-based groups" [Morrissey 97, 75]. That means that satisfaction within groups using groupware is not more positive than in traditional groups.

Erskine/Leenders/Mauffette-Leenders stress that it is very important for the people involved in a learning environment to personally know each other. "My research on video conferencing for distance learning and even for business meetings says it is important that participants and instructors know each other before going into video conferencing sessions. Everything I have experienced has reinforced that. The times when we get the class together provide the foundation for the kinds of exchange we can have for productive video conferencing. People who know each other before engaging in video conferencing do not really operate at a distance with each other. We bring the class together at the beginning of term and each faculty member teaching the program has 12 to 16 hours of class time before moving to the video world." [Erskine/Leenders/Mauffette-Leenders 98, 248]

Ensuring equal and equitable participation by all students is one of the major problems of the traditional case method [Parent/Neufeld/Gallupe 02]. Briggs/Nunamaker/Sprague as well as Parent/Neufeld/Gallupe suggest that CMC have a positive impact on group decisions, performance, and member satisfaction (see [Briggs/Nunamaker/Sprague 98], [Parent/Neufeld/Gallupe 02]). "They appear to do so by providing the means for individuals in groups to interact, by providing a structure for their interaction, and by creating a permanent record of this interaction. Nonetheless, results from over a decade's worth of research are mixed." [Parent/Neufeld/Gallupe 02, 6]

Research conducted by Parent/Neufeld/Gallupe on how an e-forum[79] used simultaneously within a classroom setting can support equal chances and opportunities for all students. Teachers teaching courses that facilitate traditional discussion parallel to discussion carried out through CMC have to get used to the fact that upon asking a question, hands go up, signaling they want to be called on, and other hands go down, and start clicking away at the keyboard. Within their exploratory study Parent/Neufeld/Gallupe found out that many students have difficulties combining technological and traditional discussion, facts of the case, and social interaction. Therefore they suggest to structure courses into technological and human moments. Within a technological moment, the instructor tells the class to type comments into the e-forum. These and other comments will then be discussed. "This would have the effect of forcing students to concentrate on typing without having to keep track of a discussion. The ensuing discussion could embody both typed and oral comments. However, one potential disadvantage to this approach might be to impede the free-flowing discussion that characterizes the case method." [Parent/Neufeld/Gallupe 02, 18] The advantage which could be derived from dividing the class into human and technical moments is that it would allow the instructor to monitor and respond to comments. The instructor can both blend the participation grade and consider participation with a certain percentage, or he can differentiate between participation in traditional and technological discussion.

This new technology introduced to the students was not picked up at once. Usage of the technology increased as the students became more comfortable with it and with each other. Frustrated students, who felt they were not being called on enough, were given the possibility to communicate their ideas through the discussion board. Even though evaluation was conducted qualitatively one omission within the study of Parent/Neufeld/Gallupe is that they did not measure satisfaction. Acceptance of technological innovations within classrooms is largely dependent on satisfaction of the students [Parent/Neufeld/Gallupe 02].

When attempting to transfer the traditional case method into a web-based environment it is often argued that student participation is the key to case learning and that especially aspects of communication suffer, when transferring this method to an online environment. Parent/Neufeld/Gallupe believe that it is difficult to attain equal participation in a traditional classroom. They see three ways in which traditional classrooms benefit from using an online discussion forum, it supports different learning types, enriches lectures through (web-based) discussions, and serves as an additional forum for questions.

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[79] The term e-forum refers to an electronic discussion board. This term refers to a commonly used medium for discussion within the web. A detailed description is given in chapter 5.1.4.

The empirical study conducted in order to identify the key factors of the traditional case method also found out that experts at The Richard Ivey School of Business generally showed a positive opinion of CMC within the traditional case method. The following paragraph gives a summary of the opinions which were evaluated in the interviews. A detailed overview of these statements can be found in appendix 0.

Students autonomously integrated CMC into their work through process of the traditional case method. All of the interviewed students at The Richard Ivey School of Business (see appendix A for a description of the target group) use virtual communication possibilities as supplements to traditional communication forms. Microsoft messenger is an instant messenger, and is used by all of the interviewed candidates. Additionally, they write each other e-mails, however not as often as they "MSN each other"[80]. "To start off with a general comment: we do quite a bit of web work informally. MSN messenger is our best friend […]. Sometimes you read the case and don't know where to start. What we often do is MSN someone. Where did you start? How did you go about doing this case? That often helps your own analysis. We do a bit of MSN chatting about it." [IV8, l. 208-212] One teacher integrated the possibility to use the MSN messenger within the classroom during the large discussion phases. This enabled the students to either participate in the traditional discussion in the classroom, or to participate in various other discussion threads on the MSN messenger. Following more than one discussion simultaneously is described as being hard: "[…] when real-time chat is used in a class it makes it hard to follow both conversations" [IV5, l. 163-164]. However, offering different discussion threads is interesting because often the in class discussion leads to a direction that is not interesting for everyone. Through MSN messenger students can discuss the topics they prefer to discuss, not the ones the students in class want to talk about. This adds another possibility for participation, and thus also to grade participation.

Results of these researchers as well as the statements given in the interviews show that transferring some processes of group-work to the web can be a reasonable alternative to face to face meetings. "In sum, it appears that IT can potentially enhance learning […] by offering the possibility of enriching the learning experience, and by allowing individual learners' needs to be met more readily." [Parent/Neufeld/Gallupe 02, 4] It becomes clear that the approaches described in this section do not follow a certain scheme or procedure. These approaches focus on the technology involved, not on pedagogical and didactical aspects.

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[80] When some of the interviewees use the abbreviation MSN they refer to the Microsoft network messenger. They use the abbreviation MSN, which actually abbreviates Microsoft network, in a wrong way. In order not to falsify the interviews, or the comments made within them, this wrong abbreviation will be kept within the interviews. Outside of the interviews the Microsoft network messenger will be referred to as "MSN messenger".

2.3.2 Automated case method

Another extension of the traditional case method is an approach which has relocated this methodology to the web completely, doing totally without personal interaction. This approach is developed at the "Freie Universitaet Berlin" by Haehling von Lanzenauer [Haehling von Lanzenauer/Trela 03]. Within this thesis this development is referred to as the "automated case method". It is described and evaluated in this section.

Haehling von Lanzenauer/Trela describes this approach as an "e-based approach" [Haehling von Lanzenauer/Trela 03, 115]. This approach believes the challenge of using the case method within e-learning lies in the difficulty to duplicate interactivity with as many of its characteristics (such as flexibility and spontaneity) as possible while doing without personal interaction between students or students and teacher. Precisely, this means that students work through this case alone and their interaction possibilities are restricted to the system, no contact to others is possible. Access to the case is granted to registered students via internet. Once the learner is admitted to the system he can work through the case. Contrary to the traditional case method this work-through process consists of only one phase opposed to the traditional case method which includes three phases (see chapter 2.1.4). This reduction to one phase results from the omitted small group and plenum phase. The student learns on his own and only interacts with the system. Within this approach two kinds of computer-supported interaction forms are realized. These are called: structured and unstructured dialogue. Within unstructured dialogue students can formulate their thoughts and proposals and write them into a text field (description field). At the momentary development level this input is not processed or evaluated. Structured dialogue is more interesting because a so called virtual tutor comments on given answers. Structured dialogue can take place in form of multiple choice questions, numerical answers, graphics etc. Within the automated case method the virtual tutor is represented through varying symbols. Dialogue between students and this virtual tutor also takes place in form of symbols. Varying symbols are assigned different roles of the virtual tutor. The following table shows some of these symbols.

Table 2.3-1: Examples of used symbols in structured dialogue (according to [Haehling von Lanzenauer/Trela 03, 123])

Role	Symbol	Meaning
"Narrator"		Text which is represented with this hat symbolizes the thread.
		Upon clicking on this symbol a video sequence concerning a certain subject or aspect of the case study is played.
"Instructor"		In front of every question there is an empty box. If the question is solved correctly the box is marked with a checkmark.
		With this symbol the virtual tutor points out that the student must become "active".
		Each feedback is annotated with multicolored smilies. This lets the student realize how he performed on the task at one glance.
		Special information and comments are marked with this lamp.
		This symbol shows when helping-functions are offered.

The general structure of this approach is linear. This means that in order to proceed within the case, the preceding steps need to have been accomplished successfully. For this purpose various helping functions are offered. Generating interaction for this development of the case method is very laborious and calls for great programming efforts. The more detailed the reactions of the virtual tutor are supposed to be, the higher the programming effort. This effort is justifiable because these units are modularized in such a way to enable reusability. The following screenshot gives insight into the automated case method.

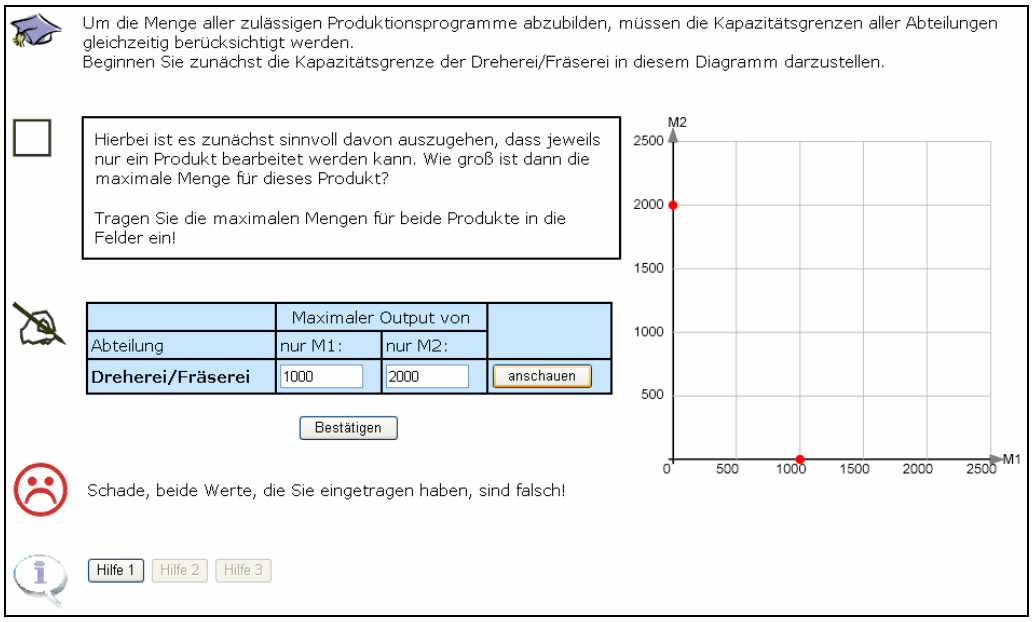

Fig. 2.3-1: Screenshot of the automated case method ([Haehling von Lanzenauer/Trela 03, 127])

For a more detailed description of this approach see [Haehling von Lanzenauer/Trela 03].

Because Haehling von Lanzenauers approach is still very new it was evaluated within the context of this thesis in order to find out what the main strengths and weaknesses of this approach are. Goal of this empirical research was to identify the influence the automated case method had on the learning behaviour of the students. The evaluation of the conducted interviews is structured according to four categories: influence of the automated case method on the learning behavior, feedback within the automated case method, function of communication within the automated case method and suggestions for improvement of the automated case method. Three of these categories are structured even further and contain subcategories. While this section contains a summary of the results, arranged according to the four main categories a detailed overview of all categories, including subcategories, is given in appendix B. Within this evaluation the students worked through the case under supervision of a tutor. This tutor assisted students with any type of difficulty.

I. Influence of the automated case method on the learning behaviour

This category describes the influence of the automated case method on aspects concerning the learning behaviour of the students. The results of the interviews showed that students mainly associated three learning objectives with the case method: learning the mediated information within the case method, learning the strategic procedure to solve a problem, and optimizing competences to solve problems. Actually applying lead to better retention of the contents. Beyond these objectives the students also reported the promotion of capabilities such as individual

initiative and independence, creativity, as well as promoting problem solving competences and flexibility as further learning goals this implementation of the case method strives for.

The authentic problem situation the students were confronted with within the case let theory become more concrete and therefore easier understandable. Prerequisite knowledge, e.g. from the basic course of studies, was activated and connected to new theories. Information and solutions were not offered within the automated case method, they needed to be compiled interactively. Some students explained that the linearity of the system restrained them from following their solution approach, even after receiving positive feedback for it. Following different solution threads was important in order to give students the possibility and the feeling to develop their own solutions. In this case, however, this was not possible due to technological circumstances. Some students mentioned that after giving a wrong answer they changed their solution strategy to an eliminating strategy, which lead to choosing an answer, which they thought of as the least wrong.

All students rated working with the automated case method as motivating. This was due to the interactivity within the automated case method. The automated case method was also perceived as being fun – this also motivated the students to work through the case. They characterized working with the automated case method as a pleasant variation to traditional teaching settings. The connection between theory and practice was made responsible for a certain feeling of success, for feeling that they understood the process of solving the problems in general – this in turn also influenced their motivation positively. A de-motivating factor was the stereotype feedback given to the unstructured text fields. Some of the interviewees soon assumed that these fields were not relevant and did not engage in the answers anymore. In general students felt that working autonomously increased their motivation.

While some students stated that working with the automated case method influenced their decision making behaviour others said that it did not. Some students believed the process of making decisions as a spontaneous action while others felt they were being forced to make decisions. One value-free comment illustrated that working through the automated case method caused the students to develop a willingness to make decisions.

Statements concerning the environmental prerequisites emphasized that the students believed it to be important to handle learning contents flexibly. However, it was also stated that within all this freedom students also liked to know that someone is reachable, who can help out in case of need. A clear thread of the learning contents as well as a clear navigation which always showed where one is at the moment were very important features in order to work autonomously. Working through the case alone resulted in minor distractions for the learner. This was regarded as an advantage compared to other learning scenarios, e.g. group work.

II. Feedback within the automated case method

Different feedback possibilities as well as their relevance to the students are introduced in this category.

If a student was off-track the instructor could bring him back on track again. All interviewees believed the supervision of the instructor while they were working on the case as helpful and very important. This also included receiving help concerning technological problems or questions concerning the contents, which the program could not answer automatically.

Feedback between fellow students was regarded as an exchange of ideas rather than as feedback. Ideas for solutions were exchanged, complemented, affirmed and compared. Because the students felt closer to each other than they did to the instructor they felt it was easier asking fellow students questions than the instructors.

Feedback of the system was illustrated as being less flexible than that of the personal instructor because the automated feedback could not focus on possibly occurring questions. It was also experienced that sometimes there was too much automated feedback, letting the student feel unchallenged. At other times students relied on the helping function of the feedback and did not think in order to find the answer, they simply guessed, according to the feedback which was given.

III. Function of communication within the automated case method

The role of communication is the focus of this category. In this setting the students were to work through the automated case method alone. They missed the relationship to their fellow students. They would have enjoyed discussing their solution alternatives with others in order to affirm their answers. This would have ensured them that they are on the right track. Therefore the students criticized that communication with fellow students was not allowed in this setting. Furthermore, the students stated that they perceived it as stimulating to go to university in order to meet others and have contact to them therefore they did not like missing out on this within the automated case method. They also reported it as more stimulating to learn through discussing facts rather than being on their own. Students also stated that the risk of distraction was not as high while working alone than when working in a group.

Within the automated case method the students outlined that they preferred questions where it was possible to answer through unstructured text. They also felt the learning effect to be higher, due to the engagement with the topic while discussing it. According to their opinion the characteristics communication and articulation supported understanding and remembering.

IV. Suggestions for improvement of the automated case method

This category summarizes suggestions for improvement the students made. Some of the interviewees recognized that the automated case method was built up in a linear way, and that they were thus not able to build up their own solution. For this reason some students felt limited concerning their activity scope. Learning with the traditional automated case method also implied being able to follow other solution threads than the optimal one. This was not possible within this implementation of the automated case method. In order to communicate to fellow students the interviewees requested the possibility to communicate with each other through the web.

Almost all interviewees perceived the attendance of a personal instructor while working through the case in this approach of the automated case method as indispensable. He gave them feedback when they needed individual support, or when they encountered problems with which the computer program could not help them. Some students even requested that the support through a personal instructor should be intensified. They did not want to have the feeling that they are being left alone.

In order to optimize the automated case method some students pleaded to extend the automated case method through group work. It was suggested to form small groups of two to three students before they start working on the case. Furthermore, it was also suggested to combine single and group work in order to make the best of both worlds. The students were of the opinion that they could not imagine this implementation of the automated case method being a substitute for a lecture. They could however imagine it being an extension to a lecture.

Conclusion

This implementation of the automated case method was very popular among the students. It was accepted to a large extent, and besides learning through this medium, the students also perceived it as being fun to do so. Students' motivation increased compared to visiting a traditional lecture alone. The application of theory was complimented, and the students described that retention of contents increased after working through the automated case method. Missing components were interaction possibilities. The students missed the possibility to communicate to peers. Even though they evaluated the instructor, who was present while they worked through the automated case method, as very important, they also requested being able to work through the case autonomously e.g. from their homes. They could imagine communicating to others (students or instructors) via the web. It is especially important to them to be able to contact someone when they are experiencing technological difficulties or problems which the helping function can not solve. The linearity of the program was criticized. This forced the students to follow the one thread of the optimal solution. It is not supported within this realization of the automated case method to follow other less optimal threads. Further suggestions for improvement concerning this specific

implementation were made in the interviews. These describe special features within this realization and are not listed here for reasons of clarity. These comments can be found in appendix B.

After giving insight into the enhanced case method in chapter 2.3.1 and into the automated case method in chapter 2.3.2 the next section justifies and supports the necessity to develop a new approach of the case method.

2.3.3 Assessment of existing variants

As described in detail in the two chapters above these variants of the case method differ according to their characteristics. Their descriptions clarified that the two approaches have diverse advantages and disadvantages and through their characteristics they are predetermined to be implemented into different settings. Each variant has its right of existence, for they prove to be successful in varying areas and under consideration of differing objectives. Their implementation is largely dependent on the circumstances involved, and the goals which are aimed for through their implementation. However, the drawbacks of these approaches also clarify that there is still potential for improvement and development.

The enhanced case method extends the traditional approach by integrating components of computer-mediated communication and groupware support systems. Thus this variant is dependent on prerequisites of the traditional case method, for it must be integrated into and then extends the traditional version. Furthermore, the description of the enhanced case method accentuates that the term enhanced case method is a generic term, defined through the author, to categorize diverse developments. These developments are neither related to each other, nor do they follow a predefined systematic. This limits the reproducibility and makes them dependent on the responsible people involved. The descriptions of these developments show that they are primarily driven by technology – not by pedagogy. As it was described in chapter 2.2.6 this is no longer state of the art. The shift in paradigms emphasizes the necessity to design e-learning arrangements with respect to pedagogical and didactical components. This includes integrating the target group into the design wherever possible [Euler 92]. Items such as satisfaction play a major role and must be recognized and evaluated. Simply implementing technology into the traditional case method is a short term perspective, for it will not improve the teaching method substantially. Additionally, consistency within these approaches is missing. These enhanced case method approaches are not consistent, for they are not constructed systematically. These developments have the character of spontaneous actions, neither realizing nor evaluating to a larger extent how they influence the process of the case method.

The automated case method focuses on reusability. It can be implemented into varying settings, for after the effort of developing and programming it is invested, little support is necessary to conduct this approach. Opposed to realizations of the enhanced case method this approach does

not call for the prerequisites necessary to conduct the traditional case method. However, due to the substitution of personal interaction this approach is subject to more criticism than the enhanced case method. The automated feedback was criticized. It was described as being stereotype and frequently the system did not give the right degree of feedback. Sometimes too much feedback was given and sometimes not enough. Furthermore, this feedback was described as not always being meaningful. Communication abilities and social competences are not promoted within the automated case method. Compared to the traditional case method this is a large sacrifice, for literature describes that the broad spectrum of mediated competences which is made possible through application of the traditional case method is somewhat extraordinary (see chapter 2.1.7). This broad spectrum is narrowed down very much by the automated case method approach. The students who worked through the automated case method described that they missed relationships to others. They missed being able to discuss certain topics of interest with their fellow students. Furthermore, they positively mentioned the supervisor who was attendant while they worked through the automated case method. They perceived it as being more motivating than a lecture although the linearity of the system was criticized. Students explained that this linearity limited their scope of activity.

As outlined in the introduction of this thesis its focus is placed on universities and on the case method. The momentary situation of universities shows many deficits especially concerning financial and thus personnel resources (described in chapter 2.2.7). The new developments of virtual universities, also described in chapter 2.2.7, make it clear that this is a field for which new methodologies must be developed and for which successful existing methods must be redesigned. Innovative and creative ideas, with a found pedagogical basis can find a new forum of publication within these new developments. These deficits require finding new ways to apply knowledge and to facilitate working in groups. E-learning approaches can be a solution for this. Approaches of the enhanced case method are not systematic and focus too much on technologies. The automated case method approach is systematic, but due to the reduction to one learning phase and the linearity many of the traditional advantages of the case method are lost. Neglected interaction possibilities lead to much criticism within this approach (see chapter 2.3.2). These and the additional critique described above clarifies that current developments are not sufficient to meet up to date needs. Current developments and trends within e-learning (described in chapter 2.2.6) and the shift in paradigms (described in chapter 1) emphasize the necessity to develop e-learning solutions which integrate and consider pedagogical and didactical approaches. As the experience of the last years shows a pure technological view as well as realizations which focus only on the tools involved do not lead to successful learning (see chapter 2.2.6). The criteria catalogue for successful e-learning, which was explicated in chapter 2.2.5 shows that factors which influence the success of e-learning go beyond technological aspects. State of the art e-learning initiatives must place the focus on implementing technology in a found pedagogical way.

The exclusive development of new technologies has been promoted long enough. In order to make e-learning more successful and thus accepted and used it is necessary to realize that now is the time to focus on the educational side. This emphasizes the necessity to develop a new approach of the case method. In accordance to state of the art findings concerning e-learning, described in chapter 2.2.6, this approach must focus on the pedagogical and didactical view. Beyond this the new approach of the case method needs to be characterized through a systematic procedure in order to make it reproducible and thus be able to implement it into a variety of settings.

2.4 Precision of the goal and further structure of this thesis

The main goal of this thesis is derived from the insufficient conditions described in the preceding chapter. The insight into actual developments of technology enhanced variants of the case method, e-learning in general and e-learning within universities clarify that the main goal of this thesis, namely to develop a conceptual design of a web-based case method, is meaningful, relevant and necessary. It must differ from existing variants of technology enhanced variants of the case method by being systematic and thus reproducible. Therefore the conceptual design developed in this thesis must focus on the pedagogical perspective, not on technological aspects. The pedagogical perspective of the conceptual design is reached by integrating pedagogical methods. Besides developing the conceptual design, this thesis will also describe its specific implementation. This implementation will demonstrate the functionality of the approach.

The development and specific realization of the conceptual design builds on experiences made with prior existing methods (described in chapter 2.3), and includes theoretical knowledge of the traditional case method (illustrated in chapter 2.1) as well as e-learning (outlined in chapter 2.2). To reach these two main goals they need to be broken down into detailed steps. These steps as well as the further structure of the thesis are described in this section.

The major goals of developing the conceptual design of the web-based case method and realizing it for a specific context can be broken down into four steps. These steps are:

1. Conduction of a requirement analysis for the development
2. Identification of the main characteristics of the case method
3. Design of the main characteristics for a web-based implementation
4. Specific realization of the conceptual design.

Before the development of the conceptual design of the web-based case method can begin it is necessary to identify requirements connected with it. This is the focus of chapter 3. The requirements are assessed through three empirical studies conducted by the author. The first empirical study is outlined in chapter 3.2 and focuses on the requirements alumni, former students, place

on learning scenarios within universities. This knowledge is valuable because alumni represent former students who are now working and they can provide interesting information concerning demands placed by businesses in comparison to what is taught within universities. The second study illustrated in chapter 3.3 identifies requirements, expectations and wishes students have concerning virtual learning. Finally it was assessed if it was perceived as realizable to bring the traditional case method to the web. This was done by interviewing experts in the field of the case method. The results of these assumptions concerning a web-based case method are introduced in chapter 3.4. A summary of this research in chapter 3.5 closes this section.

Before the next step towards the aim of this thesis is conducted, namely the identification of the main characteristics of the case method, an overview of learning theoretical basics which influence the characteristics of the case method is given in chapter 4.1. Partially, these are mirrored in the main characteristics of the case method. The determination of the main characteristics is achieved by accentuating findings of state of the art literature through an empirical study conducted with experts in this field. The description of the main characteristics is focus of chapter 4.2. Identification of these characteristics is necessary for building the basis for the further research conducted within the thesis. These characteristics determine the focus of the web-based case method.

Before the conceptual design of the web-based case method can take place it is necessary to describe basic principles of communication and collaboration within e-learning. It is essential to illustrate these two components in greater detail for they are specified as being main characteristics of the case method in chapter 4.2. After chapter 5.1 focuses on communication within e-learning chapter 5.2 illustrates virtual teamwork. This chapter serves as a transition to chapter 6 which deals with the conceptual design of the web-based case method. Here the design of the main characteristics for a web-based implementation is developed. This chapter describes the first main goal of this thesis. While chapter 6.2 focuses on general design principles which apply to all six of the main characteristics chapters 6.3 and 6.4 specify the particular design of the characteristics communication and collaboration. Therefore these chapters 6.3 and 6.4 correspond to the chapters 5.1 and 5.2. The redesign of the characteristics communication and collaboration are built on empiricism conducted for the scope of this thesis. Three studies were necessary in order to design these characteristics in accordance to the specific target group and environment of future users. These newly designed characteristics build the conceptual design of the web-based case method (WBCM). Their design ensures that the WBCM hangs on to the main characteristics of the traditional case method focused on in chapter 4.2 and is designed in a way to efficiently use modern technology. This decreases the amount of required resources while simultaneously offering many similar as well as further going advantages of the traditional case method. The increased use of technology eases implementation of the web-based case method, in

comparison to the traditional case method, and thus widens suitability to a larger variety of settings, thus enlarging the range of this methodology.

Chapter 7 then applies the conceptual design of the web-based case method. This chapter thus describes the second main goal of this thesis, namely the specific realization of the conceptual design considering a concrete example. The concrete example chosen is a university setting at a chair for OR. Chapter 8 then closes this thesis with a conclusion.

3 Requirement analysis for the development of the web-based case method

The development of the conceptual design of the web-based case method begins by evaluating necessary requirements for it. Because the main focus of this thesis is placed on the pedagogical view, and because it was further necessary to evaluate requirements which go beyond findings in state of the art literature empirical studies needed to be conducted for this thesis (see chapter 1.2 for an overview of all empirical studies). Descriptions of requirements as well as empirical studies which were conducted are described in this section.

Chapter 3.1 gives an overview of the target group upon which the development of the conceptual design is based. Chapter 3.2 then describes the results of a study conducted with alumni of the DS&OR Lab. The DS&OR Lab is an abbreviation for Decision support and Operations Research Laboratory and describes a chair which concentrates on the subject OR at the University of Paderborn. Within this study former students who took courses at this chair were interviewed. The aim of these interviews was to identify whether and how the contents as well as the methods used to teach the students prepared them for their future jobs. Chapter 3.3 then outlines the results of an evaluation concerning the necessary requirements for virtual learning. Within this study target group users were interviewed through the methodology of the group discussion. Then in chapter 3.4 the results of a study focusing on evaluating expert opinions concerning the realization of a web-based case method are introduced. These experts were not chosen from the target group, for within this group no experience concerning the case method is existent. The interviewed experts resembled the target group users closely. Within these interviews suggestions for the design of a web-based case method were given and advantages and disadvantages of such a methodology were discussed.

3.1 Description of the target group

According to Euler the definition of the target group is an essential step when designing research to be conducted in order to develop virtual learning arrangements [Euler 92]. It is neither possible to develop a conceptual design nor the web-based case method itself if it is not clear for whom this is being developed. Development of the conceptual design of the WBCM focuses on students of higher education. These are university students, who are studying business and who specialize in the subject OR. These are mainly students of the areas business, computing, business computing, and business pedagogics. These students are generally interested in the area of OR. They need to learn the contents of this subject in order to pass a test and to focus (major) their course of studies into a certain direction. This target group is very homogeneous considering their relevant characteristics. OR courses are only offered to students starting in their 3rd year

of studies. The contents of the subject OR are very complex. However, they are well structured and stable.

It is important to realize the characteristics of the target group and their affinity towards the learning process. This can be expressed through description of their situative, affective and cognitive dispositions:

Situative disposition

- Computer-familiarity is rated between high and very high.
  The target group has collected experiences using computers throughout the course of their studies. Due to the subjects the target group studies, it can be concluded that they have accomplished many tasks for their studies on the computer.
- Content-familiarity is rated as low.
  Basic abilities in the area of business computing are prerequisites, when studying OR in the 3rd year of studies. It is assumed that the students are interested in the area of OR, although they have not had any experiences with the contents.

Affective disposition

- The acceptance of computer aided instruction is rated as high.
  Prior empirical studies at the University of Paderborn in the area of OR show that students have a high affiliation towards learning electronically. Basics in business computing have a positive influence on working with electronic learning media because training periods concerning the handling of the computer are usually not necessary. Therefore people from this target group begin profiting from electronic learning media quicker than other groups would.
- Learning demands are factual.
  It is assumed that factual requirements for learning dominate this target group. The learner is highly motivated through the will to achieve something or through personal interest. Social and emotional aspects are in the background. When working with an electronic learning medium on a continuous basis, it is necessary to also respect social and emotional aspects. When learning with such a medium on a short term basis it is sufficient to only serve factual requirements for learning.
- Feedback in the learning process is received as objective, not as personal feedback.
  It is assumed that the target group has high quotient of self-confidence. Therefore they regard feedback as factual evaluation, and not as criticism regarding them.

Cognitive disposition

- An active, intrinsically motivated learning style is assumed.
  The basic motivation of the target group is believed to be intrinsic. This basic, active attitude

makes suggestions for an equally active learning style. Being open minded for new learning forms, e.g. for electronic learning programs is seen as an indicator for this explorative state of mind.

- The subjective perception is the favorable perceptive faculty.
  The target group is used to working with abstract symbols (e.g. text, graphics, simulations, etc.). This is important within the complex subject of OR, because it uses many symbols such as graphics or illustrations. Learning with an electronic learning medium increases the use of this abstract representation, because this representation is one of the main advantages electronic media have over traditional learning environments. Reading on the screen is very tiring and thus should be avoided where possible.
- Abilities of processing new information are rated as high.
  The researcher presumes that the abilities to take up, process, and remember new information is high within the target group.

The next chapter deals with the results of a study which was conducted in order to derive requirements alumni would place on learning scenarios at universities.

3.2 Alumni requirements concerning learning scenarios

A qualitative study was conducted at the DS&OR Lab in which alumni were interviewed and asked how their studies prepared them for their jobs. These students were encouraged to give positive and negative feedback about contents, design and curriculum of the faculty of business computing especially focusing on the chair of OR. Conclusions concerning the design and implementation of teaching and learning methodologies are derived from this. Furthermore, the results of these interviews support focusing the activities of this chair to areas which are especially important to the students. These results show which methodologies are actually being implemented at the time being thus either endorsing or disclaiming general factors of education in universities as described in chapter 2.2.6. Advantages and drawbacks as well as suggestions for the design of learning scenarios within universities are given by these alumni. Preferences concerning methodologies are stated as well as the advantages the alumni perceive when being taught through these methodologies. The results are introduced in the sequence of the categories which are constructed according to the qualitative content analysis. This focuses on clustering statements according to certain topics and categories. The categories are: studies of business computing in general, studies of business computing at the DS&OR Lab, lectures at the DS&OR Lab, projects at the DS&OR Lab, seminar/term papers. These five categories can further be subdivided but these ongoing categories are not described here for reasons of clarity. The summary given below filters the contributions to each section according to the topic of this thesis and thus

omits describing the fifth section. A detailed description of the analysis of the interviews can be found in appendix C.

Studies of business computing in general

Within the studies of OR the connection to other disciplines, e.g. general business studies, was not always clear to the students. The structure of the studies of OR should enable students to be able to place OR into the context of other, more general subjects. Implementing a holistic teaching and learning methodology, which combines and connects different subjects can meet this request. The English language was neglected to a large extent within these studies. This will become very important once in business, therefore the interviewees believed this should be promoted more.

Studies of business computing at the DS&OR Lab

The relationship between the employees at this chair and the students is illustrated as very good. The alumni enjoyed the personal contact to the employees of the chair and rated it as very important. Employees were reachable for students at almost anytime. The alumni perceived this as a possibility to receive help and guidance for their studies. They appreciated that courses mediate contents in a practical way, with connection to practical contexts. This eased understanding of difficult theory by having a practical context to relate to. The alumni further remarked that the traditional grading scheme, namely taking tests at the end of the term, was still the prevailing evaluation method while they went to university. They suggested developing a new grading scheme, which focuses more on the learning process, than primarily on the outcomes. The alumni especially enjoyed the active forms of knowledge mediation. They believed that the DS&OR Lab mediated social competences by promoting group work. They perceived this as very important for future working activities.

Lectures at the DS&OR Lab

Integrating presentations of practitioners into lectures was rated as helpful to actually see connections between theory and practice. The alumni also thought that combinations of lectures with exercises were of advantage because the exercises offered a forum to actually test and apply mediated knowledge.

Projects at the DS&OR Lab

Projects at the DS&OR Lab illustrated educational settings which offered practical experiences. Projects with cooperating companies offered students a great chance to gain insight into these companies and into the relationship of theory and to practice. Actual application of theory was stressed in this setting. Application of knowledge was described by the alumni as being a very important offer. Additionally, the group work in small groups, which was enforced in these pro-

jects, was described as being a good preparation for future work. It was also stressed that within the projects teams work autonomously, while the teachers guided the students. This was perceived as an advantage. The final presentation of achieved results at the end of the project to an audience was also seen as an important experience. Within one certain project the grades were given by the teacher but also by fellow students. These grades considered the overall participation in the group - not only the outcome. This grading scheme was rated positively by the alumni.

Learning forms which offered practical experience, such as projects and exercises, were described by the alumni as being very important for the course of their studies and for future jobs. Practical experiences helped them to understand mediated theory. Application contexts thus became clear. Within the interviews the alumni expressed that these offers for practical experiences should be increased. However, because these offers are very complex and call for numerous resources it is almost not possible to offer more than what is being done at the moment. This is not possible in the momentary form in which these offers are constructed. Developing e-learning alternatives, especially of the traditional case method, could be an alternative to these practical experiences for the case method integrates many of the wishes of the alumni e.g. practical experience, working in small groups and actually applying knowledge.

In addition to interviewing former students the author of this thesis also consulted present students about their preferences concerning virtual learning. This was also done as an empirical study. The results are described in the next section.

3.3 Student requirements concerning virtual learning

The focus on the pedagogical perspective concerning the conceptual design integrates the necessity to involve wishes and expectations of target group users. To meet students' expectations concerning a web-based case method in a broader sense it is important to know which requirements they have concerning virtual learning in general. In order to investigate this it is essential to know as much as possible about the target group. A theoretical outline of the target group for whom the WBCM is being developed was described in chapter 3.1. This study evaluates the expectations of these people concerning virtual learning. These expectations were evaluated by conducting a qualitative research, realized as group discussions. This chapter summarizes the results of this study. For detailed results see [Frank/Kassanke/Suhl 02]. The main focus was placed on evaluating general wishes/expectations for virtual learning, not yet focusing explicitly on the web-based case method.

Evaluated expectations of students' regarding virtual learning can be grouped into eight categories. These are installation, user-orientation/navigation, software-ergonomics, content, learning assessment, help functions, examples and internet functions.

Installation: If installation is necessary, students expected installation and uninstallation to be fast and complete, leaving no debris after uninstallation. Students wanted to be able to decide the installation path themselves. They did not want this to be a default setting. There should be more than one installation version of the program, i.e. a customized version for laptops was rated as important.

User-orientation/Navigation: The main expectation in the category of user-orientation was that the learning environment meets common standards. Students wanted the navigation to be easy and intuitive to use. Students wanted to be able to navigate freely to explore the learning environment, as well as being able to use guided tours. They cared for the possibility to activate a guide that shows them how the program works. Pages that have been opened before should be marked visited, with the option to clear the mark manually. Many students declared that they wanted to be able to use bookmarks, make their own comments on pages or use highlighting pens.

Software-ergonomics: Few students came up with this topic by themselves. Once asked by the interviewer many students stated that the learning environment has to have good software-ergonomics. After inquiring further, the students were not able to describe what they meant with "good", mostly they said they could not describe it, they would need to have an example and then they would be able to say this product has good or poor software-ergonomics.

Content: Students expected a VLE to give an overview of all topics covered in the corresponding lecture. Contents of the lecture and the learning environment should be synchronized. One idea to realize this was to offer a guided tour, which is structured the same way as the lecture is. The electronic version should extend the contents of the lecture, so if the student is interested in a certain topic, he can get more information about this topic from the learning environment, and he does not have to search in any other information resources. Some students wanted the VLE to offer complete exam preparation. Several students wanted the VLE to offer different access possibilities to explanations. For example they imagined choosing either textual or mathematical explanations for the exercises. Most students requested the VLE to estimate the time needed to complete a learning sequence.

Learning Assessment: Some kind of learning assessment is requested by almost every learner. Students wanted the VLE to supply plenty of questions so they could practice very much, not having to repeat the same examples over and over again. They wanted to choose exercises from a pool of questions with varying levels of difficulty. Some students wanted to choose the difficulty level themselves. Others preferred the VLE to keep track of how good they are and ask the next questions according to their skill level. These students would like the VLE to decide in which area they have trouble, and then ask questions to these subjects. Several students stated that they wanted some kind of reward for questions they answered correctly. This should not consume too much time. Several students proposed integrating a function, which simulates tests. Miscellane-

ously picking out questions and giving the students only a certain time to answer them – similar to doing a test in class. They were also keen on integrating tests, including their answers, out of the previous semesters into the VLE. It was also proposed to integrate a feature for sending questions to a tutor via e-mail and getting personal feedback.

Help Functions: Helping functions such as an abbreviation dictionary, an online help, a search function, an English dictionary, a glossary, and an overview of all used symbols were asked for.

Examples: Students wanted the VLE to offer many examples. They should not only be theoretical ones, but also ones taken from real practice. Transfers of theory problems to real life problems should be made. Simulations and animations were also requested by the students to illustrate problems. The speed of animations should be individually settable and an animation must be stoppable at any time. It seems to be very important to the students to integrate all examples used in the lecture.

Internet Functions: An internet-based learning environment would be favored by some students to enable group work und update functionalities. They would like to be able to learn from anywhere at anytime. Some students proposed implementing discussion databases, but even though they wanted them, they were not sure, if they would use them regularly.

The categories of the group discussion can be divided into two major categories: independent work and self assessment. The following table emphasizes this distribution.

Table 3.3-1: Allocation of interview categories

Independent work	Self assessment
▪ Installation	▪ Learning control
▪ User-orientation/navigation	▪ Help functions
▪ Software-ergonomics	▪ Examples
▪ Content	▪ Feedback
▪ Internet functions	

As the names of the subcategories already suggested, the results of this group discussion focus on technological aspects to a large extent. It is important to realize these factors, for they are precise wishes of learners. But as the focus of this thesis is placed on the pedagogical perspective, these will not be regarded in great detail within the further process of the thesis.

Besides defining requirements that students have on virtual learning and wishes alumni have concerning the design of studies at the university it is also important to evaluate realizability of a re-

search project through experts. The next section describes estimations of experts concerning possible potentials and drawbacks of a web-based case method.

3.4 Expert estimation of potentials and drawbacks of a web-based version of the case method

This section reproduces experts' opinions concerning the transferability of the traditional case method into a web-based scenario. This empirical data is derived from the study "Identification of key factors of the traditional case method". The group of experts is made up of students studying at The Richard Ivey School of Business in London, Ontario, Canada. This business school is known for the use of case studies. The summary of the evaluated category system, transcriptions of all interviews and a description of the interviewees can be found in appendix A.

This chapter describes the opinions of the interviewees concerning the transfer and the new design for parts or the complete case method when being implemented into a web-based setting. Implementation ideas as well as advantages, disadvantages and concerns are explicated. For a clear overview the results concerning potentials and drawbacks of a web-based version of the case method are arranged according to the categories: transfer possibilities in general, transfer possibilities for individual preparation, transfer possibilities for small group work, transfer possibilities for the large group discussion, advantages, and disadvantages.

Transfer possibilities in general: General opinions concerning the transfer possibilities of sequences or the entire case method into an online scenario were skeptical. "I don't think that doing the case method online would work, because the people won't be motivated enough if they don't come to class all the time. People need to do the work, and I think even we would not do the work, if we weren't forced to do that [come to class] – and forcing them on the web seems difficult." [IV3, l. 159-163]. Issues of concern within online scenarios were the dynamics of the discussion: "It would, however, I think, take away some of the dynamic which is offered in a class" [IV8, l. 274] as well as the structure and structuring of online discussions: "If you don't discuss in the classroom at all, if you only communicate online, the online channels need structuring to get that type of dynamic, you would need everyone online to follow it at a certain time" [IV8, l. 272-274]. Depending on the phase of the case method, the students could skeptically imagine online support or supplements to a larger or smaller degree. These ideas will be described within the next categories.

Transfer possibilities for individual preparation: Transferring the phase of individual preparation to the web is not perceived as being difficult. "[…] [Y]ou could transfer the individual preparation to the web - no problem" [IV1, l. 117]. Because this phase almost only consists of reading: reading the case and reading additional literature, it almost makes no difference from where you retain the reading material. Within this phase some advantages were also mentioned when transferring it

online: "When learning on your own […] [there is] no difference if you see it on a piece of paper or on the screen of your laptop. The only gain in this first level is to gain more background information on the case through the WWW" [IV4, l. 174-176]. Additional reading materials as well as further going internet links could be provided very easily. The quality of individual preparation could be increased by making the contents even more self explainable e.g. by integrating demos, simulations and other interactive components.

Transfer possibilities for small group work: In general the students believed that it is hard to transfer this phase into a web-based environment. After being asked this question many of the interviewees answered that they believe it's hard to transfer this phase. After thinking about it for a while, however, they did have some ideas. Possibilities to transfer this phase would be to use "[…] discussion boards or chat to let the small groups meet online" [IV1, l. 118-119]. One student described the following transfer possibilities: either a "[…] conference call: microphones and cameras and people conduct a conversation […] [or] instant messaging" [IV6, l. 153-154].

Students mentioned some concerns for online small group work. When working with a group of 5-6 students "[…] it's good to have voice or face-to-face. I would have difficulty using web chat" [IV4, l. 178-179]. Another student described that message boards could be used, however "[…] they are difficult to work with" [IV5, l. 142]. The interviewed students agreed that when using online scenarios to support these traditional phases, "[…] a great amount of time needs to be put in to structure it" [IV8, l. 276-278].

Transfer possibilities for large group discussion: Similar to the small group phases, the interviewed students were cautious in this matter. Most of the interviewees who stated ideas were unsure about the effectiveness of online large group discussions and additionally they believed it is hard to actually realize it. Large group discussions were "[…] difficult to transfer on the web. Large group discussion on the web is even harder than small group discussion" [IV4, l. 181-182]. One student could imagine facilitating up to 20 people online, but not any more than that. Another student thought of facilitating the discussion within a chat. However, according to this student it would be limited to ten people, for various reasons: "Once more than ten people are in a chat room, it gets confusing. When did someone say something is not really trackable. How do you pick people? You could make the students engage in synchronous communication, and make them 'raise their hand' by pressing the enter key, but who will the professor take on? Role play would also not be possible, etc." [IV3, l. 154 – 159].

The discussion board was an often mentioned possible transfer of the large discussion group. "The only way to do it is to offer a discussion board. I don't think instant messaging would work, because it is too fast. Each person must get the chance to speak, and get an adequate amount of time to get their point out, and give other people time to respond to it." [IV2, l. 175-179] Another student believed that an organized chat could be a solution: "Organized chat and have

people 'beep in' and tell the professor that they want to make a comment, and he 'calls' them" [IV5, 1. 43-144]. Real-time chatting is the alternative mentioned most often when it comes to transferring the large group discussions. Regarding this technology the interviewees mentioned concerns, disadvantages and advantages these technologies could bring. The main concern was the structure of the chat respective of the instant messaging. "If you were to discuss the case on the web, you would need a structure, e.g. pre-assigned questions about the case, to plant seeds, to start discussion. Discussion needs to be facilitated otherwise the issues would be mixed up. Comment forms must be structured just the way a professor structures comments within a classroom setting." [IV8, l. 263-267] Structuring could also be realized through reduction of topics discussed: "[…] the discussion threads need to be limited, to get an overview" [IV5, l. 162]. While some interviewees proposed that posting comments should be made possible within class, others felt that this is distracting. They preferred being able to post before and after class. "[…] [W]hen real-time chat is used in a class it makes it hard to follow both conversations" [IV5, l. 163-164]. Timing contributions was another suggestion, to structure the process. "E.g. assigned times should be required." [IV8, l. 278]

Disadvantages: Possible disadvantages were as numerous as the advantages and will be described in this section. "It's easier to say something than to type something." [IV4, l. 184] Most scenarios, except video conferencing approaches, involve typing messages to the communication partner. "[…] [T]yping is slower and more difficult than speaking […]. [The] [l]ength of the comments you get would be difficult […]. It would also take forever to read all these long comments. When you hear someone, you formulate your thoughts, and it goes much quicker. Having the class discussion online might be very difficult." [IV1, l. 124-128]

Learners would probably have no human contact, they would not meet as many people, and they would have less social interactions. This would delete an important learning objective of the traditional case method: learning to present ideas and convince others that they are correct.

Not seeing each others expressions and also missing further going nonverbal language when speaking to each other would make a conversation very hard, and would predestine it for many misunderstandings. The written word, the tone is hard to understand. Meanings could get distorted. A lot of the learning came from the interpersonal environment. When in a diverse classroom, with people who don't have English as their first language, it would be hard to understand them without nonverbal communication to support it. Technologically transmitted communication has a large deficit concerning nonverbal aspects: "Nuances, rhetorical questions etc. get lost in that setting" [IV6, l. 158-159]. Another student also sees this as a problem: "[On the internet, I could imagine conversations to get distorted" [IV2, l. 180-184]. This distortion is mainly due to the fact, that "[…] what is being said is not necessarily what is being meant" [IV2, l. 201]. The

nonverbal aspects give the spoken word a precise meaning; this would not be supported within online communication.

Within an online classroom the number of students who could participate would be very restricted. This would erase many of the advantages derived from diversity of the students. Another area of concern was the amount of seriousness learners would encounter within virtual settings. "[…] [W]hen someone is on the web, you don't take them as serious, they are almost not real. You can delete what they say if you don't like it, or go to a different website. If they say something you don't like, you don't take them serious. If someone is sitting in front of you, you are forced to take them serious you can't just 'click them away'" [IV2, l. 202-206].

Even though some learners had already used instant messaging systems to ask each other questions, they had difficulties imagining, that this could be a substitute for traditional learning settings. "We use MSN messenger to ask quick questions, but I don't like it as a complete learning environment." [IV7, l. 223-224] "I personally can't see a web based case method. Learning comes from clarity and further probing teachers do on you. Teachers probe you on things, and that's when you really shine, and you see you know something. Even though it seems that the professors aren't doing anything they actually are, you are dependent on them, and I don't think they could do that web based." [IV7, l. 228-232] Fairness of grades within this setting was seen as another area of possible disadvantage. "If the course is completely online then it's hard to authenticate the contributions. How do you know it's really him/her who said it and not the friend? In class the professor can ask further questions, to see if you really know what you're talking about." [IV8, l. 312-315]

Advantages: The advantages of transferring phases or the entire case method to the web are introduced within this category. If no physical attendance were required, and if studying was made possible through the web students, faculty and the school could save very much money. Students can save raveling and residential costs whereas schools can save costs for buildings and their maintenance. Students enrolled in the courses might be able to keep working in another part- or full-time job. Studying could be enabled at times they prefer while communication with fellow students and teachers could be done electronically. "[The] [advantage of communication over the net is to communicate between distances" [IV2, l. 194-195]. This would enable many more students to take part in the program, thus increasing the diversity of the students enrolled. "[…] [Y]ou can increase the diversity in the classroom, no limit across the world – link people in Egypt with people in Vancouver" [IV2, l. 196-197]. "[…] [I]if you are at a location where there are only persons with one nationality you could get participants from other countries and thereby contribute value" [IV8, l. 301-302].

The anonymity of online scenarios could be turned into an advantage within a setting like this. "[…] [P]eople who are scared to participate might participate if they do it on a discussion board"

[IV5, l. 160-161]. This would support those students who are scared or feel uncomfortable. "Virtual communication could be a good way to help the more quiet persons in the program." [IV8, l. 296-300] If discussions were lead electronically, protocols of these discussions could be archived very easily. "I just don't know, if you go back and read the discussion. But you could, I guess sometimes you would go back and read the discussion." [IV4, l. 192-194] Tremendous amounts of additional information could be offered to the students. "If you could link background information to the case and have it easily accessible including e.g. online textbooks, tutorial type information, FAQ, industry background information, theory made accessible which is associated close to the actual case. Often when I get a case, e.g. on mining industry, I go and search for that information on the web. If you could link these things online, that would be a great advantage." [IV4, l. 195-201] Adding simulations and demos would also be very reasonable and feasible intentions. The students would definitely profit from this. Another idea would be to integrate activity based components into a web-based version of the case method. Letting the students make "[…] actual decisions within a case, and make them real-time and see the results of your decisions" [IV4, l. 203-204] could be very motivating. "Within an online setting you could make it more of a game, make it competitive, make it fun. E.g. like being on a 2 day workshop and competing against different groups, making decisions every hour, and seeing how you compare to other groups." [IV4, l. 205-207]

The case method could be extended even further into real life by linking someone with the system "[…] e.g. an executive of the firm which the case is about. When being online, you could get outside contributions, like executives, easier, than if they have to be flown in. Often when we have guest speakers they videotape them, and then they show this tape to the other classes, who did the same case, it is just very expensive to fly in these experts" [IV8, l. 303-308].

As the above described results show the interviewed students had many ideas of transferring the traditional case method to the web. These, along with the results of the other studies conducted for the requirement analysis will be regarded within the development of the conceptual design for the web-based case method.

3.5 Summary

A precise definition of the target group was given in chapter 3.1. This was essential for the further development, for a development can only take place, if the target group is recognized. The study "Alumni requirements concerning learning scenarios" which was explicated in chapter 3.2 showed that improvements and further offerings concerning the connection of theory to practice is the domain students would most profit from. Learning scenarios which actually apply knowledge are of special relevance for students. Additionally, the ability to work in teams was perceived

as being a competence which should be taught in universities. As already described in chapter 2.1 these abilities are trained through the case method.

Within the study "Students' requirements concerning virtual learning" it could be pointed out that the main points of interest students express concerning virtual learning are technology oriented topics. When designing the web-based case method these topics must be regarded and designed according to the wishes described in chapter 3.3. However, in order to remain within the scope of this thesis, these will not be focused on, for the thesis focuses on the pedagogical view, not the technological. It can be regarded as an interesting finding that students did not mention more pedagogical attributes. However, this can be due to the technological overhand which is given in existing virtual learning offers.

Finally, the empirical study "Experts' estimation of potential and drawbacks of a web-based version of the case method" gave an overview of imaginable advantages and disadvantages of the web-based version of the case method. Consideration of these comments can be regarded as a motivation and stimulation within the development of the conceptual design.

Clarifying necessary requirements for the development of the web-based case method was conducted in this chapter. This outlines the first step towards reaching the goal of this thesis. Now, it is necessary to identify the main characteristics upon which the web-based case method is built.

4 Characteristics of the case method

Underlying learning theoretical basics shape and influence the characteristics of the case method. The attributes principles for effective learning, learning theories, learning goals and motivation specify varying aspects of learning theoretical basics and are considered within chapter 4.1. This includes an overview of qualification requirements placed on today's students described in chapter 4.1.1 as well as a listing of the principles for effective learning in accordance to Koschmann in chapter 4.1.2 [Koschmann 96]. These principles insure that the students attain the prior mentioned qualifications. Thereafter a general overview of learning theories is given in chapter 4.1.3. These descriptions include the allocation of the case method to a learning theoretical position. Chapter 4.1.4 describes learning objectives emphasizing the level of learning goals which can be reached through application of the case method. Finally, chapter 4.1.5 describes the basic principles of motivation. Here it becomes clear that the case method is a method which is very motivating, for many of the factors described here are integrated into the case method. Thereafter chapter 4.2 determines the main characteristics of the case method. As shown in chapter 2.4 this identification of the main characteristics is very important, for these characteristics will then be redesigned for a web-based implementation. These are the key features upon which the conceptual design of the web-based case method is founded. The descriptions of these characteristics are divided into six subchapters, each describing one characteristic. The seventh subchapter gives a summary.

4.1 Learning theoretical basics

Learning is without doubt the main objective of the case method. Therefore this section introduces principles for effective learning as well as basic learning theories. Learning goals and aspects of motivation are also considered, for they also influence and describe learning processes. These must correspond to the qualification requirements of today's students. Therefore these are described as an introduction to the further topics.

4.1.1 Qualification requirements for today's students

The social changes within society are calling for changes in qualifications students should attain in order to succeed within their working life. Cognitive, meta-cognitive and social capabilities are required from students within today's working environment. Cognitive capabilities express the ability to understand, recognize and be able to solve problems. These also include the ability to gather, analyze and use information efficiently. These competences are closely related to the ability of critical thinking. Verbal and written articulation as well as presentation- and leadership qualities are also characterized through the term cognitive capabilities. Meta-cognitive capabilities define the ability to perform self reflection and self evaluation. The abilities self regulated learning

and adaptability are also described by the term meta-cognitive. Cooperation and team abilities are considered to be social capabilities. Making conversation and being able to discuss are also closely related to these abilities. Being able to motivate oneself, deal with frustrating situations, be flexible and have a sense of responsibility and persistence are also considered as being social competences [Molen 99].

4.1.2 Principles for effective learning

In order to achieve the capabilities mentioned above, Koschmann describes the following principles for effective learning and instruction [Koschmann 96, 89]. Similar approaches are also described by [Hesse/Friedrich 01] and [Molen 99].

Multiple disciplines: Learning is understood to be acquisition of knowledge, which is complex, dynamic and coherent. Learning constructs a network of connected elements.

Activity: Learning is an active and constructional process. A motivated learner is a prerequisite for learning.

Accommodation and adaptation: Learning is a process which includes the acquisition of information and its transformation into knowledge. It also includes the accommodation of this knowledge into already existing knowledge networks, as well as the adaptation of this knowledge. Learning processes are constructional because new knowledge is embedded into individual experiences and individual knowledge background.

Authenticity: Individual learning goals and contexts where learning takes place determine the learning process. Since learning always takes place in specific contexts, each learning process can be regarded as situative. Therefore the learning and application contexts should be as similar as possible to insure that the acquired knowledge can be used in authentic situations.

Articulation: "Learning is enhanced by articulation, abstraction, and commitment on the part of the learner; instruction should provide opportunities for learners to articulate their newly acquired knowledge." [Koschmann 96, 89]

Timelessness: Knowledge is submitted to a continuous change. Therefore learning is a lifelong process.

The principles portrayed above build the basis for successful learning. Successful learning is furthermore characterized by a balance between discovering learning and steered research on the one hand, and systematic instruction and guidance by the instructor on the other hand. The teacher should be the initiator for the students and support them to apply existing knowledge to new fields.

The principles defined by Koschmann are similar to constructivism. The next section gives an overview of the learning theories to deepen this understanding. The main focus is on constructivism.

4.1.3 Learning theories

Because within e-learning the "e" is a means for the purpose general learning theoretical basics need to be considered. These build the didactical basics for all e-learning concepts. When designing an application of e-learning it is essential to define from which theoretical perspective the designers are coming. Learning theories are the attempts to define how learning takes place [Boehm 00]. Underlying perceptions of learning theories tremendously influence design and composition of a learning system. What is learned, how it is structured and how it is presented are the key components which are affected by the theoretical position taken [Baumgartner 97].

Learning theories attempt to summarize perceptions and knowledge of learning in a standardized system. They describe conditions under which learning takes place. They can be seen as paradigms of how to construct learning in learning systems in general, not specifically within VLEs. Paradigms are assumptions which describe a certain area. Paradigms are used as an overall concept upon which theories, empirical research or specific methods can be built [Klimsa 93, 242].

Three main theoretical positions of learning theories are behaviorism, cognitivism and constructivism. Beliefs and assumptions within the constructivist position will be focused on.

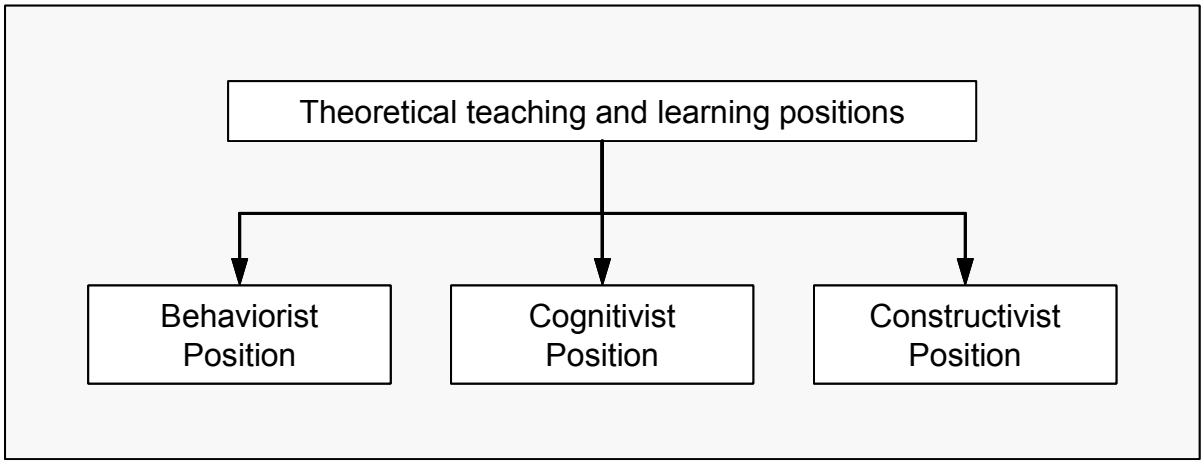

Fig. 4.1-1: Learning theoretical positions (according to [Schulmeister 97, 69])

The term behaviorism was shaped by Watson. A large part of Watson's theoretical position was based on Pawlow. Behaviorism describes the earliest learning theories, which are still of great meaning to us today. They were the stimulus-reaction-theories (S-R-Theories). These theories are the pioneer-actions of the psychologists in the early 20th century considering the objective study of human beings [Hasebrook 95]. Stimulus and reaction of observable aspects of behavior were objective variables, which served to develop the science of behavior. Behaviorism exclusively en-

gages correlation between stimulus and reaction. In the behaviorist approach, behavior is only influenced by environment (classical conditioning). The most well known representatives of the behaviorism are Pawlow, Watson, Guthrie, Thorndike, and Skinner. Classic conditioning and the importance of repetition, punishment and rewards were key components of the research of learning processes within humans and animals. These theorists were less interested in higher intellectual processes such as speaking, thinking, and problem-solving competences [Lefrancois 94, 29].

Guthrie's and Watson's approaches are quite similar. Guthrie believes that if a stimulus conducts a certain reaction, the same reaction will take place in future when stimulated. Guthrie's theory was often called a "one-shot-theory" [Lefrancois 94, 22]. This would imply that a learning process would be completed after one single pass-through.

Edward L. Thorndike's approach was made popular through Skinner. Thorndike's law of effect describes that reactions shown slightly in advance to a satisfied condition will reappear with a high probability. Reactions shown slightly before an unsatisfying condition will not reappear with a high probability. "The Law of Effect is: Of several responses made to the same situation, those which are accompanied or closely followed by satisfaction to the animal will, other things being equal, be more firmly connected with the situation, so that, when it recurs, they will be more likely to recur; those which are accompanied or closely followed by discomfort [...] will, other things being equal, have their connections with that situation weakened, so that, when it recurs, they will be less likely to occur. The greater the satisfaction or discomfort, the greater the strengthening or weakening of the bond." [Leahey/Harris 93, 39f.] The law of effect is a model of instrumental learning. Hull adopted Thorndike's assumption and used it as a central component of his system. Pawlow, Watson, Guthrie und Thorndike were all stimulus-reaction theorists because they were mainly interested in explanations of regularities that lie within the relationship of stimulus and reaction.

Even though Behaviorism was established and defined by Watson the name Skinner has almost become to be a synonym for behaviorist psychology. Skinner's work is based on Pawlow. Skinner observes and describes relationships between independent and dependent variables. He does not focus on theory but concentrates on extracting laws out of his observations. The central question Skinner wants to answer in his theory is how independent variables e.g. plan and kinds of reinforcement influence learning [Lefrancois 94]. Reinforcement comprises that after a desired behavior a pleasant reaction takes place (positive reinforcement) or an unpleasant reaction is taken away (negative reinforcement). Skinners model of operant conditioning is based on the hedonistic assumption that human behavior is targeted to increase lust and decrease pain. Many other theoreticians have adopted parts of Skinner's theory into their own. One application of Skinner's system is the programmed instruction. This is a learning method completely generated out of the

principles of operant conditioning. Skinners programmed instruction guides a learner through a number of well prepared learning steps. The sequence of the learning steps is given and must be maintained. One main characteristic of Skinners programmed instruction is that regardless of his or her prerequisites, each student has to go through each learning step [Mietzel 01].

The main difference between the cognitive and behavioristic approach is that cognitive psychology does not give any meaning to stimulus and reactions. Cognitive psychology focuses on organizational processes and decision making processes. The main point of interest is to describe the internal representation systems [Lefrancois 94]. Tulodziecki et al. outline that cognitivism differs from behaviorism because this position understands the learner as an individual which independently processes stimuli and is not completely controllable through these [Tulodziecki et al. 96]. Jean Piaget is one of the most familiar representatives of the cognitive position. Piaget defines intelligence as a kind of activity in respect to the environment. He assumes that actions can be merged into schemes. Accommodation specifies a scheme which has been adapted to a new environment. Assimilation describes a scheme which changes the environment [Lefrancois 94].

Constructivism differs from behaviorism because internal understanding of processes plays a key role. In opposition to cognitivism, constructivism does not believe in a relationship between external representation and internal processing. Constructivism stresses individual perception, interpretation and construction [Tulodziecki et al. 96]. Learning is seen as an individual construction process which modifies, reorganizes and correlates. Thus learning is recognized as the appropriate and necessary modification of cognitive structures. Instead of focusing on memorization the constructivist perspective stresses the necessity to learn skills and strategies [Honebein/Duffy/Fishman 91]. Prerequisites of learners are integrated into this concept of learning, for new knowledge is always connected to/built upon existing knowledge. Being able to activate, restructure, differentiate and integrate prior knowledge is a key factor. Constructivism aims towards an epistemological belief which concentrates on the formations and meaning of knowledge. An important difference to cognivistic theories lies in the fact that knowledge does not exist regardless of a subject. It is constructed dynamically and therefore cannot be transferred to another person without personal "reconstruction" [Papert 92, 142]. Knowledge can always be interpreted differently, which makes it so important to involve already existing knowledge. Concluding, learning complex, unfamiliar or counterintuitive models in science requires a kind of learning by doing and by construction and criticism rather than by listening alone.

When looking at learning from a constructivist point of view the preferred learning strategies, the individual prerequisites, the power of learning communities and the "every-day" knowledge the learners build up become important [Schulmeister 97]. In accordance to Reinmann-Roth-

meier/Mandl/Prenzel and Mandl/Gruber/Renkl the following requirements can be derived for learning environments when considering the constructivist position:

- authenticity of the learning environment,
- situated context of application[81],
- multiple perspectives and contexts,
- social context,
- complex problems, and
- articulation and reflection.

(see [Reinmann-Rothmeier/Mandl/Prenzel 94], [Mandl/Gruber/Renkl 97])

These characteristics influence each other. Promotion of learning in a social context also promotes multiple perspectives and articulation and reflection.

Principles of the case method, described in chapter 2.1.3 are authenticity, multiple and social contexts as well as instructional support. Additionally, the case method stresses the necessity that learning in a problem oriented setting depends on cooperative learning. In chapter 4.1.2 it was illustrated that the principles for effective learning described by Koschmann correspond to the qualification requirements of today's students. These principles for effective learning stress the need for multiple disciplines, activity, adaptation, authenticity, articulation, timelessness and cooperation within the learning process. It is pointed out here that the principles for effective learning are included within the principles of the case method. After describing the principles of the main learning theories in this chapter, it becomes clear, that the principles of the case method as well as the principles for effective learning are very similar to those defined by constructivism. The case method can thus be allocated to the constructivist position. Especially the perception that learning depends on activity and on cooperation is common to all approaches and manifests the constructivist position of the case method. Giving insight into learning theoretical basics of e-learning is necessary at this point for this thesis is concerned with the development of a web-based version of the case method.

Brown clarifies that a constructivist pedagogy calls for new learning situations, also within learning scenarios enriched by the use of computers. He places the key role on learning processes and away from learning outcomes.

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[81] The concept of situated learning is generally regarded as a combination of cognitivism and constructivism [Tulodziecki et al. 96, 47] whereby the general epistemological belief is shaped according to constructivism [Mandl/Gruber/Renkl 97, 168].

He sees five important factors to do this [Brown 85]:

1. empower learning environments,
2. integrate games,
3. offer cognitive tools,
4. propose tools to support writing and argumentation,
5. develop programs which support student reflection and thinking processes.

Because a learning theory is, at least implicitly, the basis for each learning system this can be used as a classification possibility. However, due to conceptual overlaps concrete allocation of single systems may sometimes be difficult. This section examines the theoretical background of e-learning and how it has developed considering the classification according to the learning theories.

The origin of computer aided instruction can be traced back to the programmed instruction, developed by Skinner, which in turn is based on behaviorism. Teaching contents were divided into small learning steps which were offered sequentially then. Each learning step contained a question. This question had to be so simple that it could be answered correctly by 95% of the learners. The confirmation the learner received through the right answers strengthens the action-reaction-chain, which is basis of behaviorism and described in chapter 4.1.3. Hasebrook gives a detailed overview [Hasebrook 95, 152ff.].

The application of the concept of cognitivism activated a development offering a variety of possibilities within learning arrangements. These offer different learners the possibility to choose different learning threads. The concept of microworlds was also derived from the cognivistic position. The most famous example for microworlds was the programming language called LOGO developed by Seymour Papert. This programming language was developed for children. They were to program with LOGO and thus build up, extend and apply schematic knowledge. Background of the implementation of LOGO was the assumption that learning a programming language would promote the cognitive development and would positively influence logical thinking and problem solving competences. Weidenmann et al. describe that this could not be proven [Weidenmann et al. 93, 549f.].

The demand not to use learning systems as devices to steer learning processes, but rather to regard them as tools for self steered learning can be derived from the learning theoretical position of constructivism. E-learning has been influenced by constructivist beliefs since the beginning of the 1990s [Dittler 02]. One outcome of the constructivist philosophy within e-learning is the active and self-steered learner. The constructivist view has changed the role of the learner. The learner is no longer recipient of knowledge; he is now constructor of knowledge. It is the learner's task to understand and implement knowledge. It is the teacher's job to offer the learner

the required resources and guidance for the learning process [Doerr/Juengst 98]. Constructivist theories emphasize that through active construction and complex problems especially good learning effects can be attained. This can be reached through hypermedia. The term hypermedia is made up of the terms "hypertext" and "multimedia". Multimedia means that text, graphics, video etc. can be combined to a new medium. Hypertext is a term which was already used in 1974 by Nelson. It describes non-sequential writing. Texts were extended through links, which lead to an additional cross-linking. Hypertext involves the reader in some sort of interactivity. Hypertext was developed by Bush in 1945 and was implemented technologically in the 1980s by Nelson [Tergan 02, 100]. Hypermedia learning applications are based on hypertext. In general hypermedia supports discovering learning because the learner navigates through the system according to his own learning strategies and interests. This is especially the case when working in a team is supported by experts – so that articulation and reflection are maintained.

Technology can be seen as a vehicle for exploring knowledge and solving problems from the real world. Technology offers methods to collaborate and communicate with each other as well as being a partner who assists students in sharing their knowledge [Calvert 01].

Traditional learning methods such as frontal teaching within schools and universities are limited when the "framework" around them remains unchanged. The framework refers mainly to the curriculum[82]. When reviewing the curriculum it becomes obvious that examinations are still built on behavioristic beliefs. A problem-oriented position demands that not only results, but also the process of learning is evaluated. Learning should focus on authentic situations e.g. as in case studies or projects. This makes it possible to examine whether a learner has understood the general principles of a learning domain, and if the learner can actually transfer and use the strategies and methods acquired to solve problems [Doerr/Juengst 98].

Besides the learning theoretical beliefs which form a learning method, its implementation is also dependent on the learning objectives which can be achieved through it. The next section gives an introduction to learning goals as well as a description of which learning objectives the case method strives for.

4.1.4 Learning objectives

Knowledge is structured and thus learning goals are differentiated. The taxonomy of learning goals is a hierarchic structure. According to this hierarchic structure learning methods can be rated. The higher the reached level of the taxonomy, the higher the chosen method is to be rated. In general three kinds of learning goal groups can be described. These are: cognitive, affective,

82 Theory of learning and teaching processes ([Duden 00, 269]).

and psychomotor learning goals. The transition of these dimensions into each other is very soft, only the dimensions are rated slightly different. For a detailed description see [Olbrich/Pfeiffer 80, 4]. The taxonomy applied within this context was developed by B.S. Bloom, D.R. Krathwohl and B.B. Masia in combination with diverse teachers at US colleges in the 1950s. There are other attempts to classify learning goals, but this is the best known taxonomy of learning goals described in literature. Literature refers to this classification as Taxonomy of Educational Objectives (TEO) [Keck 83, 68].

Bloom describes that the cognitive area includes learning goals which have to do with remembering or in other words the realization of knowledge and development of intellectual abilities [Bloom 72]. According to Kerres cognitive learning goals are the most well-known and the most spread [Kerres 01]. Cognitive learning goals are classified as TEO I. Affective learning goals emphasize a feeling, an emotion or a certain measure of affection or dislike. Literature refers to them as TEO II. They describe the attempt to hierarchically rate the learning goals for the affective area. Psychomotor learning goals focus on muscular or motoric abilities or on handling materials. TEO II and psychomotor learning goals are not of high relevance for the topic of this thesis therefore [Lemke 81] and [Krathwohl/Bloom/Masia 75] are referenced for further readings and descriptions concerning affective learning goals, [Keck 83] and [Krathwohl/Bloom/Masia 75] are recommended for a description of psychomotor learning goals. A detailed understanding of cognitive learning goals, referred to as TEO I is necessary for the goal of this thesis. Therefore these are described in this section.

The classes of cognitive learning goals can be arranged as follows:

1. Knowledge
2. Understanding
3. Application
4. Analysis
5. Synthesis
6. Evaluation

The complexity rises from step to step. It is a necessary prerequisite for each new step to have achieved the prior step. A detailed overview of the steps of the learning taxonomy is described by [Kerres 01], [Horn 73], [Bloom 72].

The case method is a problem-based learning method which, through its characteristics enables reaching the highest level of learning goals: evaluation. Problem-based learning is a conceptualization which is not new. John Dewey worked within this area in the 1930s and created a definition which can still be applied today. According to him, problem situations are created when a

person striving towards a goal reaches an obstacle which can not be overcome by application of known action patterns [Fuchs 80]. A newer definition shows there has not been much change: "You use **problem solving** when you want to reach a certain goal, but that goal is not readily available. You face a problem whenever a gap exists between where you are now and where you want to be – and you do not know how to cross that gap [...]" [Matlin 94, 331]. A problem is determined by three factors: an unsatisfactory initial condition, an unsatisfactory goal condition and a barrier, which prevents a movement from initial to goal condition. Problems have a different structure than tasks. Prior knowledge/know-how can be applied without great modification in order to solve the task – not so when trying to solve a problem [Edelmann 00].

When developing a general model for problem solving it can be described that a learner encounters a problem area. Starting situation and goal condition are opposite ends of the problem area. They include all states in between these conditions which the learner goes through while the learner works towards the desired condition [Weidenmann et al. 93]. Due to the subjective perception of these conditions an obstacle may have the position of a problem to one student while it is not perceived to be a larger interference factor by another student. The following graphic shows this schematically:

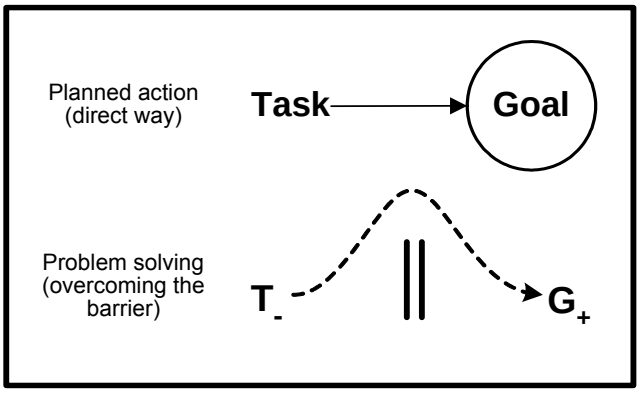

Fig. 4.1-2: Distinction between problem and task (according to [Edelmann 00, 209])

The next step is an analysis of the available problem definition. It is the main focus to restructure a problem which lacks definition (unclear beginning or goal condition) into a clearly defined problem (precise beginning and goal condition). Goal and conflict analysis are in the main focus within this process. These analyses are very important within problem-based learning. Through this discovering learning long term retention of learned rules is ensured. The process of reflection only takes place if the learner does not have an already existing scheme to solve the problem [Fischer 98]. If the learner receives the solution to the problem through a receptive learning method it is possible that the learning goal does not take place in other words that the learning success is only short term and the learner forgets it quickly.

In order to solve a problem the learner must understand and analyze the problem situation. He must be acquainted to and understand relevant rules which are needed to solve the problem. The problem solver develops a cognitive problem representation according to his prior knowledge, which includes all elements of the problem [Weidenmann et al. 93]. Thereby it can be concluded that a solution to a problem is dependent on prior knowledge and on already known rules. However, this does not mean, that the complete solution can be derived from prior knowledge. If this were the case, it would not be a problem, it would be a task. It is also possible to guide someone if the basic pre-knowledge is not present. Teachers should avoid posting problems, to which the learners have no prior knowledge [Gagne 80].

The second mandatory prerequisite is the activation of cognitive strategies, also referred to as cognitive structure. These terms describe abilities with which learners regulate their attention, learning, remembering and thinking [Gagne 80]. Edelmann refers to them as being the whole of prerequisites needed to solve a problem.

Literature describes five cognitive strategies to solve problems:

- trial and error
- restructure
- application of strategies
- creativity
- systematic thinking

For a detailed overview see [Edelmann 00, 212-228], [Anderson 96, 253], [Ausubel/Novak/ Hanesian 81, 650ff.], [Fuchs 74, 66].

Which method is applied to which problem depends on the kind of problem as well as age and experience of the person. All five cognitive strategies have in common that they are rules of a higher order. In summary solving problems is a process in which the learner discovers a new combination of previously learned rules, which lead to the solution of a new situation. Next to the actual problem which is to be solved the above mentioned gained knowledge concerning rules of a higher order is the main goal within problem-based learning. After successful accomplishment of the problem, the rule of higher order is taken into the repertoire of the learner and can be used in future similar problem situations without further practice [Gagne 80].

Solving problems through thinking systematically is the highest form of all learning methods. This kind of networked thinking is on the level of evaluation, which means all learning goals of the taxonomy must already be absolved. Learning through trial and error only reaches the stage of application. This clarifies that the learning goal stage which can be reached through problem-

based learning largely depends on which cognitive strategy of problem solving is applied, and thereby which kind of rules of higher order the learner adds to his repertoire.

Besides the reachable learning goals it is also important to regard aspects of motivation within the conceptual design of the web-based case method. Therefore basic principles of motivation are introduced in the next chapter.

4.1.5 Motivation

Learning is not possible without motivation [Gruener 73]. Generally it can be said, that motivation plays a major role in our lives because it is the reason for all actions. Is it the action that makes us happy, or is it the goal we are trying to reach through the action that satisfies us? These thoughts lead to the differentiation into two main sections of motivation: intrinsic and extrinsic motivation. Intrinsic motivation describes that the reasons for conducting an operation lies within the action [Stark 99]. What happens after reaching the goal is secondary for the person who is acting. Solely the process of reaching the goal is focused on. According to Jonasson/Grabowski two types of intrinsic motivation can be differentiated: the principle of the "need to succeed", which applies to success oriented people, and the "need to avoid failure", which applies to failure avoiding people. Usually both types play a role. Within extrinsic motivation the goals lies outside of the actual learning area. Extrinsic motivation relies on a reward which is given after something is done. The value of the goal thus lies in reaching the goal. Behaviorist models concentrate on rewards, and therefore focus on extrinsic motivation [Jonasson/Grabowski 93].

The difference between intrinsic and extrinsic motivation can be seen as follows:

- Intrinsic motivation is factual and issue-related.
- Extrinsic motivation is based on results. Consequences of reaching the goal are mainly focused on.

Theories of motivation have the aim to describe differences in human behavior. The increasing number of motivational theories show, that it is difficult to develop a generally valid motivational theory. Edelmann describes the following relevant and basic models of motivation [Edelmann 00]:

- *Drive theoretical concepts*: Activation is described by internal factors within the person. Incentive is developed through lack or overdose, which are balanced out through activities.
- *Motivation through curiosity*: The basic human need to explore is used to describe this model. Complexity, novelty and uncertainty of the environment lead to the need to examine these.

- *Incentive theoretical view:* Models based on this view emphasize external factors. Learner and environment build a dynamic system. Objects in the environment have the potential to energize the latent motivation within the learner.
- *Decision and exchange oriented concepts*: These concepts use subjective cost-use calculation on social situations. The probability of subsequent events is evaluated.
- *Achievement motivation:* This model can be divided into intrinsic and extrinsic motivation (see above).

Depending on which learning theory underlies a VLE, different motivational aspects will be implemented. Knowledge of learning theories enables designers to classify the suitability of the motivational aids. Behaviorists believe that the learners' behavior is only influenced by external stimuli. The behavioristic approach is integrated into VLEs through drill and practice programs. Cognitivism does not see external stimuli as the main control for behavior. Cognitivism sees a reciprocal effect between external, medial presentation of material and internal processing processes. New media can support the information taken up by the learner e.g. by simulation programs. The internal processing of new knowledge is the core component. Personal experience and development influences the way information is affiliated. Constructivists are convinced that individuals generate knowledge upon personal experience structures [Tulodziecki 97, 17]. When following this belief, VLEs are reduced to a tool used within the individually designed learning process. The learner constructs the learning process by himself, using the tools offered by the VLE.

The more motivating factors are integrated into a context, the more motivating this context will be regarded as. Spitzer suggests the following list of motivating factors, which is similar to constructivist beliefs and can be used as a framework when designing and promoting motivation within VLEs [Spitzer 96]:

- Action: Active participation in the learning process is important. Interactivity of the learning system is a very important aspect.
- Fun: Fun concerning the handling of the learning system is realized through humorous and surprising elements. Attention must be focused on cultural understanding of humor and not exaggerating the implementation of humor.
- Variety: It is recommended to use a wide variety of different media, resources and tasks.
- Choice: The learner should be able to choose which media, resource or task he wants to use/solve.
- Social Interaction: Possibilities to interact have an important motivational function.

- Error Tolerance: Learners make mistakes. Therefore learning environments should be designed in a way where no punishment is implemented. This does not mean to omit negative feedback.
- Measurement: In games scorekeeping is a common measurement although people do not enjoy being measured in learning processes. Therefore it is of advantage to focus on personal improvement rather than on mistakes.
- Feedback: Feedback of the system should be positive and encourage learning. Therefore suggestions for improvement should be given.
- Challenge: Tasks which must be solved should not be trivial. It is especially recommended to let the learners define their own goals [Mietzel 91, 334].
- Recognition: Motivation can be increased if learning progress is recognized by the learning system, teachers or other learners.

Color, size, font and background color are important within virtual learning. At the moment a DIN norm (DIN EN ISO 9241) is being developed[83], which describes ergonomic specifications for work with computer monitors. Designing e-learning arrangements in a software ergonomic way is also regarded as being motivating.

This chapter closes the consideration of learning theoretical basics. The next chapter will focus on the evaluation of the main characteristics of the case method.

4.2 Determination of the characteristics of the case method

Definitions and characterizations of the case method in the classroom and professional practice vary among professions and disciplines and also among teachers. But similarities and differences are perceived variants which are instructive. It is not the goal of this chapter to describe all possible characteristics of the case method moreover it is the focus to identify the main characteristics, which will in turn underlie this thesis. Characteristics of this teaching and learning method are identified and specified in this chapter in order to have a valid basis for the aim of this thesis: the design of a web-based case method.

In order to determine the characteristics a combined approach was applied. State of the art literature was reviewed and qualitative research with experts in this field was conducted. Extension of the literature review was necessary in order to focus the main features which are relevant to the target group. Because the target group has no experience using the traditional case method

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[83] Further information of the DIN norm see: http://jtc1sc36.org/ or http://www.iso.ch/iso/en/commcentre/isobulletin/articles/2002/pdf/learningbyit02-06.pdf

experts in the field of the case method in a similar situation as the target group were consulted. The description of the target group interviewees is described in chapter 3.1.

Many authors explicitly identify different numbers and slightly different principles underlying the case method. In parts these characterizations are derivable from the illustration of the case method in chapter 2.1. Upon a closer view it becomes clear, that different specifications of the characteristics explained in literature are just slightly different developments. In general the main characteristics described are very similarly. All understandings and interpretations will not be introduced and compared here, for the similarity between them is too large. Instead, a table at the end of this chapter summarizes the characteristics underlying this thesis, and within this table references to the corresponding authors are made. For insight into descriptions of the characteristics the following references are given: [Erskine/Leenders/Mauffette-Leenders 01, 5], [Lynn 99, 43f.], [Barnes/Christensen/Hansen 94, 47f.], [Wassermann 94, 3ff.], [Mateijka/Cosseé 81, 10ff.], and [Haehling von Lanzenauer 75, 1].

The empirical research was conducted through guideline interviews and aimed to identify key factors of the case method from the perspective of experts. These experts were students studying with the case method at The Richard Ivey School of Business[84]. The interviews were conducted by means of the guideline interview, which is characterized as a semi-structured interview method. This interview method requires the interviewer to remain open concerning the constructs of the interviewees. Interviewees are guided according to the guideline questions which are constructed before hand. These guideline questions make several interviews comparable but let each interviewee concentrate on his personal constructs. Statements made in the interviews are compared to each other.

The detailed evaluation of the interviews is structured according to six categories and will be outlined in the following chapters. These categories are constructivist, problem-based, perception of participants, three phased work-through process, communication and collaboration. They cannot be defined clearly enough to avoid correlations/overlaps between the categories. Statements of the category "constructivist" correlate with statements of the category "problem-based". This leads to the fact, that some attributes are named more than once.

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[84] This business school mainly teaches through the case method. Students in the first year of an MBA program work through approximately 15 cases per week. Therefore, these students can be regarded as experts in this field.

4.2.1 Description of the first characteristic: constructivism

Students did not use the term "constructivist" to describe the case method. But when compiling their descriptions for this teaching and learning method, it becomes clear that this methodology is designed in the constructivist tradition.

Students described the case method as a holistic approach. "It uses your entire repertoire of experience to solve the case, as opposed to: this is a math problem, or this is a marketing problem, you use things from every subject, you need to bring in everything you have ever learned." [IV1, l. 18-20] It emphasizes the application of knowledge. The case method focuses on "[…] knowledge on how to solve problems, rather than having focused on a specific area" [IV7, l. 143]. It encourages the learner to see the "[…] same problem under different lights […] you see that there are other creative solutions to the problem" [IV1, l. 72-73]. The case method "[…] trains to structure your thinking and analysis skills" [IV8, l. 83]. By learning and applying this, students developed new ways of thinking. "At the beginning I always made the experience that I thought 'I did not think of that'. Now, as I have had more experiences with the case method, I am readjusting my way of thinking." [IV3, l. 17-19] The case method encourages the learner to learn actively, as opposed to being a passive recipient of knowledge. Participation promotes dialogue between students as well as student and teacher. Problems (cases) worked on usually were too complex to be solved by individuals – students were dependent on their learning teams. Learning in groups (learning communities) is also promoted by constructivism (see chapter 4.1.3).

4.2.2 Description of the second characteristic: problem-based

Almost all of the interviewees stated that the real life problems, which the case method works with, were very special characteristics of this learning and teaching method. The case method teaches the learner to apply theory to actual situations. "Reading is one thing. This is application versus theory. How it is applied is often very different from how it reads. The case method moves beyond theory – it shows you what to do in context and in perspective." [IV8, l. 14-17] The case method offered learners contexts for theory. "The real life situation gives […] a context that you can relate to." [IV2, l. 22-24] The case method gives the learner more insight into a company, than any other teaching method. "You never get so much insight into a company as you do with the case method." [IV2, l. 121] The case method teaches to take on diverse roles within a company.

A case typically does not give the learner all the information he needs to solve the problem. Additionally, given information needs to be separated according to important and unimportant data. This enhances analytical skills and "[…] creates an efficiency [on] how you handle yourself in business: you will never have all information you need to make a decision, but you take what you have and make the most comprehensive decision possible – and it trains you to go on from there

and think about how you would proceed. […] This is very valuable in business." [IV8, l. 86-90] After having worked through a number of cases, the learner built up a framework of how to go about analyzing the problem and finding a solution.

4.2.3 Description of the third characteristic: perception of participants

Roles of students and teachers within the case method are expressed as being special features of the case method. They are dealt with separately according to prerequisites and roles within the next section. Additionally, environmental prerequisites are also focused on.

Perception of the learner

- Prerequisites of the learner

  Keywords mentioned when portraying the learner prerequisites were: communication skills, willingness to participate, experience, self responsibility, theoretical background, high quality students, computer skills, good problem identification andn analysis skills, open mindedness, learner diversity, basic business understanding, self confidence and the ability to live with no definite answer at the end of a case. The basic understanding for business is a prerequisite which the learner should have when learning with the case method. "You need to have a theory background to benefit from the case method - you need be able to do the initial quantitative background work." [IV8, l. 122-123] Depending on the focus of the program it may also be necessary to have computer skills, for these may be presupposed within programs.

  Students have to take on responsibility for their own learning and that of the others. In order to work with the case method successfully, students need to be able to analyze large amounts of data quickly and thoroughly. "You get very good at synthesizing a large volume of information." [IV6, l. 32] When working through a case, it is necessary to identify a problem and analyze it. A comfortable feeling within the students must be given in order for them to work with the case method successfully. Students learning with the case method should be open minded, not keen on memorizing facts, but willing to solve problems in creative, innovative ways. The learners within one classroom should be diverse, in order to offer many viewpoints concerning one problem. "The case method can only truly work if diversity within the classroom is ensured. Only by contributing different viewpoints, based on different backgrounds and environments, you can compare opinions, because you may think differently. If everyone is from a similar background, everyone thinks just about the same. Then I would prefer a lecture from the professor." [IV2, l. 26-30] However, diversity could also lead to complications. For example non native speakers did not participate as often as native speakers. This could be due to the fact that "[…] the people who don't speak the language very well, feel less comfortable and tend to speak up less" [IV3, l. 63-64].

The learners involved in the program should be "high quality students" – this improves the quality of the case method. The students interviewed believed that prior experience is a very important prerequisite when learning with the case method. They believed that age and experience correlate: "[…] if you are too young to have work experience and life experience, you will get less out of the case method" [IV2, l. 71-72]. Learning with the case method is also a question of responsibility. It is up to the learner to prepare himself for the course, no one forces him to do so. It is the responsibility of the students to teach themselves and teach others in the class.

They need to be able to motivate themselves and be "[…] independent learners, students who don't rely on the teacher" [IV7, l. 88] for everything. Students need to be self confident, and believe in what they say. This becomes especially important, when they need to convince others of their opinion. "Communication skills get built up within the program, but you need some qualities to begin with." [IV8, l. 149-150] Students need to have the ability to "[…] express ideas in a clear manner, and defend your ideas" [IV2, l. 95]. "Strong communication skills are a prerequisite. […] You can't learn much from someone who does not speak." [IV4, l. 105-108] Communication abilities are focused on further in chapter 4.2.5.

- Role of the learner

  The "[…] role of student is different in the case method than e.g. in a lecture. You don't just sit there and are a sponge and soak up the information – it is your responsibility to teach yourself and teach others in the class" [IV2, l. 129-131]. Some interviewees referred to the students as having been the actual teacher within the case method. Students within the case method must criticize, offer alternatives, give feedback, offer their own expertise, and give their fellow students psychological support. This psychological support concerns mutual support when the stress takes overhand.

  Some interviewees perceived differences in the roles of the students according to gender. However, the opinions concerning the roles are opposite, as the following two quotes show: "There is no equal balance in females and males in my class there are 2/3 men and 1/3 women. […] Class discussion is male dominated – more males speak" [IV7, l. 94-98]. Another student believes: "[…] if anything it is the reverse, the women speak out more than the guys" [IV3, l. 62]. Even though students are very self responsible within the case method they are also very dependent on their teachers. They must trust the faculty to "[…] choose the right cases […] [and to] direct the conversation to the right direction" [IV6, l. 144-145]. Within the learning process students had to take in certain roles. However, these roles were not set, they vary according to case, experience, and expertise etc. they have concerning the case.

Perception of the teacher

- Prerequisites of teacher

  Teachers teaching the case method must be willing to let the discussion go the way the participants want it to, and not always steer it towards their own "correct" answer. Experience with the case method is an often called for prerequisite concerning the teacher: "It takes a professor a lot of time to learn how to manage a class – distribute participation, how to draw quality comments […] [and] shut down other comments which don't contribute to the discussion" [IV8, l. 107-109]. It is the responsibility of the teacher to maximize the potential of the discussion. A necessary prerequisite to do so is to "[…] provide their own skill sets and their background, their expertise" [IV1, l. 107]. The "[…] case method is not efficient when it is drawn down to the smallest common nominator that way the conversation never gets to the highest common nominator – and that can frustrate" [IV6, l. 66-68]. The choice of the common nominator is up to the teacher. His competences must enable him to make the decision which is of maximum advantage for all participants.

  The teachers are appreciated and respected very much within the case method. They are regarded as a very valuable resource. "You learn yourself, your teacher guides you. If they don't guide and push you in the right areas, it's useless." [IV7, l. 236-237]

- Role of teacher

  To start out with the "[…] teacher chooses the case" [IV6, l. 124] which is to be worked on. Teachers within the case method control students less than they do within other programs. For this purpose, teachers needs to think of and prepare "[…] different discussion threads, which make the preparation so time consuming" [IV8, l. 113].

  The teacher starts, leads, and structures the discussion. "Textbooks I can read on my own, but within the case method you depend on the teacher! The teacher gives you the focus and clarity." [IV7, l. 121] The teacher gives this focus and clarity by having the abilities to:

  - mediate, guide and push discussions,
  - organize and control the classroom,
  - distribute participation throughout the classroom,
  - bring in own experience and expertise.

  "The professor is a mediator and a guider of a conversation, more than a teacher who tries to teach you. They are pushing the discussion, letting it flow in a certain way, they don't stand in front of you and teach you." [IV2, l. 126-28] How they go about this is very delicate, and calls for intuition. The teacher "[…] needs to have the ability to control the classroom – not too much, not too little [this is a] very delicate subject" [IV3, l. 75-76]. He does this, e.g. by fil-

tering contributions. The "[…] quality of the comments need to be enforced by the professor" [IV5, l. 124]. The teacher "[…] directs conversation, and draws out all important facts and positions" [IV6, l. 129]. Furthermore, he facilitates, moderates and mediates. Teachers "[…] are moderators, mediators, they are sources of information, they are there to help us clarify our ideas" [IV3, l. 138-139].

Another key factor, why the guidance of the teachers is described as being so precious, is that once a case has been worked through with the support of a teacher, the learners can be sure, that the key learning points were covered. "Hearing that you covered all key learning points from the teacher is important." [IV8, l. 248] This gives the students the security that the learning objectives which are assigned to this case are covered.

Environmental prerequisites

The most important environmental prerequisite is that the class size remains manageable. Opinions concerning the optimal number of students within one class vary among the interviewees. "The upper limit of participants is 80, because participation is graded so highly, going beyond 80 participants would hinder the grade – it would then become very de-motivating, because you would not get the chance to speak out as much as you would like." [IV8, l. 129-133] "Not too small, 6 people would be too little. Optimum would be around 50 students." [IV3, l. 73-74]

Interestingly, only one interviewee mentioned that comfortable chairs as well as a beamer and a sufficient number of blackboards were needed as environmental prerequisites. The size of the rooms, arrangement of chairs, as well as equipment such as a wireless LAN network, further going web support, receiving the cases ahead of time, being offered additional reading material etc. were not mentioned. This can be due to the ideal conditions offered at The Richard Ivey School of Business. Technological infrastructure, costs of the case, availability of contact people etc. were also not mentioned by the interviewees.

4.2.4 Description of the fourth characteristic: three phased work-through process

The case method consists of three phases. Learners start out in a single work phase, where learners read and analyze the case. In this phase first attempts for possible solutions are made. These solutions are then presented within the work phase of the small groups, also referred to as study groups. These groups consist of 5-7 students, and within this setting each student introduces his views and receives feedback. After this phase all of the students gather together in the large group phase, called plenum. Now viewpoints of students or study groups are introduced. This leads to a discussion. The teacher moderates and facilitates this discussion. A detailed description of these phases is given in the following subcategories.

Single work phase

The single work phase is described as a phase, where facts are learned. "Time is spent trying to process information of a case and come up with your own way of solving the case." [IV3, l. 116-117] Typically, this is done by reading the case and articles which are associated with the case. Usually, the case is skimmed once and then read through in detail. This phase offers the possibility to work through exhibits and to do numerical analysis. "Usually about 2 hours of preparation per case involve reading, reading supplemental readings, analyzing the case to the best of your ability. Usually you can not solve the case. You can usually get 75% or 80% done, but not more. Not on your own. That can be frustrating." [IV6, l.100-104] Another student described this phase a bit more positive: "Making sure that my understanding is there and enough to go to the small group" [IV2, l. 140-41]. This phase is a necessary prerequisite in order for the group work to become meaningful. "The phase where you work alone is critical! Working alone enables you to digest the case. Working alone lets me benchmark my opinion […]. If that hasn't been done, no benefit will come from small group discussion." [IV8, l. 207-210] The impact of personal preparation increases as more experiences are made with the case method. "At the beginning of the program my individual preparation did not get me as far, it grew over the course of the years. My analytical skills were progressing with experience in case analysis." [IV8, l. 215-217]

Small group phase (study group)

Study groups consist of approximately 5-7 students. Students are assigned to a learning team by faculty. Constellations of teams rotate approximately twice a year. The main goal of study groups is to discuss main aspects of the case, and answer the questions concerning the case. Every student introduces and validates his ideas, and receives feedback. This "[…] adds another layer of complexity to the case […] [which] enhance[s] your own analysis by hearing what your learning team has to say" [IV1, l. 91-94]. Because of the different viewpoints the small group phase "[…] [a]dds a different element of learning […]" [IV7, l. 171] to the learning process. This phase is generally perceived as "[v]ery valuable to debate, discuss and learn from others. It allows more direct discussion on the issue" [IV4, l. 141-142]. Depending on the case, this phase of the learning process can take between 1 – 3 hours. During this time "[…] the group members have to justify their position to others. You get closer to the solution than in the individual preparation" [IV6, l. 106-109]. This extension of the learning process is due to the fact, that the individuals can supplement each others knowledge. "Sometimes you don't know something and one person will know it, and you will be able to go on with the case." [IV7, l. 174] Sometimes, after the study group phase, individuals will need to go back to the phase of individual preparation and revise their work.

Study groups also teach how to work with different kinds of people. "Learning in the small groups forced you to work with different people, learning styles etc. You just had to make the

best of it. […] That can happen in the real world. Small groups replicated a true office environment." [IV8, l .223-225]

One interviewee mentioned that the study groups were only productive when the participants came from different backgrounds. "If we were from completely different backgrounds, OK, then there would be value in the small groups, because the point of the small group is to give you different viewpoints as to how you see something. When you are in a small group with other North Americans, with similar background, they can't tell me anything I don't already know. They have no additional insight." [IV2, l. 144-151] After preparing the case in the small study groups the students go to the plenum. "Some groups meet after the large group discussion to debrief. To see what their opinion is. That phase is very short, approximately 5 minutes." [IV6, l. 119-120]

Plenum (large group phase)

The phase of the large group discussion is a "[…] multi layered, multi opinion approach of the problem […]" [IV1, l. 96-100]. It was described as being "[…] very productive, because of the people in the big group. If they had all been the same as the people in my small group, it would not have helped, but the class is so diverse" [IV2, l. 155-158]. Productivity within this phase is only given, once the other two phases have been completed successfully. Otherwise it is not possible to profit from this phase. If prepared correctly, this phase broadens the viewpoints even further than the two preceding phases did.

"Often you come up with a very comprehensive answer. You would not have been able to do that alone or in the small group." [IV6, l. 114-115] This phase offers "[…] a forum to hear all the possibilities that you did not cover" [IV3, l. 129]. This lets the learner develop "[…] a bigger picture of the aspects involved" [IV3, l. 130]. Frequently this "[…] clarifies what you should have done – often in the small groups everyone has done it in the same way, but in the large group you see different ways that are much easier" [IV3, l. 131-133]. However, the discussion in the plenum often goes where the others want it to go. The individuals do not have as much impact on steering the discussion, as they have within the small study groups. The classroom "[…] is more guided, coached, and manipulated to where the professor wants to take the discussion. It's more fragmental in a big group" [IV4, l. 151-154]. Because this phase is moderated by a teacher, the students can be sure that once they have gone through this phase the key learning points the case has to offer are covered. This can not be assumed after the small group phases. "Being moderated by a professor, you know you have the key learning points covered – that you wouldn't know after being with your small groups. The summaries of the professors are very beneficial – that's what I remember most of the case." [IV8, l. 232-236]

Within this phase it is important that everyone contributes. Only by doing this everyone can get the most out of this phase. "[…] [W]hat disappoints me the most, is that some people are very

bright and don't say anything […] if you don't contribute, it hurts the other people" [IV5, l. 121-123].

4.2.5 Description of the fifth characteristic: communication

The case method is discussion-based therefore communication plays a huge role. The following quote demonstrates this very clearly: "If you have trouble communicating you either a) get over it, or b) do not go to a case program" [IV2, l. 101-103]. Communication, so another interviewee, was the whole point of the case method: "[…] the whole point of the case method is to force you to communicate your thinking and justification to others" [IV6, l. 72-73]. Students do progress and advance their communication skills while in the program, but they also need to have well trained communication abilities as a prerequisite when indulging into the case method. "Communication is incredibly important. You learn as a part of a group, the groups that form want to be groups to learn from each other." [IV4, l. 106-107] Redundant conversations take place during the process of working through a case. This annoys some of the interviewees, but they did not have ideas how to eliminate redundant conversation. Communication difficulties are often encountered because "[…] sometimes people misinterpret other's comments […]" [IV5, l. 68]. "[…] [C]ultural communication barriers […]" [IV5, l. 69] are also a reason for breaks within communication. Good communication abilities do not only describe good speaking abilities, moreover, they also require the participants to go beyond that. In order to make "[…] valid contributions you need to be able to listen effectively, otherwise you will not know what's going on" [IV3, l. 84-85]. "[…] [P]eople who can understand [English second language] ESL persons get lots more out of it. It is important to have good listening abilities you need to be careful to listen to exactly what ESL's say – to puzzle through it." [IV3, l. 81-83]. Communication abilities also influence collaborative working as well as interpersonal skills.

4.2.6 Description of the sixth characteristic: collaboration

It is impossible to carry out the case method without interaction. Students and teachers are continuously interacting with each other in a variety of settings e.g.:

- student – student
- student – teacher
- student – small study group
- student – plenum
- small study group - small study group
- small study group - plenum

"A special characteristic of the case method is the collaboration of the entire class, discussing a situation, when do you have 80 people discussing one topic?" [IV2, l. 124-25]

Within the learning process in the small study groups students take in certain roles. But these roles are not set, they vary according to case, experience and expertise etc. they have concerning the case. "Within small groups it is interesting to see that each person takes on different roles. There always tends to be a leader. A second in command. Someone who lets something happen around them. [It is] interesting to see how that develops. [It is] interesting to see that those roles change when being put on another learning team. Different people exploit different roles when in different combinations." [IV8, l. 241-246]

4.2.7 Summary

The main characteristics underlying the CM in this thesis were described in the preceding chapters. They are summarized in the following table. These key features adhere to general descriptions of the case method within literature. They are backed up and legitimated by the results of an empirical study. The accents of the characteristics are placed through empiricism. This empirically-based accentuation is very important, because the experts involved in the evaluation are similar to the intended target group users of the web-based case method. Therefore the extension of literature through empiricism was inevitable. The left column describes the main characteristics of the CM while the right column names features and attributes describing this characteristic. Footnotes give references to state of the art literature as well as to quotations of interviews[85].

Table 4.2-1: Characteristics of the case method

Characteristic	Feature/attribute
Constructivist	▪ Application of knowledge[86] ▪ Personal construction of knowledge[87] ▪ Integration of personal prerequisites[88] ▪ Learning communities[89] ▪ Promotion of dialogue (see also characteristic "communication")[90]

85 This table uses a different format of citation than the rest of this thesis in order not to disturb the reading process.

86 ([Hesse/Friedrich 01], [Gragg 54, 8], [IV7, l. 143])

87 ([Lynn 99, 2], [IV3, l. 17-19])

88 ([Mauffette Leenders et al. 01], [IV1, l. 18-20])

89 [Haehling von Lanzenauer 75, 1]

90 [Haehling von Lanzenauer 75, 1]

Characteristic	Feature/attribute
Problem-based	▪ Authentic context (case)[91] ▪ Application/context for theory[92] ▪ Complex problem[93] ▪ Problem-based learning reaches goals of a high taxonomy (see chapter 4.1.4)[94]
Perception of participants	▪ Prerequisites and roles of teacher[95,96] ▪ Prerequisites and roles of learner[97,98] ▪ Environment[99]
Three phased work-through process	▪ Single work[100] ▪ Small group work[101] ▪ Plenum[102]
Communication	▪ Communication abilities are prerequisite and trained[103]
Collaboration	▪ Cooperation in various settings with varying partners[104]

It is not the individual elements in isolation that describe the case method; it is the fusion, conversion, and implementation of these elements: "When this blend of the cognitive and affective is built into the preconscious, it has a unique capacity to prepare a student for continuous learning, growth, and administrative maturity throughout his or her career" [Barnes/Christensen/Hansen 94, 51].

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91 ([Lynn 99, 42], [Erskine/Leenders/Mauffette-Leenders 98, 8], [IV8, l. 14-17])

92 ([Erskine/Leenders/Mauffette-Leenders 01, 6], [Erskine/Leenders/Mauffette-Leenders 01, 5], [Lynn 99, 3], [IV8, l. 14-17])

93 ([Erskine/Leenders/Mauffette-Leenders 01, 4], [Lynn 99, 2], [Wassermann 94, 3], [Matejka/Cosseé 81, 9], [IV8, l. 86-90])

94 [Lynn 99, 3]

95 ([Lynn 99, 43f.], [Erskine/Leenders/Mauffette-Leenders 98, 85; 185], [Barnes/Christensen/Hansen 94, 47f.], [Wassermann 94, 61], [Mateijka/Cosseé 81, 15], [IV1, l. 107], [IV6, l. 66-68])

96 ([Lynn 99, 43f.], [Erskine/Leenders/Mauffette-Leenders 98, 85], [Barnes/Christensen/Hansen 94, 47f.], [Wassermann 94, 61], [Ronstadt 80, 2], [IV6, l. 124], [IV7, l. 121])

97 ([Lynn 99, 43f.], [Barnes/Christensen/Hansen 94, 47f.], [Kowalski/Weaver/Henson 90], [Shulman 92], [Mateijka/Coseé 81, 31], [IV8, l. 122-123], [IV2, l. 71-72])

98 ([Lynn 99, 43f.], [Barnes/Christensen/Hansen 94, 47f.], [Mateijka/Coseé 81, 31], [IV2, l. 129-131], [IV6, l. 144-145])

99 ([Erskine/Leenders/Mauffette-Leenders 98, 20], [IV8, l. 129-133])

100 ([Mauffette Leenders et al. 01], [IV2, l. 140-41], [IV8, l. 207-210])

101 ([Mauffette Leenders et al. 01], [Levin 95], [IV6, l. 106-109], [IV7, l. 174])

102 ([Mauffette Leenders et al. 01], [IV6, l. 114-115], [IV3, l. 131-133])

103 ([Lynn 99, 43f.], [[Barnes/Christensen/Hansen 94, 47f.], [Gragg 54, 8], [IV2, l. 101-103], [IV6, l. 72-73])

104 ([Barnes/Christensen/Hansen 94, 47f.], [IV8, l. 241-246])

Development of the conceptual design of the WBCM is dependent on structure through the main features of its traditional pendant. These features were named in chapter 4.2. Within the conceptual design of the WBCM two factors, which were already mentioned within the pedagogic-didactic dimension of success relevant determinants of e-learning in chapter 2.2.4, are of special significance: communication and collaboration. These were also identified as key features of the traditional case method. Their design within the concept of the web-based case method is very important. Therefore the next chapter gives a theoretical description of these features.

5 Communication and collaboration within e-learning

As it became clear in the preceding chapter the components communication and collaboration, are of special significance for the development of the conceptual design of the web-based case method. For this reason they are described in this section. This chapter starts out with a description of communication within e-learning in chapter 5.1 and then moves on to virtual teamwork, which is focused on in chapter 5.2.

5.1 Communication within e-learning

Some researchers think that new technologies will eventually replace face to face communication, especially in the workplace. Other researchers are convinced that as tasks become more complex and involve solid interpersonal relationships face to face settings are inevitable [Hallowell 99]. Within this thesis it is not the issue if it should be face to face communication per se. Instead potentials and limitations of the so-called electronic or virtual communication are described. The general term referring to this kind of communication within this thesis is computer-mediated communication (CMC). Virtual communication was developed on the basis of traditional communication. Therefore an introduction to theory concerning the traditional context of communication is described in chapter 5.1.1. Afterwards the chapter moves on to describing the basics of the web-based pendant computer-mediated communication. This means that this section continues with the definition of computer-mediated communication in chapter 5.1.2. Then in chapter 5.1.3 theoretical models which underlie computer-mediated communication are focused on. This chapter closes with an overview of three positions which can be taken in when identifying the changes made through computer-mediated communication. Chapter 5.1.4 focuses on the classification of communication systems. This classification is structured according to the dimensions synchronous and asynchronous communication forms. The advantages and disadvantages of computer-mediated communication are described in chapter 5.1.5. Finally a summary of this section is given in chapter 5.1.6.

5.1.1 Introduction to communication

Simplified, communication consists of four elements. A *communicator* (sender) sends a message to a *recipient* (receiver) who receives the message. *Content* (message) is sent through a *channel* (communication channel). The following figure describes the schematic representation of communication.

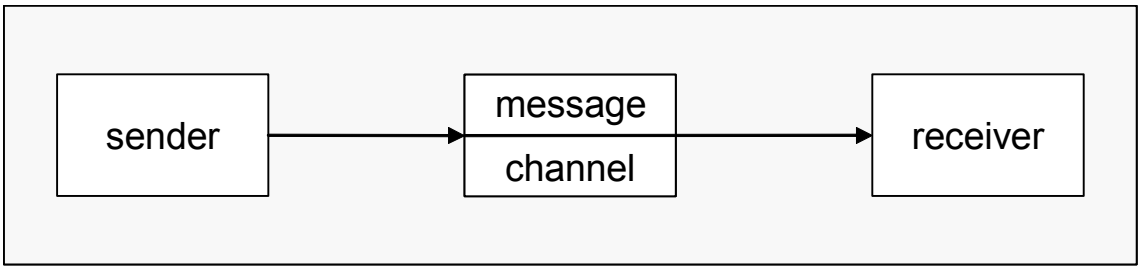

Fig. 5.1-1: Schematic representation of communication ([Maser 71, 43])

Verbal communication is the most basic phenomenon of humans [Baacke 73]. It evolved out of nonverbal communication. Nonverbal communication was extended through the addition of verbal communication. Numerous nonverbal signals are constantly added to words and sentences to intensify their meanings and intentions, to modify them or to completely substitute them. Body language takes on the greatest part of the different aspects of nonverbal communication.

Metacommunication describes communication about communication (see [Burkart 02], [Baacke 73]). Metacommunication outlines the process of communicating about how the people involved communicate and behave towards each other, how the messages which are sent are meant, how received messages are encoded, and how interacting people react to this [Schulz von Thun 01].

According to Merten there are five communication channels: visual channel, audible channel, tactile channel, nasal channel, and taste channel [Merten 77]. These are extended through Bentele/Beck by the thermal channel [Bentele/Beck 94]. Communication channels describe sensual modalities with which communication partners are sensed. Especially within communication between humans usually more than one channel is taken up. The more channels are used, the higher the precision and the reflexivity of communication are (see [Frindte 01], [Schreiber 83]).

Success factors of traditional communication are: converting signs to meanings [Forgas 99], nonverbal communication (see [Hart 97], [Delhees 94]), feedback (see [Frindte 01], [Schulz von Thun 01]) and metacommunication (see [Frindte 01], [Schulz von Thun 01]).

Models of traditional communication

Theoretical models of traditional communication focus on the relationship between sender and receiver, on the communication process, and the characteristics of communication.

Shannon/Weaver believe that there are continuous interferences while transferring information [Shannon/Weaver 76]. They emphasize that an important condition for perfect communication between two communication partners is the trouble free transmission of the message. Furthermore, they try to maximize the probability of successful communication by developing a mathematical oriented model, also referred to as "probable communication". Shannon/Weaver focus on messages which are sent from sender to receiver neglecting the meaning and function of the

message. Their model optimizes communication between sender and receiver by eliminating three interference factors. These factors of interference can be seen:

- from a technological viewpoint (the words transported are not accurate).
- from a semantic viewpoint (symbols used are not understood in the same way by the sender and receiver).
- from the viewpoint of effectivity (the interpretation of the message by the receiver is different from the way the sender intended it to be).

Communication can more probably take place without disturbances if the channels are arranged in a way which lets more information pass through.

Watzlawick created 5 axioms through which he explains communication processes, disturbances and effects of communication on human behaviour. Watzlawick generally regards communication procedures from two angles: the content and the relationship point of view. The characteristics of the second axiom (content- and relationship aspects) as well as the fourth axiom (digital and analogous communication) are especially important. Within Watzlawick's model digital aspects of a message are sent through speech and writing. Analogous contents are expressed through nonverbal expressions and have semantic potential. Messages sent contain content and relationship aspects. Contents are *determined* by the relationship aspect. Digital and analog are congruent to the terms content- and relationship aspects. Omission of the analog contents has the consequence that the relationship aspect diminishes [Watzlawick/Beavin/Jackson 00].

According to Schulz von Thun each message sent has multiple messages in itself and each statement sent between sender and receiver contains information about their relationship. Schulz von Thun's communication square symbolizes the four dimensions of a message. Disturbances can occur if sender and receiver are diverse regarding these aspects. A problem for successful communication is the circumstance that the receiver can freely select to which side of the message he reacts to [Schulz von Thun 01].

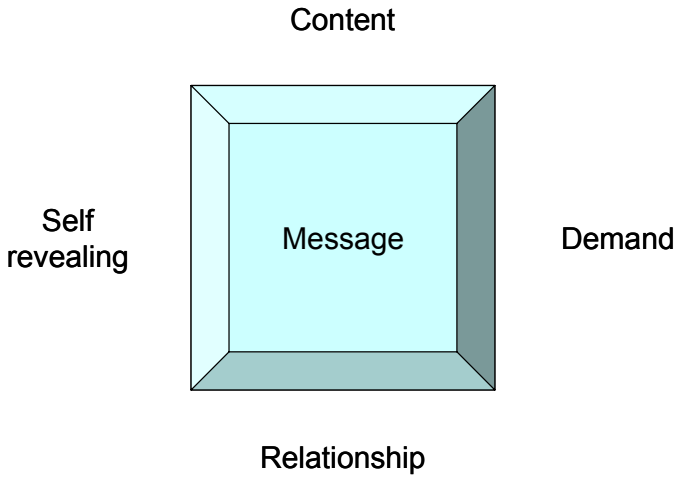

Fig. 5.1-2: Four sides of a message (according to [Schulz von Thun 01, 14])

Communication settings in learning processes

Different groupings of learners are considered as different social forms of learning. These include e.g. single, partner or group work.

Single work is the most common learning style. Within this setting it is very important, that the learner is active on his own and steers his learning speed [Tulodziecki 96]. There is no loss of time for discussions. This learning style is predestined to be used within scenarios where it is the main goal to acquire knowledge or when learning material is so complex that learners need to concentrate intensely to understand. It is obvious that this learning setting lacks the social component [Ballin/Brater 96].

When working with a partner, two students work together on the same problem. Communicating with each other is not very complex, because it is reduced to clarify how to go about solving the problem and the arrangements of the learning process. Thoughts can be spoken out loud and be used as productive monologs. Nonverbal signs give the partners an additional channel through which they receive orientation towards each other. Partner work enables learners to learn from and supplement each other. One special kind of partner work is a tutor. An advanced student is responsible for a beginning student.

According to Meyer group work is a setting where students work on a given problem in small groups. Results of work in the small groups are presented to other small groups of the course [Meyer 00]. Exchanging results and newly won knowledge enables students to compare their knowledge and its meaning to others. Communication within this constellation is much more complex than it is within partner work, e.g. because coalitions can be built up within groups. Group work can be facilitated in moderated or unmoderated form. It is recommended that teachers withdraw themselves from the group processes [Rosenbusch/Dann/Diegritz 99].

There are many possibilities for students to communicate with each other within learning settings. However, as described in chapter 2.2.6 our traditional education system - especially when focusing on higher education e.g. at universities – does not offer very many communication possibilities for students. Web-based learning offers the chance to communicate via the web. This is a chance for a change: away from passive, anonymous learning in large presence classes towards individual, active learning processes. By designing the WBCM in a way to inherit computer-mediated communication possibilities, it can be worked against one of the main shortcomings of traditional education within universities. The next sections give an overview of what computer-mediated communication is, which theoretical models it is based on, which types of CMC exist as well as classifying these and giving an overview of advantages and disadvantages. These theoretical foundations form the basis when constructing CMC for the concept of the WBCM in chapter 6.3.

5.1.2 Definition of computer-mediated communication

According to December CMC is the process by which people create, exchange and perceive information including using a network which facilitates encoding, transmitting and decoding messages (see [December 02]). This definition is also represented through the author of this thesis.

Communication referred to within this definition can be asynchronous or synchronous. The terms asynchronous and synchronous refer to the time when communication media are used. Asynchronous communication does not take place at the same time, while synchronous communication does. Therefore synchronous communication is also referred to as real time communication. Because the terms asynchronous and synchronous are characteristics according to which computer-mediated communication can be classified examples and further description of these terms are given in detail in chapter 5.1.4.

CMC is also described as being the transmission or reception of information through a networked computer system using web-based or collaborative software. Krotz differentiates between three ways in which the WWW supports CMC [Krotz 98]:

1. Traditional mass communication: Within the WWW it is possible to send standardized messages to a general audience.
2. Interpersonal communication: Users of the WWW can communicate with each other e.g. per chat or e-mail.
3. A new and different kind of communication takes place between machines or rather between machines and humans (e.g. telebanking). Intelligent agents or robots interact with each other or with humans.

Carnevale/Probst set up nine characteristics that are contained in electronic communication [Carnevale/Probst 97]. These are anonymity, speed, access, the possibility to form groups, communication via text, missing social guidelines, the ability to create own communication contributions and to send and save these, the difficulty to define the size of the audience, and electronic communication as new technology. The influences of these factors on CMC are described in chapter 5.1.5.

When nonverbal signs are missing certain parts of the message remain unsent. CMC tries to compensate this e.g. through "sound words" or "emoticons"[105]. Clear CMC calls for new competences from the participants, e.g. being imaginative concerning style and self-portrayal. Successful

[105] Emoticons is an abbreviation for "emotional icons". A very detailed overview of internet-specific acronyms, emoticons etc. is offered by the "Chat-Slang" encyclopedia by [Rosenbaum 01].

CMC presupposes knowledge about rules of CMC and having the needed capabilities to use the medium. The question is, if every user can realize this successfully within a CMC situation.

Interpreting messages in virtual communication is more difficult than within face to face contact. Especially receiver errors occur frequently. This is primarily due to the fact that the control of the communication processes lies mainly within the scope of the receiver. Interpreting messages is more difficult than within face to face contact. The context of the situation can be rated differently by the receiver than the sender intended it.

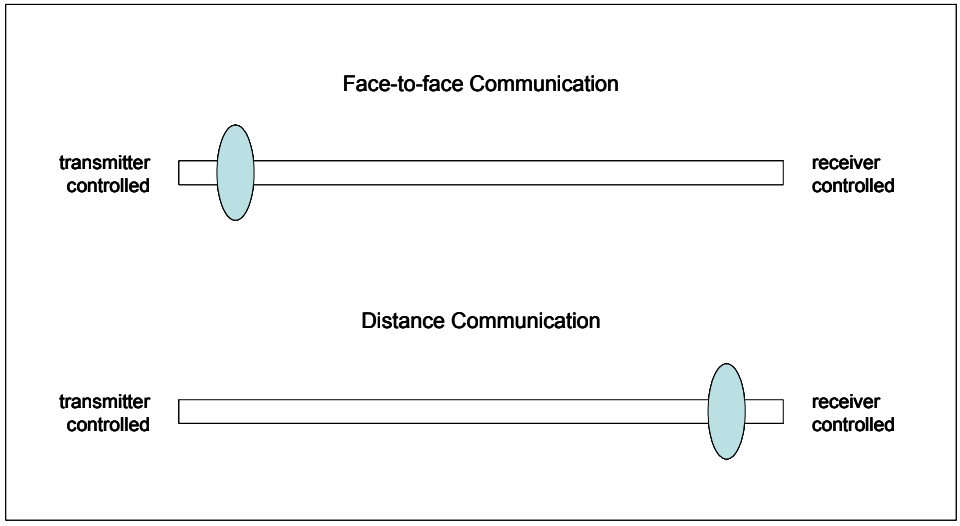

Fig. 5.1-3: Comparison of control levels ([Haywood 98, 17])

5.1.3 Theoretical models underlying computer-mediated communication

State of the art literature does not portray any models for CMC which describe aspects concerning the relationship between sender and receiver or concerning the communication process. For this reason and because of missing or lacking nonverbal communication it is only possible to transfer the models of traditional communication to CMC settings to a minimal extent. Therefore it is necessary to research underlying theories of CMC as well.

Theories behind CMC clarify that there are many differences between CMC and traditional communication. When interpersonal communication is transferred to virtual communication scenarios it is subject to new disturbances, but also to some positive effects which support interpersonal communication. Theoretical models are a great help in order to describe the process of CMC as well as the strengths and weaknesses. The models, which are introduced in the following section, are the most well known in this area. They show where the emphasis of research has been put on within the last 20 years. The models discuss the characteristics of CMC opposed to traditional communication, the way these characteristics developed and what their short and long-term effects are.

Channel reduction model

The channel reduction model describes that CMC limits the channels in other words the senses of communication. All nonverbal aspects of communication are deleted. This reduces emotionality and connection to context, and thus the "humanity" of communication is neglected [Doering 00]. Aspects of synchronous and asynchronous communication within CMC take away aspects of time and place for communication. Deficits of CMC are often attributed to the missing context [Hoeflich 96].

CMC is often referred to as insufficient because it reduces personal contacts [Mettler-Meibom 90, 87]. Hesse/Garsoffky/Hron believe that when CMC is implemented into collaborative work group cohesion and social presence can not be developed. This means that the participants can not receive feedback or cooperate with each other as is possible within traditional settings [Hesse/Garsoffky/Hron 97].

Core statement: CMC has deficits compared to face to face communication because it is impersonal due to the fact that it must be accomplished with a reduced number of senses.

Reduced social cues model

The reduced social cues model according to Kiesler/Siegel/McGuire is based upon the channel reduction model. It takes up these restrictions and concludes that the reduced channels of communication lead to a loss of information within the communication process, and this leads to a distorted perception [Kiesler/Siegel/McGuire 84]. This model describes that communication focuses on social references and thus CMC shows varying degrees of psychological distance. Communicational behaviour needs to adapt to this phenomenon. However, opposed to the channel reduction model it does not describe CMC as being a deficient form of communication. Moreover, it stresses the positive aspects, of this kind of communication. Nonverbal aspects which always play a major role in traditional communication are not transmitted, and therefore social aspects are leveled out. Everyone is equal. This can help reduce communication barriers and lead to more friendliness and openness within the communication process. It is also possible that it leads to hostility or breaking of the rules (see [Keiser 02], [Wellmann 00], and [Hoeflich 96]).

Core statement: Due to the anonymity CMC increases either social or antisocial behaviour.

Models of rational choice of media

Theories of the rational choice of media describe that interpersonal communication is limited when increasing the use of CMC. These models have a similar background as the channel reduction model. Models which belong to this area are the social presence theory, media richness theory and backchannel feedback. Their assumption is that humans rate media according to their liveliness, richness and feedback possibilities. The model of social presence declares that a com-

municative interaction is sensed to be more personal, warmer, more sensible and more informal the more communication channels are included. CMC belongs to the communication forms with the lowest social presence in this model (see [Doering 99], [Koehler 99], [Spears/Lea 92]).

The media richness theory focuses on concepts of social presence. It differs between "weak" and "rich" communication forms according to their capacities to broadcast information authentically. However, the richest medium is not necessarily the most effective. Individuals choose a medium for a communication process according to its characteristics. Social presence is referred to as a subjective category for using a medium. The warmer, more personal and sensitive a medium is referred to, the higher is the degree of social presence [Hoeflich 96]. Media richness increases when it is possible to give more than just one meaning to words, symbols or circumstances. Frindte/Koehler believe that media differ according to media richness and degree of social presence. A letter e.g. has a small degree of social presence, while face to face communication inherits the largest possible degree of social presence. Other media, such as telephone or video conference, are located between letter and face to face communication [Frindte/Koehler 99]. According to the media richness theory, the more complex a communication task, the more effective communication is via rich media. The more structured and simple a communication task is, the more effective communication via weak media can be (see [Konradt/Hertel 02], [Picot/Reichwald/Wigand 01], [Doering 99]).

The backchannel feedback model believes that communication between partners is more meaningful when the used medium has an integrated possibility to give feedback. This leads to a better understanding within the communication process ([Doering 99], [Koehler 99]).

Core statement: CMC is sensed to be more personal as more communication channels are included. It is suitable for certain communication causes and when implemented correctly it can be enriching. Feedback functionalities increase the understanding within communication processes.

Social influence model

This model extends the media richness model. It believes that not only rational consideration processes are the key criteria for the choice of media; it believes that these are extended through variables of how to operate it and social norms. "Media perceptions, are, in part, *subjective and socially constructed*." [Fulk/Schmitz/Steinfield 90, 121] Individual evaluation (e.g. costs and use of the medium) as well as socially constructed opinions for or against a medium are stressed within this model (see [Frindte/Koehler 99], [Salancik/Pfeffer 78]). This means that the choice for a medium is greatly influenced e.g. by the choice friends and colleagues have made, and therefore the "effect is that media perceptions are not fixed and objective; instead they will *vary* across individuals and situations" [Fulk/Schmitz/Steinfield 90, 121]). Operational competences e.g. "how fast can I type if typing is required" are other important factors, which influence the choice for or against an electronic medium.

"The social influence model predicts that people will vary in how 'rich' they perceive a particular medium to be. […] variation will be systematically linked to variation in the social context and media experience/skills." [Fulk/Schmitz/Steinfield 90, 128]

Core statement: Often CMC is irrational and dysfunctional because it is influenced and affected by social norms. Operational competences and social norms influence the choice of media.

Social information processing model

This model postulates that communication is not affected when using computer-mediated channels [Walther 00]. It describes that individuals adapt to structures of a given medium and adjust by applying compensation strategies. This is one explanation, why missing nonverbal attributes to communication are compensated through action words (*smile*) or emoticons (smiley) [Frindte 01]. The aspects of relationship and emotions towards one another are translated and transferred into CMC [Frindte 01].

Core statement: CMC is just as lively as face to face communication because nonverbal messages can be verbalized.

Simulation

This model can be seen as a theoretical addition to the model of reduced social cues. The extension made in this model concentrates on the lost information. The simulation model believes that this lost information can be compensated according to the individual wishes. This includes the possibility to choose how much information is given about oneself to the communicating partner [Doering 99]. Within a face to face setting information such as sex and appearance are given automatically, even if involuntarily. CMC allows the speaker to decide which information (correct or incorrect) is passed on. This shows that control over the information passed is won, because one can decide what to pass on. Still control is also lost, because one can never be sure, whether the information given is correct.

Core statement: Loss of reality within CMC is due to the freedom the participants have, when describing themselves and contexts.

Imagination

The imagination model focuses on interpersonal perceptions [Suler 96[www]]. Missing information about communication partners leads to cognitive construction processes. "When one experiences cyberspace as this extension of one's mind - as a transitional space between self and other - the door is thrown wide open for all sorts of fantasies and transference reactions to be projected into this space." [Suler 96[www]] Imagination processes can influence the perception of the communication partner in a positive or a negative way. The imagination model takes in the opposite position to the channel reduction model. In this model CMC increases emotions [Doering 99].

Core statement: CMC provokes projection processes because of the missing channels for the senses.

Digitalization

The model of digitalization focuses on consequences which conclude from the digital transmission forms of communication: text. Digital text can be changed, be used more than once, and be forwarded and answered automatically. Hypertext offers the possibility to connect different texts and media to each other (e.g. connect multimedia applications to text). Doering describes that the model of digitalization explains the development of collaborative group work and mass communication through the possibility to easily extend the number of participants [Doering 99]. The user conceives this as positive, for aspects such as social support and an extensive exchange of information is made possible. Haack believes that this extreme amount of information can also lead to an information overload and to disorientation. This effect is called "Lost in Hyperspace" [Haack 02, 130].

Core statement: Digital text processing changes the meaning of the messages sent between the communication partners. This has great influence on the production, spreading and reception of the messages.

When identifying the changes made through CMC, it is possible to accept one of three different positions:

1. CMC is defective, compared to face to face communication. It is tendentiously a socially destructive form of communication, because it reduces the number of channels through which communication is possible. This is why it will always be inferior to face to face communication (see Channel reduction model).
2. CMC is useful in some situations and offers the possibility to compensate deficits. However, face to face communication remains the superior form to communicate (see Media Richness Model, Social Influence Model, and Social Information Processing).

3. CMC is capable to offer new freedom concerning communication. New possibilities for actions and experiences are offered, which are missing in traditional face to face communication (see Simulation, Imagination, Digitalization).

It is anticipated at this point that this thesis is based on a combination of positions two and three. This is due to the results of a number of empirical studies conducted within the scope of this thesis (see chapter 1). Concerning the possibilities offered through CMC it is believed that new and advantageous possibilities of communication are created. However, since these new forms are still in their infancy concerning their development it is not advisable to do completely without traditional communication. It must be the goal to implement the adequate form of communication to the each learner within their appropriate setting. Within CMC synchronous and asynchronous communication can take place. This structure concerning time aspects of communication is a classification possibility for CMC. Therefore it is described in more detail in the next chapter.

5.1.4 Classification of communication systems

The multiplicity of diverse media to support communication makes it necessary to classify these. For this purpose many classification dimensions are thinkable. Classification criteria can be structured according to time (synchronous or asynchronous) and location (distributed or close together) or type of communication (1:1, 1:N, N:M)[106] [Senst 01]. Classification dimensions have differing accuracy and validity. In accordance to Senst the following section classifies communication systems according to the characteristics asynchronous and synchronous communication. This classification can then be consulted within the design of the WBCM in order to select the appropriate communication form. Before outlining synchronous and asynchronous communication forms the following table allocates purposes to synchronous and asynchronous media. Afterwards these communication possibilities are illustrated.

[106] 1:1 communication refers to communication which is conducted one to one. 1:N describes communication scenarios where one individual communicates to more than one receiver. Communication scenarios where more than one sender communicate to more than one receiver are symboled through N:M communication.

Table 5.1-1: Allocation of synchronous and asynchronous working forms

Purpose	Synchronous possibilities	Asynchronous possibilities
Write and send protocols	- - -	e-mail, mailing lists
Send news	instant messaging	e-mail, (SMS)
Exchange up-to-date information	IRC-chat, instant messaging, audio/video-conferences	newsgroups, (bulletin board)
Collect ideas, brainstorm	IRC-Chat, whiteboard	- - -
Discussions	IRC-Chat	newsgroups, boards, groupware
Develop and publish text	Audio conferences, (application sharing)	Text processing (team-functions), groupware
Projects, Development of concepts	IRC-chat, whiteboard	groupware, (project-tools)

The sole availability of the technologies which are described in this section does not guarantee success. Everyone needs to be acquainted with these tools and must know about their characteristics [Hermann/Meier 02]. All members must have similar technological prerequisites and use the same version of the programs. Data need to be stored at one central point in order to be accessed by everyone. Data stored always need to be updated regularly to enable everyone to work with the latest data [Meier 01]. Additionally, it is necessary for everyone involved to know which communication medium can be used for which purpose.

Asynchronous communication

Communication within the WWW often happens asynchronously. This means, that sender and receiver are not communicating with each other at the same time [Dobal/Werner 97]. There are various ways how to communicate asynchronously.

E-mail was one of the first possibilities to communicate electronically with other people. The basic functionality of e-mail is to send text based messages to one or more recipients. E-mail supports 1:1 and 1:N/N:1 communication [Seitz 95]. E-mail is the functionality of the internet which is used most broadly. Even though e-mail is a fairly simple instrument through which virtual communication is enabled, it contributes strongly to cooperation, communication and coordination between individuals through the WWW. Further specifications of use, handling and concerns of e-mail are [Freyermuth 02], [Meier/Hermann/Hueneke 01], [Diepold/Tiedemann 99]. A detailed overview of advantages and disadvantages of e-mail are discussed by [Simons/Mattner 03[WWW]], [Freyermuth 02], and [Leiner et al. 02]. If messages need to be sent to a

common group of people often, e.g. as done within virtual teams, mailing lists can be used [Simons/Mattner 03[WWW]].

Mailing lists extend the concept of e-mails. Mailing lists consist of the e-mail addresses of the participants [Runkehl/Schlobinski/Siever 98]. Once included in a mailing list, the participant receives all mail, which is addressed to this list. Single mailing list contributions are referred to as postings. Contacting single people on the mailing list is also possible [Doering 99]. The number of people in a mailing list can vary. Mailing lists can be moderated and unmoderated, as well as interactive and reactive mailing lists. In a moderated mailing list all messages are first sent to an administrator, who decides about forwarding it to the other participants. Contents in unmoderated mailing lists are completely up to the members. Interactive mailing lists can be used by every internet user. Reactive mailing lists are used by someone who offers information and wants to spread it to registered participants [Runkehl/Schlobinski/Siever 98].

Peltz describes that a regular exchange of e-mails concerning a certain topic within a group of people is considered to be an electronic discussion board [Peltz 95]. He describes that electronic discussion boards can appear in form of mailing lists, newsgroups or bulletin board systems. This thesis uses the term discussion board when referring to a bulletin board. Stangl also compares discussion boards to black boards on which one can post messages. The messages are not sent to each participant via e-mail, they are rather administered in one central place. Discussion boards often offer expert knowledge online. The user can receive help about a certain topic without consuming time and often little successful searches on the internet. However, it must be mentioned, that contributions may also be made by non-experts, and thus can be wrong [Stangl 00].

Newsgroups make use of the pull principle. This means that the user must get the information from the server himself [Simons/Mattner 03[WWW]]. Traditionally, newsgroups are not moderated and can be used by everyone. Because they are often anonymous they promote the readiness to share knowledge with others.

Virtual rooms are limited areas where participants can exchange information and save data. Because this is frequently done in web-based scenarios it is not necessary to install software. It enables flexibility because they can view the information from everywhere [Meier 01]. Virtual rooms support teams concerning the exchange of information (communication), in the management of actions (coordination) and when accomplishing common tasks (cooperation). Virtual rooms train, remind and control their members [Lenk 02]. Literature describes that these systems are broadly accepted. A reason for this is the great possibility to exchange documents with such features as reminder mechanisms once new data is set into the room, or annotating functions etc. [Ziegler/Wissen 02].

Software which supports communication, co-ordination and cooperation within distributed teams is called groupware. Groupware combines many components such as e-mail or discussion

boards. The most important components are tools for communication (e.g. e-mail, chat), tools for cooperation (e.g. electronic calendar or workflow management functions), and tools for coordination (e.g. common address books, the possibility to edit common documents) [Hermann/Meier 02]. Whiteboards offer the possibility to work together on an application (e.g. draw on an outline or sketch together). Application sharing enables working together simultaneously on the same document. Working offline is made possible by storing data in databases and replicating it to single computers. Because data is collected at one central point it is possible to access and edit the latest information. Implementing groupware is usually connected to high costs. Besides these high costs the users must be trained in order to use all of the offered functions [Ziegler/Wissen 02]. At the time being, there are numerous groupware programs with diverse functions. Some of the most known are Lotus Notes, Microsoft Outlook/Exchange, Novell Groupwise and CAS Genesis World.

Synchronous communication

The main characteristic of synchronous communication is the same-time exchange of information [Greis 01].

Chat offers individuals the possibility to lead a discussion in writing in real-time with other people. Chat requires the presence of both communicating partners. Chatting offers all types of CMC (1:1, 1:N, N:1, N:M). Structuring communication is done by creating channels. These channels can be compared to virtual rooms, and everyone in a room can read the messages sent within this room [Greis 01]. Private chats are also offered, they allow only two people to correspond to each other. Chat communication is often enriched by emoticons or action words. All messages posted are posted under a pseudonym [Seidler 02^{WWW}]. One popular chat is the IRC (Inter Relay Chat). The IRC is one of the first chat systems and was developed in 1988 by a Finn student, Jarkko Oikarinen [Runkehl/Schlobinski/Siever 98]. This is the largest multi-user-chat-system, which bundles many public and private channels.

Instant messaging systems are similar to chat. This is a free communication channel through which participants can transfer text messages. Some systems offer further functions such as chat, sms, e-mail, sending URLs, or sending files. In order to use this program, software needs to be installed, and the user must register with the appropriate service. The user can create a "contact list" into which he can register his friends and contacts. This contact list automatically shows whether people on the list are on- or offline. Another feature of instant messaging is the possibility to search for other participants according to the place where they live, their interests, or hobbies. There are numerous offerers of instant messaging systems e.g. ICQ messenger, AOL instant messenger (AIM), MSN messenger, or T-Online Messenger (TOM). Each offerer adds some other functions to his messenger program. The internet offers programs which combine all of the

above tools but, frequently these combinations do not offer all the additional functions the original tools do [Mohr 03[WWW]].

A MUD is a Multi User Dungeon/Dimension. This is an interactive, text-based environment. Many participants can communicate simultaneously with each other. Runkehl/Schlobinski/Siever compare MUDs to online role games. Taking part in a MUD requires installation of special software. MUDs are usually played via *Telnet*, but there are also some Java-variants, that have become broadly accepted [Runkehl/Schlobinski/Siever 98]. When a participant enters a MUD, he takes on a chosen identity and keeps this. Participants in a MUD stay anonymous and can "hide" behind their character. Communication happens via text messages, graphics or voice. Doering gives a detailed overview of characters and their capabilities within MUDs [Doering 97].

Conferences are suited best if information needs to be exchanged between a couple of people who simultaneously want to be able to discuss. There are telephone conferences and video conferences. Within telephone conferences telephone channels are connected to each other. This enables all participants to talk to each other. Nonverbal language is not transmitted within this setting. Transporting non verbal signals within CMC is quite difficult, but video conferencing technologies are a possibility to send these signals over great distances. Special hardware and software is required in order to participate in a video conference (e.g. camera, software etc.). Desktop conferencing is the extension of video conferencing and enables participants to hold conferences from their own computer work place. According to Kerres, when using this technology, it is important to consider the fact that the user/participant may still have difficulties contacting someone via this medium and will most probably consider it to be not as natural as a face to face setting [Kerres 01]. An overview of how these synchronous communication possibilities can be implemented is described by [Kruse/Keil 00].

5.1.5 Advantages and disadvantages of computer-mediated communication

New forms of information technology have the intention to improve efficiency and effectiveness of communication. CMC has a large impact on communication in general, for it opens many new opportunities for communication. These technologies have the potential to radically change the way people communicate with each other. Physical limitations, such as geography or chronology associated with face to face communication, can be removed by CMC. "Chronological constraints are overcome as members are allowed to contribute to a discussion at different times. A single discussion can span days or months and traces of previous entries can be reviewed." [Drake/Yuthas/Dillard 00, 50] These and other effects can be positive or negative. An overview of the main concerns and advantages of electronic communication is given in this section. This overview is not intended to provide an exhaustive list of all existing advantages and concerns; it is limited to the most relevant ones.

Technology itself can be a barrier for participation. Learners who do not have the capabilities nor needed hardware will not have access to electronic communication. Especially for inexperienced people it is difficult to develop trust using the new medium [Frank/Suhl 03]. "With the vast information resources available, users can experience information overload if they lack programs to manage this new information." [Drake/Yuthas/Dillard 00, 51] Further concerns related to online communication are self exploration, privacy issues, participation of students and faculty, confidentiality and conflicts [Aitken/Shedletsky 02]. Many of the negative aspects of online communication can be led back to the reduced amount of communication channels, as described in the channel reduction model (see chapter 5.1.3). Communication problems occur when a medium with low social presence is used in situations that call for a high degree of social presence. Making acquaintance to new people, trying to solve conflicts or trying to rate reactions of someone are exemplary situations for this.

As shown in the simulation model the possibility to create and take on false identities leads to anonymous communication. Additionally, due to the missing nonverbal language interpersonal interaction can develop towards and support a norm neglecting, hostile, antisocial behaviour – called flaming (see [Krotz 98], [Graef 97]). Flaming is the most mentioned online conflict. Flaming is "[…] when individuals exchange hostile or insulting remarks" [Aitken/Shedletsky 02, 330]. The computer creates a distance which makes some people feel their verbal abuse of others is justified. In order to avoid flaming conversation rules have been introduced – the so called "netiquette". However, empirical studies show that "speech" used within CMC has become less emotional. Symbols, abbreviations and emoticons can only compensate this partially [Sassenberg 00]. Limitations in time also create boundaries in communication when the communication partners do not have enough time to keep the typed conversation going.

Electronic communication omits the personal relationship and nonverbal messages included in every traditional communication process (see [Paechter/Schweizer/Weidenmann 99^{WWW}], [Drake/Yuthas/Dillard 00]). More attention is given to the tasks than to the social needs. Feeling alone in the virtual space is a common phenomenon resulting as a consequence. While verbal conversations contain many conventions that have grown traditionally, e.g. avoid interruptions or dominative speaking, electronic communication lacks conventions. Furthermore, even when intending a friendly message, choppy sentences or lack of personal contact can cause the receiver of a message to interpret it as careless [Drake/Yuthas/Dillard 00]. Stegbauer believes that misunderstandings are numerous within CMC because of the missing personal and situative contexts. This influences the interaction possibilities – these are reduced, because direct reactions, e.g. interrupting or asking questions are not possible [Stegbauer 01].

Within university settings probably the main obstacle to overcome is to develop and implement an adequate technological infrastructure [Hesse 98[WWW]]. Empirical reports often show problems with the technological realization of communication [Schmidt/Grothe 01[WWW]].

In chapter 5.1.2 the characteristics of CMC are described by Carnevale/Probst. From these characteristics speed, anonymity and access are the main potentials of CMC. The *speed* is of advantage because the digital transmission via the internet accelerates the speed of interaction across large distances and between different time zones – while also decreasing costs (see [Runkehl/Schlobinski/Siever 98], [Kleinsteuber/Hagen 98], [Carnevale/Probst 97]). *Anonymity* of an online environment can limit and promote communication. The positive aspect of anonymity describes that annoyance of certain people can be reduced because of the unknown identity of the receiver. The unproblematic *access* of communication environments is a factor which positively influences communication between individuals. Another advantage is that the participant can access the information when he is ready – not at a designated time. Individuals have the possibility to mediate their opinions and ideas to many other people [Carnevale/Probst 97]. Flexibility concerning time and place is a special advantage of CMC. This makes it possible to communicate at most any time of day, independent of the recipient's presence (see [Koehler 99], [Graef 97]).

Electronic communication can enhance authenticity of conversations through increased accountability. Anything "said" can easily be retrieved (if the technological framework allows it) and the person can be made responsible for it. This feature can ensure trust, because all parties involved in the communication know it can be retrieved. Furthermore, it can make sure, that messages are read and reciprocated. Participants may take more time to think about and respond to statements than in face to face settings. This is especially useful to those who do not have strong debating skills or personalities. It takes more time to write messages than typing them but typed information can be scanned more quickly, thus enabling CMC to provide an adequate background e.g. to enable a new participant to enter a discussion [Drake/Yuthas/Dillard 00].

The following table highlights and compares the main success factors described in literature. For clarity reasons this is done in a tabular form.

Table 5.1-2: Comparison of success factors of traditional and virtual communication

Comparison of similarities and advantages of characteristics of virtual and traditional communication	
Traditional communication	**Virtual communication**
Similarities	
▪ Feedback and metacommunication are possible[107] ▪ Use of communication rules[108] ▪ Moderator or leader of a group can abuse their authority and apply pressure on participants[109]	
Advantages of traditional communication	*Advantages of virtual communication*
Due to the multi-channels more nonverbal messages can be exchanged[110]	More opinions are given than within face to face communication[111]
Verbal communication delivers messages quicker[112]	More statements are made concerning the process of communication (metacommunication)[113]
No disturbances between statements. Immediate feedback/reactions of the communications partners[114]	Cognitive resources (e.g. for mimic and gesture) can be neglected and full concentration can be dedicated to the main task[115]
No costs for technological transfer of communication (as within CMC)[116]	The digital accelerating lets an exchange of information overcome time and place barriers quicker, than text based traditional communication[117]
Utilization of more arguments and explanations possible than within CMC[118]	The anonymity allows people to create a certain self-portrait towards others[119]

107 ([Schulz von Thun 01], [Frindte 01], [Watzlawick/Beavin/Jackson 00], [Doering 99])

108 ([Sader/Schwenkmezger 02], [Doering 99], [Runkehl/Schlobinski/Siever 98])

109 ([Kerres 01], [Sassenberg 00], [Reinmann-Rothmeier/Mandl 96])

110 [Krippendorf 94]

111 [Sassenberg 00]

112 [Sassenberg 00]

113 [Sassenberg 00]

114 [Burgoon et al. 94]

115 [Sassenberg 00]

116 [Krotz 98]

117 [Kleinsteuber/Hagen 98]

118 [Frindte 01]

119 [Thiedeke 00]

Comparison of similarities and advantages of characteristics of virtual and traditional communication	
No information overflow, as within CMC, because within face to face communication participants communicate synchronously and only relevant information is asked for[120]	Exchanging information is possible without time and place barriers[121]
	Content of communication can be saved within databases to maintain them for a long period of time[122]
	Information on social status is not transferred automatically within CMC – this benefits an increased information exchange[123]

5.1.6 Summary

The channel reduction model and the reduced social cues model show that through missing possibilities of personal expression e.g. mimic, gesture, and tone of voice CMC can lead to limitations concerning interactivity (see [Doering 99], [Spears/Lea 92]). This demonstrates that a medium must have those characteristics in order to enable clear and precise communication between the communication partners (see [Koehler 99], [Hoeflich 96]). In order to integrate these into CMC the characteristics of the medium and the potential of technology can be extended by software (e.g. audio-visual transfer options). Making use of these technologies is also subject to the competences of the user. Someone with experience concerning media can use electronic communication systems better and can thus communicate more efficiently. These people will consider chat and e-mail communication as more lively and rich because they can keep the communication flow upright [Doering 99]. For successful online communication it is also important that those people involved in the system are reliable.

New technologies open new forms of communication. IT can potentially enhance learning by offering possibilities of enriching learning experiences. It can do so by allowing learners' needs to be met. "In the case of cooperative and constructivist learning, advanced IT (groupware and the Internet) may offer the means to deliver meaningful management education." [Parent/ Neufeld/Gallupe 02, 4] However, they carry potential risks. Risks can be: misunderstandings or distrust. When integrating new technologies their suitability to the different goals and tasks as well as their impact on interpersonal relationships need to be regarded. "Conversely, they may

120 [Pelz 95]

121 [Graef 97]

122 [Pelz 95]

123 [Sproull/Kiesler 91]

achieve unanticipated benefits if users creatively adapt them to meet their own and their organization's objectives." [Burgoon et al. 00, 49]

One aspect which keeps returning in state of the art literature is the disadvantage of CMC due to the lack of nonverbal communication. Communication is subject to certain rules, and every communication partner is indirectly obligated to stick to those rules. CMC omits some of these rules. For example within a chat conversation it is possible for one participant to simultaneously communicate with another person, without the other participant knowing. A basic, unwritten rule of communication is that one does not communicate with another person, while he is in a one on one conversation. Rather he should focus all of his energy on the conversation he is involved in. Krotz states that behavior like this leads to insecurity within CMC [Krotz 98].

In accordance to Drake/Yuthas/Dillard and Briggs/Nunamaker/Sprague this chapter closes with the note that research on IT and CMC still remains in its infancy. There is almost no research done concerning the consequences of implementing new technologies. Seemingly, online communication is a double-edged sword. On the one hand it has the possibilities to provide support for traditional communication. At the same time, however, it provides new and serious restrictions. "The detrimental possibilities in some respects mirror the positive attributes." [Drake/Yuthas/Dillard 00, 58] There are still many unanswered questions due to the fact that consequences of IT on communication are largely context-dependent. When deciding to use CMC, it is important to take the special characteristics of the setting, environment, target group and their prerequisites etc. into account (see [Drake/Yuthas/Dillard 00], [Briggs/Nunamaker/Sprague 98]). The combination of face to face and CMC communication enables a learning process to profit from the advantages of both – this is similar to the concept of blended learning, which was described in chapter 2.2.6.

When designing and adopting new communication technologies it is important to consider their impact on communication processes and outcomes. These communication processes have great influence on virtual collaboration, also called virtual teamwork. Collaboration was described as one of the six main characteristics of the case method. When designing the WBCM this feature must also be facilitated in a web-based approach. In order to do this, theoretical ground rules of collaboration and teamwork, as well as essentials of virtual teamwork must be considered. Theoretical basics of traditional as well as virtual teamwork are illustrated in the next chapter.

5.2 Collaboration within e-learning

Work capacities are often too large to be handled by one individual. Therefore, it is necessary to form teams. Another motif to create teams is that some competences can only be acquired by working in groups. Virtual teams are an advancement of traditional teams. The main difference lies in the communication form. In accordance to chapter 5.1 this section also begins with an

overview of traditional teams in chapter 5.2.1 before focusing on the definition and characteristics of virtual teams in chapter 5.2.2. Variants of teams are then explicated in chapter 5.2.3. Because the factor communication is *the* factor which differentiates traditional from virtual collaboration this is the focus of chapter 5.2.4. Success factors of virtual teams are described in chapter 5.2.5 and an overview of strengths and weaknesses is given in chapter 5.2.6. The differences between traditional and virtual teams are explicated in chapter 5.2.7. These descriptions close this chapter.

5.2.1 Introduction to teams

The terms "team" and "teamwork" have become "buzz-words" within recent developments [Bay 98, 15]. Despite frequent use of these terms in colloquial as well as scientific contexts, a uniform and precise definition of the terms is missing. Colloquially the term "team" is often equated with "group" without a conception of the characteristics[124]. Within economical practice there are also varying rough conceptions of the term. [Rees 01, 17] describes a team as "two or more people who work collaboratively to make something happen" (for similar definitions see also [Sader/Schwenkmezger 02], [Frindte 01], [Francis/Young 98]). This understanding is not sufficient for scientific requirements. Literature contains a wide variety of definitions. Therefore it is advisable to aggregate these and define common characteristics of varying definitions. Foster conducted a content analysis of 20 different definitions of the term "team" and isolated five characteristics [Foster 78, 17]:

- A small function-oriented working group
- with a common goal,
- intensive reciprocal relationships,
- a pronounced distinctive sense of community and
- strong group-cooperation (cohesion) between the team members.

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[124] Frequently the emphasized sense of community within a team and the intensive mutual relationships between the members clarify the difference between team and group. Therefore every team is a group, but not every group is a team. A group is understood in the sense of an organizational affiliation while team emphasizes the crew spirit. Teams are more productive than groups. For a detailed comparison and demarcation of the terms "team" and "group" see [Francis/Young 98, 20], [Katzenbach/Smith 93, 31] and [Zimbardo 92]. Other authors do not differ between these terms (see [Kauffeld 01, 14], [Antoni 00], [Bay 98], [Guzzo 96, 9]). [Bay 98, 17] determines that there are simply teams with varying degrees of maturity. This describes differences in the cohesion and the mutual relationships. This understanding emphasizes the process character of team formation and development. Even though complete congruence is not assumed the differences in the terms are not relevant for the further structure of this thesis. Therefore the terms "teams" and "working group" will be used synonymously.

Virtual teams who work together on the same task are also considered to be teams when they fulfill the above mentioned requirements.

The term "teamwork" also does not have one comprehensive definition. However, characteristics exist which can be consulted in order to clarify the term. The substantial characteristic of teamwork is the synergy-effect on achievements of individuals. According to Francis/Young teamwork-characteristics can be differentiated according to the attributes: achievement, dynamics, structure and climate [Francis/Young 98]. Descriptions of these attributes are given by: [Rees 01, 32], [Lumma 00, 24ff.], [Haug 98, 16], [Katzenbach/Smith 93, 78].

Depending on the author optimal team size is described between 2-25 people. For a very detailed discussion concerning advantages and disadvantages of group sizes see (see [Belbin 96, 141] [Katzenbach/Smith 93, 72]).

There are many types of teams with varying goals, structures and focus on specific characteristics. The following table gives an overview, which does not claim completeness.

Table 5.2-1: Overview of team types ([Kauffeld 01, 16])

- Task Force Teams	- Production Teams
- Problem-Solving-Teams	- Maintenance and Repair Crews
- Quality Circle	- Research and Development Teams
- Productivity Action Teams	- Product Development Groups
- Multidisciplinarity Teams	- Planning Commissions
- Multiskilled Teams	- Negotiating Teams
- Semiautonomous Work Groups	- Medical/ Surgery Teams
- Management Teams	- Cockpit Crews
- Committees	- Instructor Teams
- Employee Involvement Groups	- Delivery Crews

A classification of teams according to "life span of a team" and "organization identity" is given by [Bay 98, 19][125].

[125] Teams can't be simply put together, they need time to develop. Traditional groups and teams go through different developmental phases until they reach the peak of their performance. Details concerning team development

Success factors of traditional teams

In order to be a successful team certain criteria need to be considered. Numerous authors name and describe success factors for teamwork. This thesis focuses on the success factors according to Francis/Young because their model is in greatest detail, and combines many of the success factors other authors determined. They name 12 factors which influence the success of a team [Francis/Young 98]. These are given in the following table and then explicated.

Table 5.2-2: Success factors of traditional teams

- Leadership	- Working methods
- Qualification	- Organization
- Commitment	- Criticism
- Climate	- Personal advancement
- Level of achievement	- Creativity
- Role within the organization	- Relationship to other group members

Leadership: The team leader needs to work together closely with his team and give his new team members the appropriate amount of time to develop. Either the boss or any other team member can be the team leader. Leading a team can be done in various ways, depending on motivation, knowledge, and competences of the team members.

Qualification: Team members have the appropriate qualifications needed for the work within the project. There is an equal amount of talent and personality. Talents need to be spread across the members in order to distribute the activities according to ability. Strengths of the team members need to be recognized in order to integrate them into the goals of the project.

Commitment: The team develops a common way of thinking within the community. Each member is willing to contribute and invest into the structure of the teamwork and to support the other

processes are described by [Schneider 96, 100] and [Bay 98, 26]. Roles within teams describe patterns of behaviour which emerge when team members interact with each other (see [Recklies 01[WWW]], [Belbin 96, 205]). Belbin outlines nine possible team roles. An overview of these roles containing tasks, characteristics and strengths is given by [Belbin 96, 103], [Recklies 01, 1[WWW]] and [Belbin 03[WWW]]. According to Belbin it is aspired to obtain a balance of roles within a team. However, there is no "recipe" for the optimal combination of team members and during the working process team members can learn missing competences. Leading a team is a very complex task. Which leading style is to be chosen always depends upon which phase of team development the team is in. Further information concerning leading styles are given by [Guendelhoefer 01, 117], [Antoni 00, 72], [Staehle 99], [Wunderer 92], [Hersey/Blanchard 77]. The topics addressed within this footnote are not focused on in greater detail in order not to go beyond the scope of this thesis.

team members. They identify themselves with the team and represent this to people who are not involved.

Climate: The members feel well and enjoy working in the team. They trust each other and can communicate in an open way. The relationships within the team become more and more personal and a "we-feeling" evolves within the team.

Level of achievement: Everyone tries to keep pre-defined goals. To enable this it is important to clearly define the goals in advance. This also enables the members to identify themselves with the goals. Achievements of the team are to be judged and rewarded as a whole. This clarifies it to every member, that personal achievement within the team is rewarded. This way team members are motivated to contribute even more to the team.

Role within the organization: The team is merged into the organization and has a clearly communicated function. This has to be done consequently, otherwise the team leader might try to protect the interests of the group and thus behave in a rejecting way towards the organization.

Working methods: Co-workers try to solve problems by working systematically, effectively, and practically. Decisions are made by one or all of the members. The more members are integrated into decision making processes, the more difficult these become.

Organization: The roles of the team members are clearly defined. The flow of information is clear and functions properly. Each member knows what contributions are expected of him. All relevant information is exchanged throughout the members.

Criticism: Team members talk openly about their strengths and weaknesses in order to learn from their mistakes. They are fair and can do without personally attacking someone. This increases co-operation and achievement of the team.

Personal advancement: Each member is ready and open for new experiences. Each member continues to develop and this keeps him open and curious for everything that is still to come. Attention is devoted to continuously increase qualifications and strengths of team members.

Creativity: The team tries to create new ideas and to support innovate risks. Ideas are taken up and converted accordingly.

Relationship to other group members: There are relationships to other groups in order to maintain an optimal cooperation. Contacts to other teams are maintained.

The next section focuses on strengths and weaknesses of a team.

Strengths/Weaknesses of a team

Working in teams often causes synergy-effects. Synergy means, that the results of a group are not the added amount of single achievements. What is more, it means integration and coordination.

It describes the results as being something new, which has not been there before [Antoni 00]. By forming teams it is easily possible to use the knowledge of each member, and the knowledge potential of the group as such is much greater than that of a single person. Group members can learn from each other and increase their knowledge. Innovation and creativity of each team member is increased by working in the team. It is more effective because work can be split up. This makes it possible for a team to flexibly adjust to occurring problems. The risk of making wrong decisions is minimized because team members can look at problems in a more objective way, than single people [von Rosenstiel 00]

Aspects concerning the organization of teams can be very time consuming, especially concerning the plan for the project and the meetings needed within it. Appointments have to be made, and information has to be passed on to each other. It often takes longer to make decisions in a team than it does for a single person. If the project is fairly short this can lead to problems [Schneider/Knebel 95], e.g. if different members have different opinions of the goal of the project. This can happen when goals and expectations are not clarified within the planning phase. If team members can not agree on one goal it can lead to less achievement. It is not possible for each team member to contribute his personality into the project at every time. This may cause a feeling of not being successful. Believing that someone else contributes more to the team than oneself can lead to feelings of competition. This also decreases the entire achievement of the team. Unclear defined responsibilities can cause team members not to feel responsible. Everybody counts on the others to complete the task, and the task does not get done. Pressure due to a short amount of time can cause problems in the coordination of teams. Meetings are often perceived as a waste of time (see [Pohl/Witt 00], [Haug 98]. A study conducted by [Akademie 02[WWW]][126] identified the following top 12 reasons for failure of teams.

[126] Within this study 376 high-level personnel out of differing branches within Germany were interviewed. The results of this study are downloadable: [Akademie 02[WWW]].

Table 5.2-3: Reasons for failure of teams

Rank	Reason	Percent
1	Communication difficulties	97,0%
2	Unclear task	94,3%
3	Missing cooperation structure	91,0%
4	Unexpressed conflicts	90,2%
5	Missing trust	90,2%
6	Fights for power	87,8%
7	Ineffective team meetings	84,8%
8	No team calendar	79,6%
9	Dominating personal interests	69,2%
10	Unclear hierarchy	56,9%
11	Open conflicts	52,9%
12	Not enough time	47,8%

Solutions for weaknesses

The team tries to avoid unnecessary conflicts. This is why the planning of projects is very important. The planning phase integrates all agreements and rules which apply for the project. Goals and expectations of the project are to be clarified and given an appropriate amount of time. Team members are to be chosen in a way that they can complement each other. The team leader needs to distribute responsibilities and working fields accordingly. Information exchange on a regular basis is important in order to keep every team member up-to-date and involved in the project. Every team member is to be integrated into decision making processes; at least they have to be informed about decisions made.

The team leader must be able to motivate his team members and to build up trust among each other. He is to clarify existing conflicts to the members, and he provokes solving the conflicts. Team members need to be able to communicate openly about conflicts. If necessary the team members need to be trained in how to solve conflicts.

After giving this overview of traditional teams the next section is concerned with a definition and the characteristics of virtual teams.

5.2.2 Definition and characteristics of virtual teams

The advancements in computer and communication technologies have lead to an increasing role of virtual teams and virtual teamwork since the middle of the 1990s. Virtual teams are not an electronic substitute for conventional teams. They are a new compilation created by multimedia technology but still consisting of real human beings [Scholz 02]. Opposed to traditional teams, virtual teams can work independently of time and location. For this purpose they use connecting networks which are enabled by communication technologies [Lipnack/Stamps 98]. Constructivist learning theories are an ideal foundation for virtual teams. Doering is convinced that learning in distributed groups prepares students for the forms of computer supported collaborative learning (CSCL) and work (CSCW) in future [Doering 99].

Similar to the area of traditional teams there are numerous definitions for virtual teams or teamwork. Lipnack/Stamps' definition is quoted quite frequently: "A virtual team is a group of people who work interdependently with a shared purpose across space, time, and organization boundaries using technology" [Lipnack/Stamps 00, 18]. Opposed to traditional teamwork face to face contact is missing. The virtual team uses communication technology to work without considering boundaries such as time, place and organization. Senst observes that differences in organization as well as culture and language lead to special developments and characteristics concerning heterogeneity within teams. He emphasizes that virtual teamwork describes the interdependent and committed working processes within a group of individuals, which follow a certain goal and overcome hurdles through the help of communication media [Senst 01]. This understanding underlies this thesis.

Lipnack/Stamps are of the opinion that virtual teamwork begins when team members are separated more than 50 feet from each other. According to this understanding three employees sitting in different areas of a building would already form a virtual team [Lipnack/Stamps 00]. Scholz considers this definition simplifies this matter too much. He supposes virtual teams must show the following features [Scholz 01]:

- The assignment of staff to determined working places is reduced.
- Virtual teams are based on self organisation.
- Virtual teams imply intensive interaction associated with regional distance, combined with individual and collective learning processes.
- Virtual teams use synergies, especially concerning the cultural heterogeneity of its members.

The differences between traditional and virtual teams are minimal, for traditional teams also use media, such as telephone or fax, to communicate with each other. Lenk describes his own set of characteristics for virtual teams, which are almost identical to the characteristics described in

chapter 5.2.1 by [Picot/Reichwald/Wigand 01] and [Grunwald 96] of traditional teamwork [Lenk 02]. *Essentially* virtual teams have the same characteristics as traditional teams do, supplemented by decentralization and adoption of electronic communication media. Therefore *basically* they do not differ from traditional teams [Konradt/Hertel 02, 17ff.]. Virtual teams are a specialized form of teams with modified conditions (see [Keiser 02], [Scholz 01]).

Dynamics are much slower in virtual teams compared to traditional teams. Mostly, this is due to the fact that written CMC is slower than the spoken word. Furthermore, it takes longer to find a consensus within CMC than in face to face interaction [Walther 00]. According to research done by Doering with virtual groups, these are the only negative aspects. Except for this critique groups enjoy working with the new medium. Teachers who support virtual groups must support their students more than in traditional settings. This is important to ensure that technological problems can be solved and to offer a continuous process of virtual communication. Teachers must give up their typical teaching role. They are moderators within this setting [Doering 99].

Within state of the art literature the term virtual teamwork is the prevailing term. Related terms are telecooperation and computer supported cooperative work (CSCW). Within this thesis the terms are used synonymously.

Working in a virtual team calls for diverse competences which also apply to traditional teams and were described in chapter 5.2.1. Duarte/Snyder describe six exemplary key qualifications for virtual teams which go beyond traditional teams [Duarte/Snyder 01]. These are shown in the following table:

Table 5.2-4: Key competences for virtual teams ([Teo/Bal 03[WWW]] see also [Duarte/Snyder 01, 126ff.])

Six additional competences for team members of virtual teams
Project management
▪ Planning and organizing individual work to correspond to team schedules ▪ Developing and using methods to report progress and problems ▪ Monitoring and controlling costs ▪ Taking actions to get back on track ▪ Documenting and sharing individual learning
Networking
▪ Knowing the organizational landscape and who is in it ▪ Knowing what questions to ask to get the others' perspectives ▪ Maintaining guidelines about when to see people face to face, when to send them messages, and when to avoid them altogether

The use of Technology
▪ Using the appropriate technology to communicate, co-ordinate, and collaborate, given the backgrounds of the other team members ▪ Knowing how to access training or help with new technologies ▪ Knowing the etiquette of using technology ▪ Knowing how to plan and conduct remote team meetings
Self-Management
▪ Skill in establishing personal and professional priorities and goals ▪ Skill in prioritizing work and setting limits ▪ Skill in creating and executing opportunities for individual learning and growth ▪ Skill in taking the initiative to change working methods and process to meet the demands of the work
Boundary Management
▪ Understanding how cultural perspectives influence work and collaboration ▪ Understanding how differences in national, functional and organizational culture impact working styles, team interactions, team-members' expectations and team dynamics ▪ Being sensitive to differences in business practices in different parts of the world
Interpersonal Awareness
▪ Being aware of interpersonal styles and their impact on others ▪ Collecting feedback on one's interpersonal style from other team members and providing them appropriate feedback on theirs ▪ Being able to plan experiences that lead to improvement

Virtual teams possess higher prerequisite specifications than traditional working groups. Besides technological skills in order to use groupware infrastructure soft skills are especially important e.g. communication abilities. Keiser points out that under certain conditions these must be developed in order to accommodate the adapted demands [Keiser 02, 174].

Leading virtual teams calls for certain competences. This topic will not be explicated. But the following literature is referenced for information concerning special characteristics of leading virtual teams: [Konradt/Hertel 02], [Scholz 02], [Picot/Reichwald/Wigand 01].

The next section gives an overview of variants of virtual teamwork.

5.2.3 Variants of virtual teamwork

Duarte/Snyder differ between seven different kinds of virtual teams [Duarte/Snyder 01]. The following table gives an overview of these teams.

Table 5.2-5: Types of virtual teams ([Teo/Bal 03WWW] see also [Duarte/Snyder 01, 4ff.]).

Type of team	Brief description
Networked teams	Consist of individuals who collaborate to achieve common purpose. Such teams frequently cross time, distance and organizational boundaries. Membership is diffuse and fluid, with members rotating on and off the team as their expertise is needed.
Parallel teams	Carry out special assignments, tasks, or functions that regular organisation does not want or is equipped to perform. Such teams frequently cross time, distance, and organizational boundaries. It has distinct membership that identifies it from the rest of the organisation. The members typically work together on a short-term basis to make recommendations for improvement in organizational process or to address specific business issues.
Project or product-development teams	Team members conduct projects for customers for a defined period of time. Such teams also cross time, distance, and organizational boundaries. Their tasks are usually non-routine, and results are specific and measurable. They exist longer then parallel teams and have a charter to make decisions, not recommendations. Membership is inconsistent but is more clearly delineated from the rest of the organisation.
Work or production teams	Perform regular and ongoing work. Such teams usually exist in one function. Membership is clearly defined and can be distinguished from other parts of the organisation. The teams begin to operate virtually and across time and distance boundaries.
Service teams	Are now to be distributed across distance and time. The teams work on rotating basis so that one team is always operational, providing 24 hours service. Each team works during its members' daylight hours, transitions work and problems to next designated time zone at the end of the day.
Management teams	Can be separated by distance and time. These teams are often cross national boundaries but they almost never cross organizational boundaries.
Action teams	Offer immediate responses, often emergency situations. They cross distance and organizational boundaries.

This categorization is one possibility of a variety of categorization possibilities. Teo/Bal give an overview of the most important Anglo-American representatives [Teo/Bal 03[WWW]]. Classifications which focus exclusively on application of communication technologies should be neglected. This omits the real concept behind teams. Konradt/Hertel identify four central aspects in order to differentiate between varying kinds of teams [Konradt/Hertel 02]:

- Degree of autonomy and hierarchy: from hierarchic leadership structures to complete self organization, where every member can take on leadership tasks.
- Perspective of time: from temporary co-operation until reaching short term project goals to long-term, strategically motivated cooperation.
- Perspective of demarcation: from clear boundaries of the team and explicit affiliation to a replacement of members according to demands and boundaries beyond organizational units.
- Complexity: from members of similar occupational areas within the same organization to completely different occupational areas, language areas and cultures.

The aspect complexity is closely connected to structure of roles and competences within a team. The statement that virtual teams generally do not differ from traditional teams presupposes that role allocations are also not significantly different. Principally the model developed by Belbin is applicable to virtual teams. However, there are special features within virtual teams [Belbin 96]. Lipnack/Stamps describe that members in virtual teams often have to fulfill several roles simultaneously and switch between roles, due to dynamics in virtual teams. Understanding of roles needs to be much clearer due to the missing face to face contact. However, it is difficult to accomplish this because of decentralization aspects and self-organization. Risk of conflicts in/between roles is larger than in traditional teams [Lipnack/Stamps 00]. Duarte/Snyder regard the balance between autonomy and coordination and cooperation as largest problem of role distribution within virtual teams. On the one hand team members must accomplish certain tasks independently, thereby taking in leadership functions; on the other hand they must also coordinate the team as a unit and cooperate with the other team members as well as with external partners. Team members of virtual teams have more power than in traditional teams [Duarte/Snyder 01].

Another special feature of virtual teams is directly related to the implemented communication technology. Young colleagues, who have know-how concerning these technologies advance to experts, expert "old-timers" find themselves offsides. Uncertainty concerning status and self-esteem develop. These are often displayed as resistance against technology [Hermann/Meier 02].

Generally it can be stated that role structure is more complex within virtual teams than in traditional cooperation forms. Asynchronity, missing face to face contact and dynamics concerning

role allocation combined with the empowerment complicate clear understanding of roles [Bell/Kozlowski 02]. The factor communication is more complex in virtual teams than in traditional teams. Therefore, it is the focus of the next chapter.

5.2.4 Communication in virtual teams

Communication is *the* criterion which differentiates virtual from traditional teams. Per definition virtual teams use communication media in order to work together despite of time and place barriers. Starting point to overcome is the distance. Often this results in decoupling aspects of time. Without a communication medium virtual teamwork would be impossible.

In general the communication volume seems to increase in virtual teams compared to traditional teams. This is often due to leaner hierarchies. Lean hierarchies also lead to more balanced communication volume than in traditional teams (see [DeSanctis/Monge 98[WWW]], [Henry/Hartzler 98]). Additionally, the change of tasks, roles and responsibilities leads to an increase in communication efforts. "Virtual Teams are required to overcommunicate" [Henry/Hartzler 98, 85]. This overcommunication is also caused by the limitations of communication channels. Nonverbal communication must thus be transmitted verbally. In general virtual communication is rated as less rich than face to face communication (see chapter 5.1.3).

Doering and Seitz believe that learning in a virtual team is an intensive way to learn (see [Doering 00], [Seitz 95]). By presenting results to other team members in the WWW learning which takes place is very intense. One characteristic of a virtual team is that it has much more freedom, than traditional teams have. This becomes especially clear when looking at the organization and coordination of learning and working processes. Learning can happen in a mostly self steered way. This means that a team plans and realizes learning steps on its own. Team members can work, not regarding time and place. E-mail is the most commonly used form of communication within virtual teams. Mailing lists, newsgroups and the WWW are also used intensely. Synchronous communication per chat does not play such a large role, for members of virtual groups tend to work within their own rhythm concerning time [Doering 00].

Nonverbal messages can not be sent in virtual teams. Virtual teams can not copy the processes of traditional communication. This makes communication within virtual teams more difficult than within traditional teams. A motivating smile or an uncomplicated private chat in a break can not be transferred onto the web. Still, these signals are often very important for the teambuilding process and for the creation of a personal atmosphere between the team members. One way to compensate this deficit is to integrate traditional presence phases into virtual teams. This is important to strengthen personal contacts and to help the team members build up trust for one another [Robbins 01].

A short summary of effects of virtual communication on communication in teams is described within the following table:

Table 5.2-6: Major results of electronic communication on virtual teams (according to [DeSanctis/Monge 98[WWW]])

Major effects of electronic communication on virtual teams
1. Communication volume and efficiency
In electronic communication settings, volume tends to increase and efficiency tends to decrease.
2. Message understanding
Message bias decreases but comprehension is more difficult. Impression formation takes longer. Social context is critical.
3. Efficiency of virtual tasks
Some tasks are performed less effectively when done electronically, for example consensus formation.
4. Lateral communication
Broader, more diverse participation is likely due to less domination and hierarchy in electronic communication (though these are not entirely eliminated).
5. Norms of technology use
Styles of technology use emerge in individuals, groups and organizations.
6. Evolutionary effects
Impressions of others, impression management and the degree and type of relational communication all change over time. Interpersonal relationships deepen. Norms develop.

Characteristics mentioned so far are almost exclusively occupied negatively. To draw the conclusion that virtual communication in virtual teams is not efficient would yet be too early. Senst examines the reasons communication problems in distributed working groups occur. According to Senst these are [Senst 01]:

- absence of social presence,
- defective communication of collective knowledge basics,
- difficulties concerning the interpretation of meaning of messages,
- difficulties concerning the interpretation of communication styles,
- unequal distribution of information,
- information overflow of the team members,

- missing reference of exchanged messages (context),
- missing group coordination.

Many implications concerning virtual teamwork result from this. Many of the itemized problem areas can be avoided by fairly simple procedures. Senst recommends the development of communication norms, which basically apply to the following areas:

- Reachability of the members
- Meaning of messages
- Behaviour during conferences
- Information sharing.

Aitken/Shedletsky found that their college students enjoy the nature of online discussion [Aitken/Shedletsky 02]. They portray, that students participating in online discussion groups gain greater self-acceptance and learn new skills – just as they would within a traditional discussion setting. They outline course interaction within their web-based courses as being comparable to traditional courses. "The online discussion is embraced by some students and ignored by other students. Online discussion brings out good things in some students who otherwise would not speak up. Some students prefer to talk in face-to-face class settings. Some students do little to contribute to the online discussion, citing everything from access issues to time problems. Online discussion, however, does enable equity for all students to contribute. The method can work: Students can learn and demonstrate their learning through online discussion." [Aitken/Shedletsky 02, 331] Furthermore, they find chat and instant messaging less useful for group interaction than e-mail or discussion boards. Discussion via discussion boards and e-mail allow more serious discussion than does online chat. What is more, Aitken/Shedletsky report that through online discussions their students have been able to develop a sense of belonging and connection. "This sense of community may be essential to the disconnected students taught by distance education." [Aitken/Shedletsky 02, 331] Further success factors are focused on in the next section.

5.2.5 Success factors for virtual teams

Success factors of virtual teams are more diverse than those of traditional teams. All of the success factors mentioned in chapter 5.2.1 concerning traditional teams also apply to virtual teams. Success within a virtual team is very important, because this may decide about future projects. In order to have successful teamwork the success factors of traditional teams are extended by the following factors:

- Choice of project
- Team compilation

- Cooperation
- Communication/Coordination

Choice of project: Choosing the right project for virtual teamwork is very important. Choosing a project which is not suited for virtual teams should not be chosen just in order to try out virtual teamwork. This usually leads to projects that fail and frustrate all participants. Typically, this is the last attempt to implement virtual teamwork. Only successful projects can lead deciders to implement this way of working more [Lenk 02].

Team compilation: Teams are usually compiled according to their competences. Teams recruit each other according to their experiences, competences, knowledge, etc. Within virtual teams every member must fulfill a minimum of factors such as team identity, satisfaction, initiative, ability to make decisions, etc. in order for the team to function [Lehmann/Hertel/Konradt 01^{WWW}]. Besides specialized knowledge within the field that is worked on, each team member should have further competences, to make a virtual team successful and to make work on the project effective. These are methodological, technological and social competences.

Cooperation: To enable cooperation within virtual teams rules concerning the process of working together need to be set. These need to be made and accepted by every team member in advance. Rules and norms give every member the feeling of security. Through these norms structures of behaviour develop. Each team member needs to have his role within the team [Lenk 02]. Each team member has to understand purpose and goal of the project. Everybody must to be able to identify himself with the project and sense that contributing to the team is of personal advantage. Because the team members only see each other rarely they must trust each other very much. Trust consists of fairness, integrity and reliability. This means that all partners are dependent on each other and can only reach the goal collectively. They need each other and act accordingly [Scholz 02]. Lenk believes that virtual teams should be fairly small, and not exceed seven members. This size still enables personal contact between all members. If teams are too large, chances rise that cohesion and satisfaction decrease [Lenk 02].

Communication: Reciprocal communication between all members must be supported. Tasks and decisions need to be conducted in a coordinated way. Team members must trust the implemented technology in order to use it. This trust can be built up e.g. through training courses.

One key factor for successful virtual teamwork is missing in this overview: trust. Without trust virtual teamwork is doomed to failure: "Trust is the key to virtual teams" [Lipnack/Stamps 00, 283] (see also [Duarte/Snyder 01, 139]). It is especially hard for virtual teams to develop this trust. If possible a face to face meeting should be arranged, before cooperation takes place, even if this may be very costly. Furthermore, face to face meetings should be called whenever it comes to changes in team members (see [Henry/Hartzler 98], [Haywood 98]). If this is not possible

resources for private communication should be made available. Regular online-meetings can be organized with no concrete working task in order to support "getting to know and trust each other".

These success factors show clearly that virtual teams can not be built up solely by technological infrastructure. Organizational, didactical and sociological processes are not supported by merely integrating technology – these factors need to be considered aside from the technology [Hampel 01]. Further advantages as well as disadvantages are described in the next section.

5.2.6 Strengths and weaknesses of a virtual team

Expectations placed into virtual teams are great: "They increase speed and agility and leverage expertise and vertical integration between organizations to make resources readily available. Virtual teams also lessen the disruption of people's lives because the people do not have to travel to meet. Team members can broaden their careers and perspectives by working across organizations and cultures and on a variety of projects and tasks" [Duarte/Snyder 01, 9].

Advantages described by Haywood are:

- increased productivity,
- increased employee satisfaction,
- less need for office rooms,
- better emergency readiness,
- closeness to customers,
- increased flexibility,
- better access to expertise.

Haywood has determined that perception of advantages is dependant on the position of the asked person. High-level personnel focus on aspects of costs, while team members concentrate on flexibility and independence [Haywood 98].

Beyond these advantages Konradt/Hertel identify further strengths [Konradt/Hertel 02]:

- maximal information supply,
- avoidance of breaks in media,
- reduced ancillary wages.

Virtual teams unite weaknesses of traditional teams together with further weaknesses which apply especially for virtual teams. Haywood determines that perceived disadvantages also differ ac-

cording to position. Managers perceive lacking control as one of the main problems, while team members focus on communication difficulties and lacking technological support.

Table 5.2-7: Differences in the perception of problems within virtual teamwork (according to [Haywood 98, 9])

Managers	*Team members*
▪ Control	▪ Communication
▪ Team building	▪ Technical support
▪ Cultural issues	▪ Recognition
▪ Cost and complexity of technology	▪ Inclusion vs. isolation
▪ Process and workflow	▪ Management resistance

The team is dependent on integrated technologies. If these are not safe, this can lead to safety- and coordination problems [Lehmann/Hertel/Konradt 01]. Lacking face to face contact between team members is substituted by communicating via electronic media. Communication through electronic media, however, is very rational and often neglects personal aspects. Missing personal aspects often lets motivation decrease. Members often feel isolated from each other. This encourages them to work alone, not sharing their results with the other team members anymore. This is why intrinsically motivated team members are crucial for successful virtual teams.

If teams are spread throughout diverse locations and some members are together at one location subgroups can develop. These people may feel as being one group within the team [Picca 02].

Another problem area which needs to be regarded is the occurrence of diverse cultures within one virtual team. Differences can be due to e.g. regional differences. Another problem which can occur is that due to time differences team members do not work together on the project in a synchronous way. This limits the amount of time which can be used for tasks which should be done synchronously [Scholz 02]. If the amount of identification with the organization or the project varies to a great extent between the members, this can also lead to difficulties [Picca 02]. Coordination problems concerning spreading of information and tasks may occur. Because virtual projects are not always present it is possible that the priority of these projects decreases. Further weaknesses are:

- additional expenditures for face to face meetings,
- less identification with the organization,
- dependency on information and communication technologies,
- increased risk of escalation in conflict situations,

- uncertainty in performance evaluation,
- reduced controlling possibilities.

A study conducted by the "Akademie 02" evaluated that of the 376 interviewed people 20% permanently and 42% temporarily work in virtual teams. The figure shows clearly that virtual teamwork is less liked than face to face cooperation [Akademie 02[WWW]].

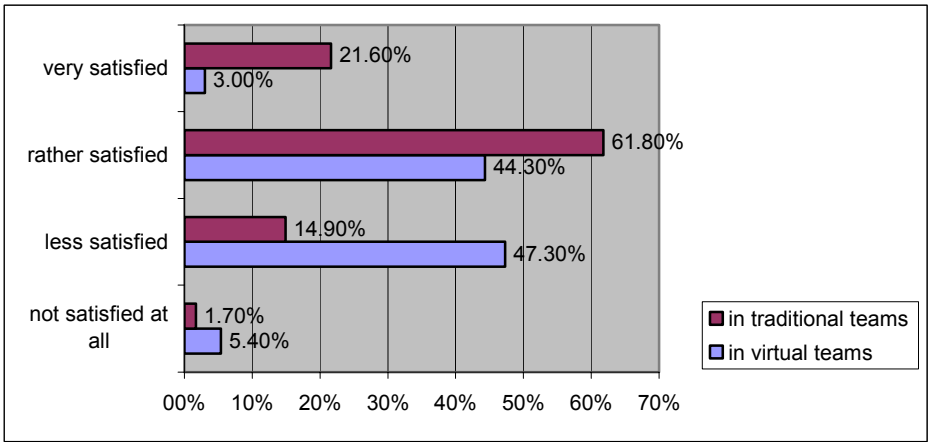

Fig. 5.2-1: Satisfaction within virtual and traditional teams ([Akademie 02, 19[WWW]])

The pointed out weaknesses show that on the one hand teams overcome boundaries but on the other hand they create new boundaries. These new boundaries are mostly due to technological issues and they structure the complete cooperation process. Virtual communication technologies result in the following restrictions:

- channel reduction of communication,
- asynchronous communication slows communication down,
- reduced personnel development handicaps the development of a social group structure,
- external restrictions, e.g. lack of time, lead to individual varying commitment in virtual communication and therefore to unbalanced information, and
- limitations of virtual social rooms.

Solutions for weaknesses

Possible solutions given for the problems within traditional teams also apply for problems within virtual teams. However, there are some more solutions to the problems, which apply additively to virtual teams.

At the beginning of a project it makes sense to integrate a face to face meeting. By doing this some problems will be solved even before they occur. Because the team members get to know

each other, it makes it easier for them to exchange information in later phases of the project. Motivating team members for teamwork can be done by offering certain bonuses to them. This supports each member to see his personal use of reaching the project goal. This helps him to develop initiative to interest him for the project. It also makes sense to train all the team members concerning the technologies involved. If they all have the same understanding of how the technology is to be used, and which information is to be inserted communication can be eased (see [Picca 02], [Lenk 02]).

5.2.7 Differences between traditional and virtual teams

Even though there are many similarities between virtual and traditional teams, there are also some differences. These differences are summarized within the following table, and then explicated within this section.

Table 5.2-8: Differences between traditional and virtual teams

Criteria	Traditional team	Virtual team
Responsibility of core competences	- Responsibility of team leader	- Responsibility of team members
Integration	- Retention of organizational principles - Hierarchical determination of team leader(s)	- Through visions and culture - Team leader is chosen by the team
Communication tools	- No participation within the choice	- Choice of the system done by the team
Organization development	- Can be understood as one unit - Function derived from the structure	- Continuous development processes
Diverse cultures	- Divergences are minimized	- Differences are used as advantage

In traditional teams the competences of the team members and their advancements are within the responsibility of the team leader. He knows what the organization wants and checks and develops the competences which are needed. Within virtual teams each team member is responsible to define and develop his competences on his own. Integration into a team differs according to whether it is a traditional or virtual team. Traditional teams hold on to organizational principles. A team leader is chosen in a hierarchic way, which implies that the team leader is chosen from

outside of the team. Team leaders within virtual teams are chosen, either externally due to suggestions or internally due to his competences. Traditional teams have almost no chance of deciding upon communication possibilities. Virtual teams test diverse procedures, and then choose the most promising ones. Scholz describes that a traditional team is organized in a different way than a virtual team. The traditional team can be seen as one unit. This function is due to its structure. The virtual team continuously changes and has no clearly defined end. Within virtual teams people from different cultures may meet each other. Traditional teams typically try to minimize these divergences or take all team members to one level. Virtual teams try to use cultural differences to their advantage. This is why they often address these differences and try to preserve these [Scholz 02].

Working in teams causes many problems and conflicts, e.g. organizing aspects such as planning, making appointments, meeting and making decisions. Even though the disadvantages appear in the greater number the advantages outweigh the disadvantages. From a qualitative point of view the advantages have a larger meaning than the disadvantages. Working in teams makes sense especially when the problems which are to be solved are very complex. Problems of this complexity are the ones learners are confronted with within the case method (see chapter 2.1.2). Therefore the implementation of teamwork is inevitable. Respecting the characteristics of virtual teamwork as well as mediating them to the participants is necessary to ensure a productive working environment. The following chapter discusses the design of the WBCM. This design is arranged according to the relevant characteristics of the CM which were compiled in chapter 4.2.

6 Conceptual design of the web-based case method

This chapter focuses on the conceptual design of the web-based case method. In chapter 2.4 this was declared as the main goal of this thesis. Beforehand the first step towards this goal in form of a requirement analysis was described in chapter 3 and the second step, namely the description of the characteristics of the case method, was explicated in chapter 4.2. Chapter 5 then described the two very important components communication and collaboration within e-learning. Their relevance for the conceptual design becomes especially clear within this chapter. Chapter 6.1 describes the structure of the web-based case method. Here an overview of the main determinants of this conceptual design is given as well as a description of the function of this conceptual design. Thereafter the conceptual design is developed according to the main characteristics of the case method. This determines the structure of chapter 6.2, chapters 6.2.1 to 6.2.6, correspond to the characteristics identified in chapter 4.2. Chapter 6.2.7 then summarizes this section and serves as a transition to chapter 6.3. For the description of the further structure of this chapter it is anticipated here that the key characteristics of the WBCM must be divided into two categories: general design principles and specific design principles. Reasons for this are specified in chapter 6.2.7. General design principles have a generally accepted character and will be integrated into every implementation of the WBCM. These design guidelines build the framework for the WBCM. This framework will remain predetermined and fixed. However, within this framework there is the need to form and adapt flexible elements. These flexible elements and their respective form will be referred to as the specific design. This specific design includes consideration of multiple external factors and thus must be designed anew for each specific setting. Within chapter 6.3 and 6.4 the specific design principles are deduced. This design focuses on the characteristics communication (in chapter 6.3) and collaboration (in chapter 6.4) and thus the structure in this chapter corresponds to chapter 5. At this point it is accentuated that the design of the specific characteristics is strongly dependent on the application scenario. Consideration of external factors leads to differing developments – depending on the respective setting. When including these external factors the design no longer remains general – and thus the results can not be transferred to further settings unless the influencing factors and demands are similar. Within this thesis the design focuses on a target group within the setting of the University of Paderborn out of the field of OR described in chapter 1.1.

6.1 Structure of the web-based case method

When wanting to implement e-learning in a successful way, it is important to consider the practices involved. Simply taking practices out of classrooms and implementing them onto the web will not guarantee successful e-learning. As Palloff/Pratt describe it, e-learning is considered to be a "new arena" and practices constructed for an "old arena" (the classroom) may not have the

same success within e-learning. The medium forces us to think in different terms in order to benefit and make use of its learning-enhancing features and pedagogical potentials [Palloff/Pratt 99]. Creativity and open minded thinking support generating new ideas and concepts. Creative ideas and suggestions made by experts, derivatives from literature as well as empirical research form the characteristics of the WBCM. Furthermore, the basics of the three components pedagogics, e-learning and the case method are regarded while constructing the WBCM. External, influencing demands are also considered while designing the characteristics.

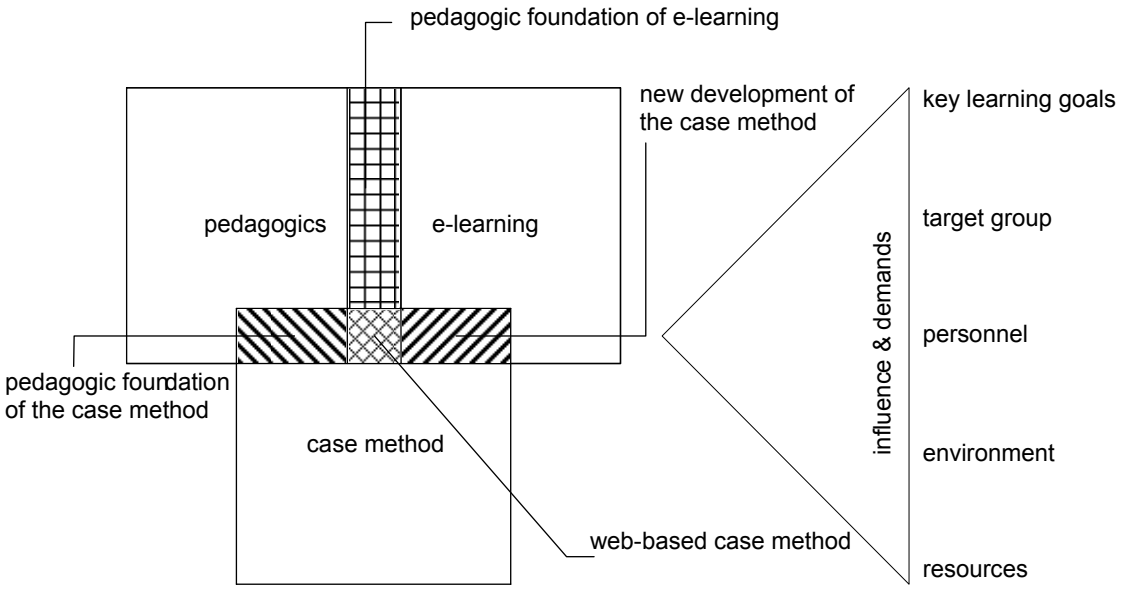

Fig. 6.1-1: Basic components of the WBCM including external demands

Within chapter 6.2 all six of the main characteristics of the traditional case method are (re-) designed in order to build the conceptual design of the WBCM. This redesign of the main characteristics ensures that the WBCM is designed in accordance to the main features of the case method defined in chapter 4.2. Consideration of each of these features ensures the systematic within the WBCM approach. The redesign of these characteristics is described through a pedagogical focus and where necessary it is supported by pedagogical methods. Once each of these characteristics is redesigned for implementation on the web it is possible for a teacher to design his own realization of the WBCM according to these characteristics. The case itself, as an instructional tool (see chapter 2.1.2) will still be used within the conceptual design of the web-based case method as well as the principles underlying the traditional case method described in chapter 2.1.3. The application follows the arrangement of a three phased work-through process, described in chapter 2.1.4 and within the characteristics: three-phased work-through process (see chapter 4.2.4.

The next chapter examines the general design principles of the web-based case method, structured according to the main characteristics.

6.2 General design principles of the web-based case method

This section describes generally accepted attributes for each of the six main characteristics of the case method. Therefore it has six further going subchapters, chapters 6.2.1 to 6.2.6, structured according to the six main characteristics which were described in chapter 4.2. The WBCM adheres to all of the main characteristics of the traditional case method. By combining these redesigned characteristics a uniform model of the WBCM is generated. Section 6.2.7 summarizes the results from the first six subchapters and thus serves as a transition to the next two chapters 6.3 and 6.4 which concentrate on the characteristics communication and collaboration.

6.2.1 Redesign of the characteristic: constructivism

The attributes learning theory, learning methods, learning goals and motivation characterize the case method from a learning theoretical point of view. The WBCM must inherit basic constructivist principles of these important characteristics.

The WBCM is constructed in the constructivist tradition. It offers learning which takes place in an authentic context and it promotes dialogue within the learning process. Connection to and usage of prior knowledge the students have is necessary in order to solve the given problems offered by the case. These factors correspond to constructivism (see chapter 4.1.3). Information technologies e.g. learning networks or the internet can embody the constructivist perspective very well due to their hypermedia structure. Individuals need to be able to steer their own learning processes. This steering possibility is embedded into the WBCM by offering additional, web-based materials to the case. The hypermedia structure of these materials, which will be explicated in chapter 7.4, enables free exploration and free navigation through the contents.

Individual perception, interpretation and construction processes as described in chapter 4.1.3 play an important role within the WBCM. Learner prerequisites are of special value when implemented into the learning process. Learners learn from each other and from their prior experiences. Advantages of the WBCM concerning the aspect of learning theories are that various learning strategies can be offered, and the learner chooses the one, which matches his learning style and level of prerequisites best. As within the traditional case method the learning situations are constructed in a fastidious way, so that they can not be solved by one person alone. Group work and collaboration become important.

The WBCM strives to reach a number of learning goals. Besides factual knowledge, the WBCM offers the opportunity to analyze, make decisions and actually formulate plans, thus training thinking, analyzing and structuring skills. As it was described in chapter 2.1.2 the cases used

within the case method describe real life applications. This also applies to the WBCM. Engagement into these scenarios teaches learners about actual business situations and thus supports their problem solving skills. When focusing on the context of OR it is important to emphasize that students studying this subject must attain competences in two areas. Students must gain knowledge and understanding of the OR tools[127]. This includes achievement of founded knowledge of all instruments as well as theoretical models of available solution possibilities. Additionally, the students must learn to implement these instruments efficiently. These abilities are trained by further going learning goals of the WBCM: problem definition, problem formulation, modeling, data analysis including statistical preliminary work, design of solutions, validation and verification, interpretation of results, questions concerning conversion with consideration of behavior-specific aspects due to the fact that continuously more people are involved into implementation processes.

Still the main focus is placed on application of knowledge to accumulate factual knowledge in a wide range of fields is theoretically possible through the WBCM however. Further primary learning goals which are achieved through implementation of the WBCM are social competences, so-called soft skills e.g. communication, generating alternatives, creative thinking, learning to act in different roles, self responsibility, coordination, teambuilding, -leading and working productively within a team. This implies integrating knowledge from various fields, not only from one subject. The WBCM teaches students to take on responsibility for their own learning, because facts are not simply presented to them, they need to research these on their own or together with their learning teams. Strategies for researching information by using new media are learned and strengthened. Additionally, computer literacy is increased, general competences concerning the use of new media are enriched, as well as rules for web-based communication are learned. The increasing use of new technologies within business settings demands that newcomers have experience in these fields, thus universities must serve this demand (see chapter 4.1.1 which describes the qualification requirements of today's students). Through implementation of the WBCM universities can serve this demand.

Learning goals and their classification into the taxonomy of learning goals were described in chapter 4.1.4. Here it was clarified that problem-based learning is suited very well in order to reach the learning goal evaluation. The traditional CM applies problem-based learning, and because hypermedia learning environments are an appropriate setting for problem-based learning the WBCM, which thus must be a component within a hypermedia learning environment, and be created as such, builds on this learning method as well.

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127 This is theoretical knowledge and ideally it is mediated in a lecture.

When implemented correctly hypermedia learning environments offer completely free discovering learning. These applications associate the multimedia conceptions as well as the structural idea behind hypertext. Learning objects must be presented to the learner through numerous media, e.g. text, graphics, pictures, speech and music. Furthermore, documents are to be structured in a way which links the documents into a network structure, which consists of given references or of special references chosen by the learner.

Another advantage of the WBCM is the connectedness to the WWW. The WWW is an optimal environment to support problem-based learning. It provides a framework for delivering problems and offers a structure for learners to work collaboratively. Connection to the WWW offers the learner the possibility to find additional information and it forms the technological foundation for cooperative working.

Due to the general fact, that the WBCM belongs to the constructivist learning methods only a certain range of motivational factors will be included. The WBCM believes that knowledge is constructed according to personal experience structures. Therefore the WBCM offers a wide range of supporting offers in order to design the own learning process. The learners and the small groups can choose learning materials and collaboration settings which serve their requirements best.

Chapter 4.1.5 outlines four groups of motifs. The WBCM addresses each of these groups through both: intrinsic and extrinsic motivating factors. Matter-based motivation is created through stimulating problems which are outlined in the cases. Choosing the cases according to the interests of the target group wakens interest and curiosity. An inspiring case stimulates a readiness within the learner to learn. Achievement-based motivation also influences the choice of the case, and the tasks which needs to be solved in this context. The law of success calls for an optimal degree of difficulty, in order to offer successful experiences. This is realized within the setting of the WBCM through the expertise of the teacher in combination with the detailed knowledge of the target group. The next group of motifs focuses on the individual: oneself-based. Due to the researched advantages of blended learning specified in chapter 2.2.6 the WBCM is implemented into an existing lecture. The learning goals of this lecture are described so clearly that before attending, the learner has the choice to decide whether he wants to learn the contents or not. Socially-based motivation calls for interaction and feedback between students and students and teacher. Social contacts are not only obligatory they are also actively enforced within the WBCM. Participants can decide, to a certain degree, whether they prefer virtual or traditional forms of interaction. Interaction with the teacher is also integrated although the main focus lies on interaction between the students, especially on the interaction of students in predefined groups. This reduces the need to employ additional personnel, which is a scarce resource at German universities (as portrayed in chapter 2.2.6). Miscellaneous motivating factors are imple-

mented into the WBCM. Factors such as bonus points for examinations, humor and exercises belong to this category.

Depending on the technological design, general motivational factors, such as design, sequence control, structuring, feedback, helping functions or virtual companions, characterized in chapter 4.1.5, can either be integrated into the WBCM or into the technological infrastructure surrounding it. This largely depends on the prerequisite technological infrastructure. These descriptions do not imply that the holistic approach does completely without motivational factors, shaped according to different learning theories. Integrating drill and practice units (in accordance to behaviorism) or simulations (in accordance to cognitivism) widens the range of materials/motivation the learners can choose from. Then the learner can construct the learning process independently.

Through these above mentioned specifications it becomes apparent that contents can be reproduced in a constructivist tradition within web-based technology. Offering additional materials in various forms to support the work-through process of the case benefit the learning process, for the adequate material suiting the respective learning preferences can be chosen independently and used. Self determined learning is thus supported, similar to the traditional approach, enhanced by current technologies. Similar to the traditional case method the underlying philosophy of users of the web-based case method must be constructivist.

The next chapter shows the redesign of the characteristic problem-based which focuses mainly on the case.

6.2.2 Redesign of the characteristic: problem-based

The WBCM, which wants to offer problem-based learning, is designed in a way that it presents a problem situation to the learner. The problems (cases) worked on within the WBCM underlie the same demands as traditional cases – one of the most important criteria is for the case to be authentic (see also chapter 2.1.2). The solution process takes place through free compilation. This means that the learner is not guided to the solution, but must compile it on his own or through group work. This determines the structure of the WBCM as being non-linear. Thereby the WBCM adheres to the postulation described by Nikolaus stating that up-to-date learning systems offer their students the possibility to choose which contents they want to learn next [Nikolaus 02, 30]. The structure the WBCM uses is based on hypermedia. This means, that the learner can choose his path through the learning program freely. This makes it possible to freely explore learning contents. The most serious prerequisite for working with hypermedia is the existence of a problem (in the WBCM this is the case), which must be solved.

The main difference to the traditional case method is the web-based presentation of the case. Printed hand outs will not be used within the WBCM. Furthermore, the web-based presentation

of the case makes it possible to easily offer and access further materials describing the case e.g. text, graphics, animations, websites, databases etc. These materials can be offered by the teacher or by the students among each other. Offering the possibility for students to submit material to others should be made possible within the WBCM. The technological realization is dependent on the environment and resources. A concrete example of a possible realization is given in chapter 7.

A description of the characteristic perception of the participants within the web-based case method is focused on in the next chapter.

6.2.3 Redesign of the characteristic: perception of participants

Required prerequisites and roles of people involved in the teaching and learning process of the WBCM are introduced within this section. These are arranged according to the participants involved and extended through the prerequisites and roles of environment and technology.

Teachers need to have the ability to let go of the influence they are used to have on the students. They no longer determine contents and proceeding structures concerning the learning process of the students. Teachers have the task to guide students within their own process of solving the case. Experience with the traditional CM is an important prerequisite because leading discussions in case classes is very difficult. Moreover, leading discussions in the WBCM also calls for competence within CMC. The teachers need to have competences in design, leadership and moderation of discussions in a computer-mediated setting. They must also have the ability to motivate learners to form virtual small groups, and to begin and continue learning within them. The teacher must be able to use his expertise in order to maximize the potential of the discussion and thus increase the quality of the learning process of the students.

It is the teacher's task to select adequate cases and to prepare them accordingly. The chosen case must serve the specified learning goals. Additional learning material must be offered and constructed for the new medium. The teacher must also get to know his target group very well. Learner prerequisites must be analyzed and if necessary competences are missing the teacher must offer special training to enable productive work with the WBCM. Within the WBCM this especially applies to media competences.

Using prior knowledge is a prerequisite when learning with the case method – previous knowledge must be brought into the learning process. A basic understanding of the thematic area which is focused on is also a prerequisite the learner has to have, along with basic communication skills, self responsibility including self motivation, as well as an open mind and the willingness to think creatively. Basic understanding is necessary in order to do the initial quantitative background work. Memorization of facts is not as important as the ability and willingness to think in a creative, innovative way. The learner needs to have the ability to live with no definite answer at the end of a case. He needs these prerequisites in order to bring himself into the learning process.

Ideally the learners are diverse concerning viewpoints and backgrounds – this enriches discussions.

The WBCM offers students a variety of differently structured learning material. This gives them the responsibility to work independently and collaboratively. They have the responsibility to keep up the work in small groups. Processes of learning as well as teaching are focused mainly on the students – students have much more responsibility for themselves and their learning processes than they do in other learning methods. They choose:

- the learning material adequate for their learning processes,
- the amount of effort they devote to further going research,
- the extent to which they research circumstances,
- the amount of effort they invest into the different stages of the learning process, and
- connections to prior knowledge.

Students must also be willing and able to work with CMC. Experience with working with CMC as well as in teams is of advantage for the small group phases.

Class sizes must remain manageable. There is no definite number of where manageability starts and stops. This is often determined by the character and experience of the teacher and the students. Because the WBCM relocates many interaction processes to the web and switches the focus of feedback away from the teacher towards the students, the maximum number of participants exceeds the maximum number of participants within the traditional CM. In general, the courses should not be too small (not under 10 students). Otherwise they will not be able to form small groups and they will not be exposed to discussions with enough varying perspectives.

Due to the momentary condition of e-learning in general, as described in chapter 2.2.6, it is regarded as advantageous to offer the WBCM in a blended learning approach. Therefore prerequisites concerning rooms and resources (room size, chairs, flip chart, beamer, internet access possibilities, and availability of teachers) also need to be taken into consideration. In order to conduct the WBCM certain technological basics need to be offered. These are mentioned in this section, and concretized within the exemplary integration of the web-based case method in chapter 7.

Setting up the WBCM calls for personnel which have technological know how. Administration of the WBCM must be ensured, including user support. Technological infrastructure, e.g. servers with enough space to run certain applications, must be available and technological support must be ensured in order to keep participants motivated. This is especially important at the beginning of the implementation. Security aspects are also important and must be monitored. Appropriate bandwidths are dependent on the respective environment. Materials need to be structured in a way so they are retractable with diverse output devices and from different locations e.g. it should

be resigned from sending films when a user declares he uses a 33 Kb modem. Keeping track of the newest technologies is necessary in order to be informed about ongoing developments. Adhering to newly developed standards is important to ensure satisfaction of the target group and to keep the WBCM up-to-date.

In general it can be summarized that the perception of the participants involved within the WBCM is similar to the perception outlined for the traditional case method (see chapter 2.1.5), which is generally influenced by the constructivist perception expressed in chapter 6.2.1. However, these are extended through the components of computer-mediated communication as well as the implementation of technology in general. These affect both the learners and the teachers. More competences concerning the implementation, maintenance and support of technology are called for on the side of the teacher. He needs to organize these areas. Depending on the target group it is also necessary for the teacher to mediate missing competences concerning use of technologies, and to support existing competences of participants in order to foster the best possible use and efficiency of computer-mediated communication. Once the WBCM is implemented the teacher must continuously motivate and encourage students to use computer-mediated communication possibilities. The students must be willing to change old habits and take into account that this change goes along with an increase in effort.

Besides a change in the perception of the participants the WBCM also calls for a redesign concerning the traditional work-through process. This is illustrated in the next chapter.

6.2.4 Redesign of the characteristic: three phased work-through process

The work-through process of the WBCM must resemble the process of working through the CM traditionally, for this was outlined as a key characteristic of this method and was also defined as a success factor of the case method (see chapter 4.2). Therefore the three phases of working alone, in small groups, and together in the plenum must all be integrated.

The design of the individual preparation within the WBCM can be enriched compared to the design of this phase within the traditional CM. As illustrated in the section 6.2.2 the web-based approach offers a wider spectrum of material. The learners can systematically be supplied with more supporting learning material in a cost efficient, easy way. This diversity offers the learner the possibility to choose his preferred material. Additionally, the learner also has the chance to use the access to the WWW to increase his own research. A multimedia enriched presentation of contents offers the learners more access possibilities to the material – therefore increasing the quality of the learning process. Learning material becomes accessible time and place independently.

The advantages and the necessity of small group work phase were specified in chapter 2.1.4. In order to reproduce these advantages into the WBCM the size of the small groups adheres to the

sizes within the traditional CM. Working in small groups within the WBCM is enabled by adequate communication technologies. They enable students, in a constructivist sense, to choose the setting they prefer. It is the responsibility of the WBCM to offer all possible settings to the learner, so he can decide which combination is best for his learning style. Students can exchange, annotate and continue to work on materials in distributed teams more easily through electronic channels than this is possible traditionally. Composition of groups and communication processes between group members are extremely important within small group work.

Plenum activities are held with all members (students and teacher) participating in the WBCM according to two variants. A virtual variant is accessible for plenum discussions. For this purpose a discussion board is offered. This board is open to all participants of the WBCM. Participation in this board is possible asynchronously (see chapter 5.1.4). It is the teacher's task to moderate this discussion. Comparable to the traditional CM it is important to initiate this discussion and to keep it going. Additionally, a synchronous medium is offered, e.g. chat, for those people, who prefer synchronous communication. Students have to set up arrangements to meet synchronously. Discussions held in this setting will then be made available to all other participants of the course, for they are archived, unless this is rejected by the participants. This enables students to access discussions and conversations of others. Due to the researched inadequacy of virtual communication to actually replace traditional communication (outlined in chapter 6.3.2) a traditional plenum phase is also integrated. Opposed to the virtual variant, participation in this variant is mandatory mainly to ensure reaching the learning goals which can only be mediated in this setting. The traditional plenum phase takes place in the lecture and offers a limited discussion. This discussion phase can not be designed as long as these discussions are within the traditional CM for the lecture must also mediate knowledge. Depending on the case this discussion phase lasts between 15-30 minutes.

In order to ease integration of the WBCM into existing structures it is integrated into an existing lecture. Due to the necessity to also mediate contents within this lecture, and the large number of participants within the lecture it is not possible to offer the possibility for free discussion throughout an entire lecture as this is the case within the traditional case method. Therefore the discussion time is reduced, compared to the time given within the traditional case method. Other than this the three phased work-through process of the traditional case method described in chapter 4.2.4 is reproduced within the WBCM. The main difference is the use of computer-mediated communication within these phases. Due to the number of soft skills which are mediated during the small group work and plenum phases, and because these can most probably not be reproduced within computer-mediated settings (see chapter 5.1.3), it is necessary to conduct research in order to allocate the correct distribution of traditional and virtual communication possibilities within the three phased work-through process. An introduction to this is given in the next section. A detailed description is focused on in chapter 6.3.2.

6.2.5 Redesign of the characteristic: communication

Offering the participants of the WBCM the chances to communicate and discuss and interact with each other are given through the diverse communication channels integrated into the WBCM. Findings in literature describe varying opinions concerning the appropriate design of CMC. This is strongly dependent on the target group users, for prerequisite abilities, experience and access to CMC vary among individuals and target groups. Therefore these characteristics are not designed according to literature – these findings would be too general and would not give information about necessities for the target group. These characteristics are thus designed according to the empirical findings which were researched especially for this purpose and are shown in chapter 6.3. As reported in chapter 5.1 CMC differs extremely from traditional communication. Advantages of the communication forms largely depend on the context as well as on the participants and their expectations and experiences involved. In order to implement as many advantages as possible concerning CMC at the time being, state of the art literature describes that it is necessary to combine traditional and computer-mediated communication (see chapters 2.2.6 and 5.1.6). The empirical research conducted in chapter 6.3.1 will evaluate the success factors the target group attributes to traditional and virtual communication. The choice and setting for the communication possibilities within the WBCM is dependent on environmental factors, especially on the target group, and therefore these have to be identified for each setting into which the WBCM is integrated. Besides emphasizing the necessity to implement communication possibilities, preferably a combination of traditional and virtual elements generally accepted characteristics transferable to each implementation of the WBCM can not be set up for this characteristic.

It becomes clear that new technologies and their handing greatly influence this characteristic. Due to the newness of these technologies and their implementation it is necessary to regard existing prerequisites of the participants and customize these offers accordingly. A similar approach is necessary for the redesign of the characteristic collaboration. This is shown in the next chapter.

6.2.6 Redesign of the characteristic: collaboration

Chapter 5.2 focused on the variety of interaction possibilities the traditional CM offers. The main focus, especially concerning the amount of time and dedication expected is placed on collaboration within the small groups. As characterized in chapter 5.2.4 virtual teamwork mainly differs from traditional teamwork through the decentralization and adoption of electronic media. This emphasizes the close relationship between the characteristics collaboration and communication. Important competences expected from the participants of virtual teams, which are in addition to those necessary for traditional teamwork, are: project management, networking, and use of

technology, self-management, boundary management, and interpersonal awareness. Team structure, which positively facilitates working on the WBCM, should resemble a working team (see chapter 5.2.2). Collaboration, especially working together in small groups must be integrated into the WBCM (see also chapter 6.2.4). Team compilation and design of virtual teamwork should consider factors concerning prior experiences with teamwork and the technologies involved, affinity towards virtual communication possibilities, and personal prerequisites which can enable and restrain productive collaboration. This emphasizes that no general design guidelines can be given for collaboration within the WBCM because they are dependent on the specific target group. Collaboration is dependent on a variety of external factors which need to be structured.

After describing the intermediate results in the next chapter the design of the characteristics communication and collaboration will be specified for this setting.

6.2.7 Intermediate results

The design of the WBCM shows that electronic support of the single work phase is ideal through the computer. As described in chapter 4.1.5 appropriate medial presentation of contents promotes motivation. Additional reading material, simulations, access to databases, charts and figures, as well as video and audio sequences describing the facts of the case support basics of constructivist learning and simulate authentic contexts. Searching-strategies for additional information e.g. on the internet is another ability which can be mediated through integration of multimedia into this stage of the learning process. The main differences in the next two work-through phases of the case method (small and large group work) concentrate mainly on the aspect communication. Media can be integrated to support communication and team aspects. However, the design of these aspects is largely dependent on the target group.

A combination of all characteristics is necessary to ensure that the structure of the WBCM contains the key features and ensures the systematic of this approach. The design of these characteristics already showed clearly that additional advantages and learning goals can be mediated through the WBCM compared to the traditional case method. It also became clear that within the characteristics there are differences concerning their specification. Chapters 6.2.1-6.2.6 showed that these six key characteristics can be divided into two groups: general characteristics and specific characteristics.

Table 6.2-1: Grouping of the key characteristics according to general and specific features

General characteristics	Specific characteristics
- Constructivist - Problem-based - Perception of participants - Three phased work-through process	- Communication - Collaboration

General characteristics apply for every implementation of the WBCM. They are transferable to any setting and any target group in future implementations of the WBCM. They can not do without the further design of the two specific features: communication and collaboration. However, these features must be designed in accordance to the specific implementation. Prerequisites, interests and knowledge of teachers and learners as well as environmental settings need to be included when designing these characteristics. Therefore the design of these characteristics relies on empirical research. These features are closely connected and related to each other, and are embedded into the framework of the four general characteristics. The following graphic illustrates this.

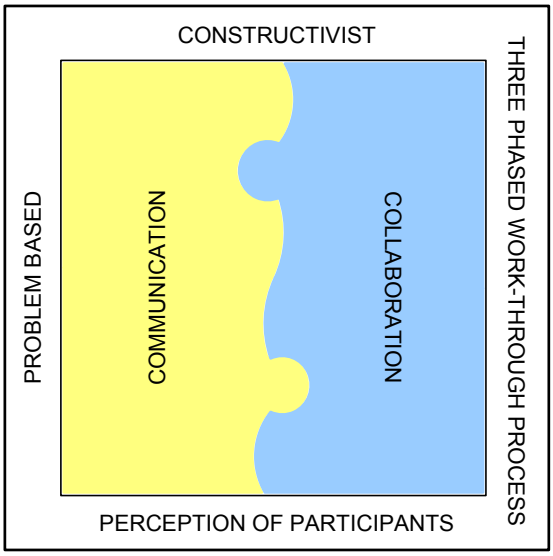

Fig. 6.2-1: Relationship of the main characteristics within the WBCM towards each other

The following chapter describes research which was conducted in order to construct and shape these specific characteristics for one specific implementation. The specific implementation will then be specified in chapter 7. This must be done in a similar form for every implementation of the WBCM. The specific design uses general design principles as a framework but concentrates on developing the two characteristics communication and collaboration. Their design refers to the conception and implementation of virtual and traditional elements within them. By offering

different puzzle pieces the following illustration shows that these components can be designed in a variety of ways – depending on prerequisites and circumstances of the environment into which it is to be implemented. The design of the "puzzle pieces" is not limited to four as the illustration shows – a variety of combinations are thinkable. The graphic is reduced to four for demonstration purposes.

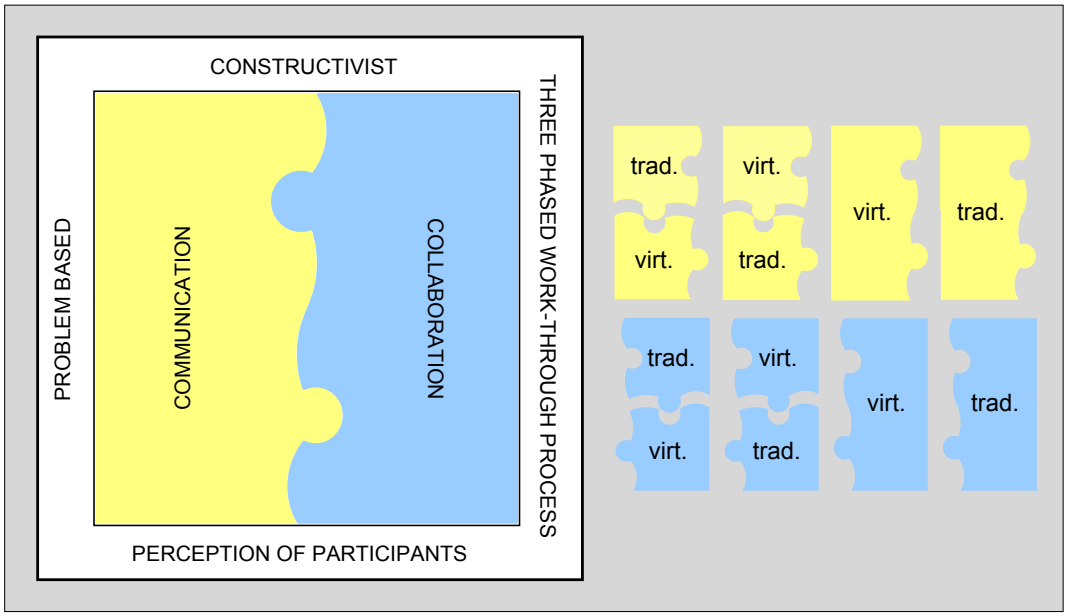

Fig. 6.2-2: Specific characteristics which need to be redesigned for each implementation of the WBCM

The specific design of these characteristics for the conceptual design within this thesis is compiled within the next two chapters 6.2 and 6.3.

6.3 Specific design of the characteristic communication

This chapter outlines the empirical research which was conducted in order to derive specific recommendations concerning the design of the characteristic communication. The empirical study reported in chapter 6.3.1 evaluates the success and hindering factors target group users attribute to traditional and virtual communication. The conclusion of this study states that due to these results it is not advisable to neglect traditional communication completely in favor of virtual communication. Concluding chapter 6.3.2 then illustrates the empirical evaluation focusing on which phases within the case method should be offered virtually or traditionally. One main result of this study shows that the small group phase within the WBCM offers greatest potential for computer-mediated communication. Therefore the main emphasis within the characteristic collaboration is put on the small groups.

6.3.1 Success and hindering factors of traditional and virtual communication within the target group

One of the largest shortcomings of the case method is the possibility to offer equal chances of participation to every student. "If the key to learning with the case method is active student participation, any intervention that encourages and supports that participation may be valuable." [Parent/Neufeld/Gallupe 02, 6]

Communication processes on the web are quite different from communicating in a traditional face to face environment (see chapter 5.1.2). In addition this area of research is quite new, which means that extensive research results are not available at the time being, especially when narrowing it down to the relevant target group. Therefore specific empirical research had to be generated within this thesis in order to develop communication guidelines for this implementation of the WBCM. This study determines and compares success factors for virtual as well as traditional communication within the target group focused on within this thesis[128]. These success and hindering factors are evaluated in order to decide to which extent traditional and virtual communication should be implemented into this version of the WBCM[129].

This evaluation took place within the context of a tutorial. Participation in the tutorial was voluntary and aimed to support students in the subject matters of "Statistics B". All 20 students[130] who participated in the course "Statistics B" had the possibility to communicate traditionally, in the presence phases, and virtually through a discussion board in between presence sessions. The students communicated traditionally and electronically with each other for the entire duration of a semester. After the term, they were interviewed according to the guideline interview to evaluate their opinion of success factors of virtual and traditional communication.

Results of the study

The results of this evaluation were interpreted according to the ten identified main categories: face to face communication, virtual text based communication, audio visual communication, communication in virtual groups, virtual support through officials (moderator, tutor, professor, administrator), discussion board as a discussion platform, user orientation, communication be-

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128 Information concerning pros and cons of an implemented discussion board is also collected. This information can be accessed in appendix E.

129 These interviews were held in German language. Because of the English language of this thesis no (German) quotes are integrated into these explanations. The quotes which support these descriptions are referenced through giving the numbers of the lines of the German interviews, which appear in appendix E.

130 Five of the 20 students dropped out of the interviews. The group of students who were interviewed consisted of twelve men and three women, all aged between 20-27 and in their second year of studies (2nd-4th semester). The choice of this sample represents the target group described in chapter 3.1.

havior of the participants, usage behavior of the participants, and extending traditional communication through virtual communication. Each of these categories has between three to five ongoing subcategories. Category ten is an exception and has no further subcategories[131]. The statements of the interviews were paraphrased and assigned to the appropriate categories. The following presentation summarizes the results to all categories concerning success and hindering factors for online and traditional communication as well as giving a comparison.

Success factors of traditional communication

The interviewed students expressed that traditional communication, including verbal (see category 1.1)[132] and nonverbal (see category 1.2) communication, was the most basic form of communication between two people. The personal dialogue/discussion is regarded as very important (category 1.1, statement 6) because the students needed someone who moderated and described the circumstances of a situation in a face to face manner (category 1.1, statement 2). Nonverbal communication is important, because communication did not only take place within speech, but also through emotional and visual aspects (category 1.2, statements 1-6). Nonverbal communication complemented verbal communication. Both state of the art literature as well as empirically attained statements, define nonverbal communication as an element of success within communication (category 1.2, statements 1-6).

The majority of the students mentioned that they did not believe that virtual communication could displace or replace traditional communication (category 1.4, statements 2, 3, 5, 6, 8). This main aspect shows that communication between humans is necessary and can not be replaced by virtual communication due to the contact between the individuals (category 1.4, statement 5).

Advantages of traditional communication are the omission of anonymity (category 1.4, statement 10; category 1.3, statements 5, 6) and the possibility to concentrate on the communication partner by including and parallel use of diverse communication media, (category 1.4, statements 3, 6, 7; category 1.3, statement 2). Through implementation of nonverbal aspects less information gets lost, and feedback can be given more quickly. Feedback is another success factor of both traditional and virtual communication. Literature describes that answers and feedback to statements clarify if the receiver has understood the message correctly (see [Frindte 01], [Schulz von Thun 01], [Burgoon et al. 00]).

It is easier to transmit large amounts of information verbally than text based (category 1.4, statements 6, 8). The aspect of time within the process of transmitting information between people

131 The complete category system can be found on the CD-ROM.

132 These references refer to the category system, which is on the accompanying CD-ROM.

was named as another positive factor by the interviewees. Because circumstances can be described very precisely, the information given can be received quickly and understood easily. Therefore direct reactions can be shown (category 1.4, statements 1, 4, 8). Traditional communication is very up-to-date concerning contributions and because of the synchronous realization it saves time and enables solving problems quickly (category 1.4, statement 9). Fast learning success is achieved because participants can prepare before they meet, they have similar foreknowledge and motivate each other. Direct and quick solution of given problems is enabled (category 1.3, statements 5, 6, 8).

Hindering factors of traditional communication

Nevertheless, traditional communication does also have hindering factors. Traditional communication has elements that need very much time, and these are described as hindering factors of traditional communication by the students (category 1.5).

Loss of coordination in the group is another negative aspect within traditional communication (category 1.5, statement 1). Flexibility is reduced due to the necessity of personally attending the course (category 1.5, statement 4). According to one interviewee personal affection and dislike were not controllable because feelings like these could come up unconsciously (category 1.5, statement 5).

Success factors of virtual communication

The evaluation showed that the participation of everyone involved is a prerequisite for successful virtual communication (category 9.4, statements 1-9). Active participation, this means posting questions on the board and answering these, is important to keep virtual communication "alive" (category 9.2, statements 1-6). Users expect that posted questions will be answered (category 4.3) and therefore it is essential that this happens. Simply reading the input of others without contributing own input hinders successful virtual communication (category 9.3, statements 1-6). It is also necessary that everyone involved concentrates on the formal topic and does not lose himself in informal contents (category 8.1, statements 1, 4, 8, 13, 14). Positive interpersonal behavior is supported by a pleasant language, and by supporting each other by giving honest answers to honest questions. This in turn also promotes developing new relationships (category 8.2, statements 1-8).

Using CMC is usually done with the intention to receive an answer to a problem (category 4.2, statements 1, 3, 9, 12, 13). This showed that feedback is a central aspect for successful virtual communication. Feedback shows e.g. that the other participants are also working on the same problem or e.g. that they have already understood the problem and can explain the solution (category 4.3, statements 5-7). The interviews show that the factor time also plays a major role for communication in a virtual scenario. Speed of transmission of information is described as a suc-

cess factor within literature because it enables groups to receive quick answers, shows commitment and thus increases participation (category 5.1, statements 1, 2, 4-7, 9, 10; category 4.5, statements 2, 3, 5, 9-11). The digital acceleration of data increases the fast transfer of information between the ones who are communicating. This bridges the gap between time and place restrictions which increases the flexible use of virtual communication systems. The interviewed students also mentioned that flexibility, in other words being place and time independent was an advantage of virtual, text based communication (category 2.2, statements 1-4, 6, 9, 13). Fast accessibility attracts and commits participants to electronic communication (category 4.5, statements 5, 10, 11).

Successful communication does not only depend on the actual contributions. Moreover it is important that these are made in a clear and understandable manner. This prevents misunderstandings between communication partners. Therefore it is important to emphasize important contents through symbols, signs, or acronyms (category 2.1, statements 1, 3-5). Additionally, it is important to concentrate on clear and precise formulations, e.g. within specialized questions, in order to prevent communication difficulties (category 4.4, statements 2, 5). Within virtual communication it is not possible to jump between thoughts.

Contents must not only be comprehensible, they must also be structured in a clear way. Clearly structured contents do not call for specialized operating abilities from the user due to the self explanatory style of the contents (category 7.1, statements 1-4, 7-9). For example the "tree structure" within discussion boards increases their functionality (category 7.1, statements 1, 7). Functionality, as well as up-to-date postings are essential for the success (category 6.2, statement 2). The participants should not perceive anything as being unstructured or unclear, because this promotes ambiguity concerning virtual communication (category 7.1, statements 4, 8).

Flexibility is another important factor for successful virtual communication (category 2.2, statements 1-4, 6, 9, 13). Communication with other members is enabled anytime anywhere.

Some kinds of CMC offer the possibility to save and archive the information posted on the board. This has the advantage that the data can be accessed throughout a long period of time. Retrieving data, even after a longer period of time, is not a problem (category 6.5, statements 1-3). This also supports extending and forwarding the information to others. More information can be received and spread more quickly (category 6.4, statements 4, 6, 8).

Influence on the discussion board through a tutor leads to positive reactions. Interviewees mentioned that they enjoyed asking for and accepting assistance with occurring problems. In addition participants also regarded this as motivating (category 5.1). This motivation is achieved for example if the tutor gives exercises which have to be solved to a certain deadline and if solved correctly students receive positive feedback, maybe even bonus credit points (category 5.1, statements 5-7, 9, 10).

In order to stimulate interest of the students in the discussion board it should be introduced beforehand. Additionally, advertisement including advantages and disadvantages as well as potentials should be made known (category 5.2, statements 8, 11). A "controlling function" within CMC was perceived as being positive. Posted comments, especially answers to questions, were monitored by the teacher, and thus the students were sure, that they were not "learning in the wrong direction" (category 5.2, statements 2, 3).

CMC is successful when it focuses on a certain target group of people. The concentration on a common goal enables intensive discussions, to which everyone can contribute (category 4.5, statements 1, 4, 6, 10).

It is of advantage if the people involved have experience with the use of virtual communication possibilities, rather than including people who are less interested, or even hostile against CMC. Within this evaluation it became clear, that the students of computer science were more open for CMC than the people studying business (category 6.2, statement 4). Some of the students stated, that communication did not really take place within the implemented discussion board, because the business students using it did not have the competences to do so. According to those students this was shown e.g. by the fact, that it took the business students too long to answer a posting (category 9.4, statement 2) and (category 8.1, statements 2, 3, 7, 12).

Hindering factors of virtual communication

A negative aspect within virtual communication is negative behavior within an electronic environment. Discriminating others, being arrogant, dishonest, letting others down and egoism are behaviors which can be encountered within CMC, which hinder successful communication (category 8.4, statements 1, 3-6, 8, 10) ([Doering 99]). Behaviors such as these have a bad influence on the other participants and should be avoided, in order to enable successful CMC (category 8.4, statements 3, 5, 7, 9) ([Doering 99]).

Distrusting statements which were made on the board and lead to the fact that not all contributions could be taken seriously were mentioned as hindering factors for CMC (category 8.5, statement 1). Another factor which did not allow successful communication is the lacking interest. Some interviewees mentioned that they did not see the necessity to use CMC in order to achieve their personal goals, therefore they did not see the necessity of participating (category 8.5, statements 4, 6, 7). The aspect of time is another problem. Often it took a long time from posting a question until receiving an answer (category 4.3, statement 5). The amount of participants is named as a reason which influences the speed of contributions (category 4.3, statement 6) and in this case 20 students were not enough to keep the discussion going fast and effectively.

Virtual communication is perceived as an impersonal form of communication. It is described as not being supportive for behavior between humans because it often provokes misunderstandings

(category 8.1, statements 5, 11). It is perceived as being impersonal because messages sent are often factual and do not contain emotional aspects (category 8.5, statement 1). Another reason for the impersonality is the anonymity. Even though anonymity is a factor which can also be rated positively the statements of the interviewees disprove of this, they believe that the anonymity increases the impersonality of communication and is therefore rated as a negative factor (category 2.2, statements 1, 5, 12). Such negative communication behaviour can support "flaming". This behaviour can be avoided, if communication rules are implemented. The interviewed students did not comment on this. Accessing the board was also criticized because it was perceived as being pedantic because it had too many safety inquiries (category 7.4, statements 1, 2).

The students perceived the CMC as an extension of the tutorial because due to the limitations of CMC it can not replace the face to face communication included within the tutorial. Furthermore, the students believe it can support and improve the tutorial because it makes it possible to extend the tutorial beyond barriers of time and place. It enables the students to ask questions asynchronously that can then be focused on within the tutorial (category 10). Virtual communication holds conventional communication upright and promotes it.

The following table gives a listing of the named success and hindering factors of traditional and virtual communication, which were obtained through this study. All items which appear in this table were named by the students.

Table 6.3-1: Overview of the empirically evaluated success and hindering factors for traditional and virtual communication

	Traditional communication	**Virtual communication**
Success factors	▪ Interpersonal contact ▪ Personal conversation (sends more verbal messages than text based messages) ▪ Nonverbal communication (mimic, gesture) ▪ Reduction of anonymity ▪ Parallel use of different media ▪ Quick reactions	▪ Active participation of participants ▪ Feedback ▪ Comprehensible statements - accentuation and description of important contents - precise formulations ▪ Support of virtual communication through - videoconferencing - chat

	Traditional communication	Virtual communication
Success factors	▪ Precise explanation of circumstances ▪ Fast learning success in groups	▪ Clear structured presentation of contents ▪ Flexibility ▪ Extension and spreading of information ▪ Storage of all messages and information ▪ External influencing factors - creation of stimulation mechanisms - advertisement of the discussion board - controlling functions ▪ Goal-orientation ▪ Participation of people who are interested ▪ Formal communication ▪ Positive interpersonal behavior - fairplay - friendly, collegial helpful conversation
Hindering factors	▪ Written communication demands a high investment of time and energy (e.g. writing a letter and sending it) ▪ Time-consuming search for people who have high competences regarding the topic. ▪ It is sumptuous to receive an explanation to a problem through broaching the problem over and over again ▪ Loss of coordination can occur within a group ▪ Little to no flexibility	▪ Passive involvement of the participants ▪ Negative interpersonal behavior - discrimination of participants - arrogant, unhonest, condescending, egoistic, self-seeking behavior towards other participants ▪ Negative attitude towards the discussion board - distrust concerning statements placed on the board - skepticism concerning the necessity of a discussion board

	Traditional communication	Virtual communication
Hindering factors	▪ No steering mechanism concerning personal affection and dislike of other participants	▪ Timeframe (aspects of time) - high loss of time through delayed answers - elaborate to explain circumstances by writing ▪ Discourage through missing of requested topics ▪ External pressure ▪ Impersonal form of communication ▪ Anonymity ▪ Access ▪ No parallel use of media because of missing technological possibilities within the Statistics B discussion board.

Conclusion

The evaluation shows that CMC lives from active participation. This is due to the necessity of social interaction, which is achieved by the reciprocal communication process. This process is enabled by posting and receiving answers to contributions. Influence of an administrator or a discussion board leader, as was done within the "Statistics B" board, serves as a motivation. This works against stagnation of communication. The students endorse the traditional presence style of the tutorial, because this increases social closeness between the participants. Face to face communication is regarded as being the most basic type of communication, including both verbal and nonverbal communication, and thus is regarded as being valuable for successful communication. It is of advantage to include communication rules (on a voluntary or binding basis) within CMC as well as highly expressive textual signs or acronyms such as emoticons, sound words or disclaimer. By increasing the communication channels within a learning environment social closeness can be increased. In order be able to precisely describe contents the integration of multimedia functions, such as a whiteboard, are be of advantage. Technological potentials must be used, e.g. by integrating chat-channels, video conferencing and other multimedia possibilities, which enable synchronous verbal and nonverbal transmission of information. Communication through chat was an extension, an interviewee stated. It allowed communication partners to personally get to know each other better than e.g. a discussion board does (category 2.3, statement 7). But it was also brought up that the disadvantage of synchronous communication, e.g. through chat, deletes aspects of flexibility, which in turn are offered by asynchronous media (category 2.3,

statements 2, 4) (see [Doering 99]). Offering as many communication channels as possible is reasonable. Thus the participants can choose the adequate one. Easy and comfortable accessibility must be given. This should not be disturbed by too many time consuming queries e.g. concerning safety issues. Clear structuring of contents should be given within CMC. This increases the possibility to quickly access the information desired (category 7.1, statements 1-4, 7-9). CMC offers the advantage that the participants can communicate without regarding place, and if the environment supports asynchronous communication, without regarding time. In addition offering stability of the data due to the possibility to archive the information contributed to a board is offered (category 6.5 and category 2.2).

Effective virtual communication can only take place if the participants know how to use the medium technically. Therefore, experience and training offers for this media are of great advantage (category 6.2, statement 4). This helps to keep conversations active and information can be transferred without delays.

It is considered a result of this empirical study that most of the students do not consider CMC as more successful than traditional communication. They believe that virtual communication can not replace traditional communication (category 10, statements 1-4) at the time being. While the discussion board is used to work on questions asynchronously it can not replace the numerous communication channels which are offered within traditional face to face communication. The limited amount of communication channels is a major boundary within electronic communication. The results received within this study are not limited to application on the electronic discussion board within the "Statistics B" course. They remain valid when being applied to text based CMC for the target group.

It can be concluded as an overall result of this study that virtual communication can positively supplement but not replace traditional face to face communication. State of the art literature agrees to these findings (see chapter 2.2.6 see also [Brunn/Frank/Suhl 03]). If CMC can supplement but not replace traditional communication it is necessary to design a concept based on the adequate mixture of traditional and virtual communication, including advantages of both respectively. Evaluation of the right blend is outlined in the next chapter.

6.3.2 Distribution of traditional and virtual communication within the web-based case method

This chapter deals with an exploratory study which was conducted in order to determine the adequate blending extent of traditional and computer-mediated communication within the WBCM. By comparing a traditional approach of the CM, enabling only face to face communication, to an approach which excluded traditional communication and integrated only CMC suggestions for an

ideal blend concerning the target group could be derived. Additional suggestions and ideas as well as recommendations for action could be given for the design of the WBCM.

Sixty students, all within their 3rd and 4th year of studies took part in this study. For this purpose the students of a lecture focusing on the general application field of OR were to work through a case. Students' motivation to participate was increased by offering them two additional credit points for the final exam. After thoroughly informing the students about the concept of the traditional CM the students were able to choose between working through a case using only traditional or only web-based communication and collaboration possibilities. Approximately 20 students decided for the approach containing CMC, 40 chose traditional communication. Combining approaches was explicitly not allowed within this exploratory study.

All students who wanted to work through the case using CMC had e-mail accounts and were given the e-mail addresses of the other students. A discussion board was implemented for asynchronous communication within the small groups. Students also were to interact with each other via e-mail or instant messaging. Although these offers were not integrated into the discussion board, the students had to use public programs for this (e.g. ICQ as an instant messenger). Students were motivated to interact with each other and with their professor via all communication possibilities described above – giving them the choice to decide according to their own preferences. In addition to a discussion board for the small study groups an additional discussion board was offered in which the professor also participated. This resulted from the fact that students of the "Statistic B" forum enjoyed having a supervising person in their discussion board (chapter 6.3.1). The professor answered and discussed questions the students posted here.

After both the traditional and the online groups had worked through the case twelve students were interviewed qualitatively in order to evaluate both approaches. These twelve students consisted of six students from the traditional group and six from the virtual group. In each case the groups were represented by three women and three men. They were interviewed using the technique of the guideline interview (see chapter 1.2). The decision for qualitative evaluation was very important in order to assess critique, suggestions, wishes and expectations of the version they had worked with in detail.

These results show statements illustrating both the implementation of virtual and traditional versions of the case method. Some statements compare the two approaches. The results of the evaluation are divided into the categories: case method, single- and group work, online vs. traditional version, discussion board, discussion in plenum, feedback, contact person and motivation.

Recommendations for action are given within each category[133]. Transcriptions of the interviews can be found in appendix F.

Results of the category case method

This category shows how students rated the methodology of learning with the case method – not differentiating between the online or traditional version. Generally the students involved in the evaluation rated the use of the case method as being positive [IV10, l. 2259]. The contents being realistic problems, not abstract theory, which is usually worked through within this course was seen as an advantage [IV8, l. 1806ff.]. The students described the knowledge acquired within this realistic setting to stay in their minds longer than isolated theory e.g. given in a lecture. As a reason for this, they explained that the case method is application oriented and therefore an actual connection between theory and practice can be developed. This is one of the reasons, why they believed that working through a case is more efficient than just memorizing and reciting theory. They criticized the information given within the case as being unstructured. One student described that she had to read the case three times before she could make out a structure [IV6, l. 1426]. Additionally, the unstructured data lead to confusion and forced the students to put in more work than had been necessary if the data would have been structured [IV2, l. 298ff.]. They also asked for more time than was given to work through alternatives.

The case given to the students was written in English. This lead to difficulties, for some students had problems translating the case, especially the technical terms within the text lead to misunderstandings [IV1, l. 241ff.]. Even though the language was criticized by some students, others found it to be a challenge, and beyond that, they regarded English as being a necessary prerequisite for the working world. Therefore, they perceived the practice with the English language as an advantage ([IV1, l. 247f.], [IV5, l. 1260ff.], [IV6, l. 1440ff.]).

Recommendation for action: Before implementing any version of the case method students need to be informed about how the case method works. They should be informed that cases quite frequently seem unstructured, or be lacking important information. In fact this is to resemble actual business situations better. In the "real world" business decisions are not always made upon knowing every fact – often essential components are missing. The little amount of time given to students to work through a case also resembles situations faced by managers.

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[133] These interviews were held in German language. Because of the English language of this thesis no (German) quotes are integrated into these explanations. The quotes which support these descriptions are referenced through giving the numbers of the line of the German interviews, which appear in appendix F.

Students should be informed about difficulties which are implemented into the case on purpose to train special abilities, e.g. the ability to solve problems. The students in these interviews described these difficulties as being de-motivating – even though they have a special purpose.

Difficulties, which can vary in degree, are the following.

- Situations, which could be described with few words, are expanded into long text [IV6, l. 1426ff.]. This forces the learner to take more time to identify relevant data and omit non relevant information. However, selecting which data are important and which are not is an important skill concerning problem solving skills (see chapter 2.1.7).
- The less information is missing within a case, the easier it is to work through it. More difficult cases do not offer all relevant data for the decision making process. This forces the learner to determine and procure the data himself. Students interviewed in this setting felt that missing information was a very negative characteristic of the case which was worked through [IV5, l. 1409ff.]. They also described that some information was misleading, e.g. the units. Units which were used for calculation varied. At first kilogram were used, then pound and at the end cases[134]. One student described that he had to do all the calculation over again, once he realized this change in units [IV10, l. 2149ff.].
- Cases with a low difficulty level integrate less *useless* information than difficult cases. The ability to differentiate between important and unimportant information is a key learning point of the case method (see chapter 2.1.7). Students interviewed described that exactly this useless information is very distracting and de-motivating [IV6, l. 1436].

Increasing the degree of difficulty in the presentation dimension results in more effort concerning reading, sorting, prioritizing, identifying missing information, and organizing and structuring data. Additionally, the case method aims to teach students to work under time pressure. They have to learn to focus on the substantial elements of a case. In order to reach this goal the students must attain a better understanding of where to spend time within each case. They must develop a process for working through cases that helps achieve superior results.

If the teacher explained the motivation behind these attributes of the case method critical opinions concerning these aspects would probably be reduced and the students would understand the advantages and features of the case method better. This could increase the motivation to work with the case method.

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[134] The unit "case" was described in the text and sometimes it was referred to in pounds and sometimes in kilograms.

Results of the category single and group work

Both groups of students within the traditional and online version enjoyed the group work phases and explicitly mentioned the positive effect the discussions had on their perception of the case [IV11, l. 2432ff.]. Typically, these groups consisted of two to four students ([IV10, l. 2201f.], [IV1, l. 79f.], [IV3, l. 593f.], [IV7, l. 1640ff.], [IV11, l. 2279f.]). The group members helped each other out and motivated each other [IV10, l. 2277ff.]. The students enjoyed splitting tasks among each other [IV11, l. 2368ff.]. One student having chosen the traditional approach decided to work through the case alone, not joining a small study group. She described that she had massive problems working through the case by herself. In the end she was not able to answer all the questions, because she had had no one she could ask to help her out [IV4, l. 1176ff.]. This student described, that she wished she had had a small study group [IV4, l. 857ff.].

Students involved in the online version mentioned that discussing via e-mail or discussion board was quite complex, so in some cases they then decided to meet or phone each other even though this was not intended within the scenario of this approach [IV3, l. 595f.]. Individual preparation was not explicitly mentioned. As it is a mandatory prerequisite to discuss in groups, it can be assumed that they went through this phase without mentioning it. The group work is especially important to offer students an opportunity to express and communicate their thoughts.

"Small group discussion provides a vital link between individual preparation and class or large group discussion." [Mauffette-Leenders/Erskine/Leenders 01, 21] The students who had not joined a small group felt this large deficit.

Recommendation for action: State of the art literature describes that it is important to engage into the case through individual preparation, small group work and the plenum (see chapter 2.1.4). The first step should be for the student to work through the case individually. Within this phase the student learns to motivate and organize himself. Proper individual preparation requires the student to be very self disciplined and willing to offer a great amount of time for this work. The small group work takes place after the individual prepares the case on his own. Reasons, why the small group phase is regarded as being important:

- Small groups offer the learner the possibility to support and control each other while working through a case. Teaching others is a great way to learn.
- Preparing for the small groups is more important than for the discussion in the plenum. Single students can be unprepared in the plenum and hide behind others, but this is not possible in the small groups.
- Small group discussions offer every team member to participate. Discussions in the plenum are so big that not every single student can participate in them.

- Discussion in small groups offers the opportunity to increase communication abilities, such as learn how to speak and listen. Small groups offer the opportunity to learn how to work in teams. Small groups offer more security to practice this than large groups, because the fear to say something wrong is larger in a bigger group than it is in a small group.
- Discussion in small groups allows the students to compare their ideas to those of their fellow students.
- Building up a relationship to team members of a small group is easier than it is to members of a larger, more anonymous group.
- A small group teaches students to work for themselves and for others in order to reach the common goal, which is solving the problems stated within the case.

Even though small group work is a very important phase within the case method it is often neglected because many teachers and students do not recognize the importance of the contribution of this step to the whole learning process. The interview results show that students who do not have a learning team see the need for one [IV4, l. 857ff.]. Once involved in the case method students do realize the importance of the small group discussion. To prevent students from loosing time to discover this on their own, teachers implementing this method should give high priority to pointing this out to the students. Results of the interviews show that interviewees prefer learning in small groups to learning on their own because working this way is perceived as being more comfortable and more effective [IV6, l.1576ff.]. Within an online scenario teachers need to communicate the possibilities "online students" have to facilitate discussions.

Teachers should support students in forming these groups. This can be done, e.g. by merging all those students together to one learning team who do not find their own learning team, or by integrating single students into already existing learning teams. Another reason why it is so important for students to work together in learning teams is that the amount learned in a group learning process is very high compared to the time which needs to be invested.

Results of the category online vs. traditional version

This section explains why the students chose either the online or the traditional version of the case method.

The decision for the traditional version of the case method was often made in order to have contact to peer students or to the professor [IV1, l. 105ff.]. Lacking abilities to use the internet and electronic learning media in general encouraged some students to choose the traditional version [IV4, l. 870f.]. Yet other students did not have a computer with an internet connection. This made them choose the traditional version ([IV1, l. 106ff.], [IV8, l. 2007ff.]). One student was unsure of how the online version would work therefore he decided for the traditional version

[IV6, l. 1596ff.]. Another student described that he preferred to "keep the habit" of going to class, and once in class he could learn through the problems and through the questions the others had with the subject matter [IV5, l. 1362ff.]. One student was worried that working through the case in an online environment would take more time than doing it traditionally [IV4, l. 878ff.]. Another student described that she is the type of learner who learns best through hearing, and she remarked that she can listen comfortably within a traditional classroom environment [IV7, l. 1749ff.].

Independence of place and time were reasons which were often named when describing why the choice fell for the online version of the case method ([IV2, l. 561f.], [IV3, l. 688ff.], [IV7, l. 1715]). While some students came from farer away, others were preoccupied during the time of the course. So they preferred to take part in virtual variant ([IV11, l. 2530ff.], [IV2, l. 354ff.]). Another student based his decision on his preferred learning environment: his home. He described that he preferred learning at home, because at the university the courses were overfilled, he got no seat and because he felt that it was more efficient and convenient to work at home [IV2, l. 376ff.]. Other students took part in the virtual case method because they were curious to find out how this virtual setting would work [IV11, l. 2566ff.]. Yet in other cases, the students had already formed a learning team, and the majority of the team decided that they would work with the virtual variant, and this "forced" students to also take part in the virtual version of the case method [IV11, l. 2537ff.]. Based on these arguments for both approaches, the next section proposes recommendations for action concerning this topic.

Recommendation for action: Most mentioned arguments for working through the case in the traditional version were non sufficient experiences with the internet or no prior experience of learning through electronic media. Students who were unsure of what the online setting would bring preferred to stay with the in class approach, which they were more accustomed to. One student stated that the online version was not explained enough in order for her to understand what it was all about. She was uncertain of what would be expected of her, and thus stayed with the traditional approach [IV4, l. 1097ff.]. Future implementation of the case method should place a larger focus on describing the processes of the case method. Additionally, all necessary prerequisites (e.g. technological, learning style etc.) should be explained in detail in order to enable the students to be able estimate whether they are capable to work through the virtual version of the case method or not. Students should be granted a fairly long time to consider the alternatives before they need to make a decision [IV4, l. 1116ff.].

In order to accept the virtual version of the case method, it is important that the medium is very user-friendly. Some students stated that it was very difficult to find the questions for the case on the web [IV2, l. 324ff.]. There were also some ambiguities concerning the discussion board [IV9, l. 2064ff.]. In future versions of the case method the students should be informed very precisely

how the technology works and where the needed materials can be found. By explaining which technological framework is needed, and by explaining exactly how the online version is to be worked on, students are enabled to check if they meet the technological prerequisites required. Teachers should not hesitate to explain everything in great detail. Explanations concerning the use of discussion forums prevent students from having questions and misunderstandings e.g. concerning the handling of it, its intention, and how students are supposed to behave within it etc. One student understood that students taking part in the traditional version had to present their results in front of the class [IV11, l. 2554ff.]. Another student thought they were required to hand in an exercise, and they never knew where they had to hand this in or to whom. This was another misunderstanding for they were not required to hand in exercises. Misunderstandings like these can lead to students falsely preferring one approach over another.

Another suggestion is that students should be enabled to try one version, and if they do not like it, they should have the possibility to change to the other version. This could encourage those students, who stayed with the traditional approach for safety reasons to try out the new approach. It is also advisable to let the students work through a number of cases, because the main learning success of the case method occurs, once multiple cases have been worked through for a longer period of time, not after applying this method once.

Combining both versions is another suggestion which could make sense. Working through a case completely online is not perceived as being an ideal setting [IV7, l. 1749ff.]. Participants of the traditional version would have enjoyed taking part in the CMC ([IV7, l. 1737ff.], [IV8, l. 1999ff.]) and participants of the virtual version would liked to have joined in the discussion in the traditional plenum ([IV7, l. 1739ff.], [IV4, l. 876ff.]). Students who took part in the online version described that they enjoyed being able to discuss on the discussion board, but they would also have liked to join in the traditional discussion. They wanted a possibility to present their ideas to a broad plenum and get *personal* feedback. Including them in a traditional discussion would have the great advantage that in addition to learning about the case, they would also learn to present themselves in a social environment.

Results of the category discussion board

Many students who worked through the case online enjoyed working on the discussion board [IV11, l. 2361ff.]. Using the discussion board was of advantages at times, when single students did not know how to continue their work. They looked into the discussion board and received support [IV7, l. 1775ff.]. Some students especially appreciated the involvement of the professor in the discussion board ([IV3, l. 646ff.], [IV2, l. 451f.], [IV9, l. 2105ff.]). They found it especially positive, that the professor answered questions posted on the board very quickly. Other students used the board as a possibility to confirm themselves that their answers are correct ([IV2, l. 544ff.], [IV11, l. 2412ff.], [IV9, l. 2080ff.]). Another student also expressed that comparing her

own answers to those other students posted on the board was a main point of interest in the board [IV7, l. 1778f.]. Some students out of the traditional approach said that they would have also liked to have had access to the discussion board [IV7, l. 1680ff.].

The discussion board was not only rated positively. The sparse amount of contributions of fellow students was a main point of critique ([IV3, l. 650ff.], [IV2, l. 440ff.], [IV9, l. 2075f.]). Reasons for the little amount of contributions were that the information beforehand about the discussion board was not sufficient [IV9, l. 2064ff.]. One student was convinced that if there had been more explanation about the intended use of the board, it would have been used more. Another student described that there were so many unanswered questions on the board, that he believed the other students must have visited the traditional version of the case method, even though they were supposed to attend the virtual version, in order to receive answers to their questions [IV3, l. 659ff.]. Additionally, another student criticized that other students said that one's solution was wrong. Still, they did not find the mistakes in the answer [IV9, l. 2123ff.] Another student believed that students were lazy, and thus would not contribute excessively to a discussion board – he believed they would sit back and wait until someone else posted the correct answer. However, he did feel that the discussion board is appealing [IV2, l. 532ff.].

Another interviewee was convinced that the discussion board was redundant, for he solved all his questions within his small study group, with which he worked via e-mail and telephone. He could not find more answers on the board than he could within his learning team [IV9, l. 2100ff.]. Another participant described that after long discussions within the learning team they did not have the energy left to post everything into the forum [IV11, l. 2712ff.]. This statement is very interesting for the discussion took place traditionally, even though this was not allowed within this approach. Another student did not work with the online discussion board because she felt it took too much time to work with it [IV11, l. 2710ff.].

Some students were shy to use the board because they knew the professor could also access the board, and would be able to see their questions or comments. They were afraid to post their questions for fear the professor would think they were stupid questions [IV11, l. 2391ff.]. Other interviewees were scared to publicize their answers within the forum for fear of other students simply stealing their solutions [IV10, l. 2416ff.]. Furthermore, the discussion board was described as being too complex, and therefore it took too much time to read through the contributions ([IV7, l. 1727ff.], [IV11, l. 2323ff.]).

Recommendation for action: Many of the students involved in this evaluation described the discussion board as being helpful – even some of the students from the traditional group requested to have access to it. This shows that a discussion board should definitely be included within an online version of the case method. Critical remarks should be evaluated to improve future versions of discussion boards.

Criticism is mainly focused on lacking participation within the board. One solution to this problem would be to also grant students from the traditional version access to the discussion board. One student who took part in the traditional version explicitly requested this in the interviews [IV7, l. 1737ff.]. When implementing a discussion board, teachers must make sure they explain the intended use and motivate students to actually use it [IV11, l. 2675ff.]. Shy students can be encouraged to participate in a forum, because of the greater anonymity [IV11, l. 2679ff.]. Clarity within the discussion board needs to be increased. One suggestion made by a student to increase clarity within the board is to regularly delete contributions that appear more than once [IV11, l. 2605ff.]. Increasing motivation is difficult, but there are suggestions by the interviewees. Possibilities for increasing the use of the discussion board can be offered by:

- requiring a certain amount of contributions per person per case to the board.
- setting up certain times, when discussion can take place almost synchronously, in addition to the asynchronous use of the board, which is probably more conventional [IV3, l. 721ff.].
- quickly and continuously giving feedback to the students about their contributions within the forum. Teachers should indicate the normal turnaround time for feedback on assignments.
- explaining the importance of participation within the board.

Some of these possibilities are questionable because they derive the students of the time and place independence, e.g. obligating students to participate in a discussion at a certain time.

Results of the category discussion in the plenum

Generally the students of the "traditional version" rated the discussion in the plenum as being positive. They thought it was good to be able to ask questions that still seemed unanswered, they enjoyed developing the correct solutions in the large group and eliminate items that remained unclear ([IV8, l. 1288ff.], [IV1, l. 127ff.], [IV10, l. 2175ff.]). They also liked the fact that they could compare their solution and their decisions, to those of other students [IV5, l. 1328ff.]. Not only hearing the solution, but being introduced and therefore being involved in the decision making process was regarded as great advantages of the plenum [IV7, l. 1654ff.].

The general idea of integrating role play into the phase of the plenum was regarded as being positive. Some students stated that this role play eased the atmosphere within the course [IV1, l. 123ff.]. However, the role play implemented into this specific case was object to criticism because the actors within the play already anticipated too many answers of the case. The students would have appreciated it more, if they could have found out the solution together [IV4, l. 805ff.]. One student declared that the professor should have intervened more, in order to prevent taking away the solution [IV8, l. 1916ff.]. One student criticized that the performance of the role play was too

extensive. It bored some of the students who had already worked through the case on their own [IV3, l. 1647ff.]. One critical student went even further and stated that when having to listen to this role play it would not have been necessary to work through the case individually ([IV8, l. 1831ff.], [IV7, l. 1647ff.]).

Recommendation for action: Since the large group discussion in the plenum is a very important part of the case method (see chapter 2.1.4 and the descriptions of the advantages of the case method given by experts in chapter 2.1.7), it should definitely be retained and somehow be integrated into the online version of the case method. Within a virtual approach of the case method students can not learn to present their opinions in front of others. This is why they should also take part in the plenum discussion traditionally. This way, even students taking part in the online version can learn to present themselves in front of an audience. Students believe this as being very important. Some students from the virtual group attended the group discussion of the traditional group, even though this was not intended in the conceptual design [IV1, l. 127ff.]. Discussion in the plenum is important for the students to exchange information among each other.

Integrating role play into the large group discussion was generally rated as being positive ([IV6, l. 1583ff.], [IV1, l. 123ff.]). In addition to creating a relaxed atmosphere the role play introduced those students to the case, who did not prepare the case [IV4, l. 1082ff.]. It was criticized that this specific role play gave too much insight into the case – seeing the role play made preparation of the case unnecessary. Due to this critique, future role play should keep in mind to only give short insight into the problem. If the representation within the role play is too long, then it can get boring and take away the motivation of the students to work through the case on their own beforehand.

According to the students conducting the discussion within the plenum can also be improved. The students requested developing the solution together. For this reason it would make sense that the professor focuses on moderating the discussion, seeing that everyone contributes, even the shy students [IV4, l. 805ff.]. Discussion in a room conceived for the lecture method is not ideal, because it is not easy to see or hear each other [IV5, l. 1295ff.]. This problem could be solved by moving the discussion to a room which has moveable chairs, thus being able to form a circle.

Results of the category feedback

This category describes how the students rated the feedback they received during the process of working through their version of the case method. Students taking part in the online version received the majority of feedback through CMC, while students who were integrated into the traditional version received feedback within the discussion in the plenum. No one received personal feedback, e.g. in an individual dialogue with the professor. It is interesting that the traditional

groups did not mention feedback they received through their small groups. Obviously they related feedback to the professor.

Students taking part in the traditional case method believed the feedback they received during the course as very important and helpful ([IV5, l. 1328ff.], [IV6, l. 1534ff.]). Even though no one received personal feedback, every interviewee reported that after taking part in the discussion of the plenum, all questions were answered and there was nothing that remained unclear [IV1, l. 127ff.]. Students involved in the virtual case method explained that they had often received no feedback through the discussion board.

Some students who took part in the virtual variant would have wished that their solutions, questions etc. would have received more feedback than given within the discussion board. They felt that it would not have been necessary to give feedback in great detail, but they would have appreciated it if someone had said: "Yes, that is the right answer." or "Very good, correct!" [IV11, l. 2506ff.]. Another student reported that the feedback she received on the discussion board helped her very much in preparing for the exam [IV11, l. 2516ff.].

Recommendation for action: Even though the instructor should ideally provide individual feedback to each student this is often not possible due to large class sizes or costs connected to this. Even though it was not possible to give feedback to everyone, the amount of feedback given within the traditional setting was described as being acceptable for the students ([IV1, l. 155ff.], [IV5, l. 1342ff.], [IV6, l. 1539ff.]).

Students involved in the online version were not satisfied with the amount of feedback they had received [IV11, l. 2488ff.]. The students of the virtual approach would have appreciated it, if they had received more feedback – in addition to the feedback received on the discussion board. They would wish for someone to validate their solutions [IV11, l. 2511ff.]. It would have been the task of the teacher to do so.

Offering the students of the traditional approach access to the discussion board would increase the number of participants. They would have the opportunity to work through their solutions together, which could lead them to not needing the teacher to give them feedback. One interviewee of the traditional approach requested to be accepted to the virtual approach [IV10, l. 2251ff.].

Another attempt to increase feedback could be to motivate the students to learn online to give feedback to each other. Feedback from fellow students is often quite helpful. This results from the fact that it comes from their perspective rather than an expert's. Another possibility to increase feedback is for the teacher to give more feedback, e.g. by e-mail or by integrating the feedback into the discussion board. In online courses, teacher feedback can generally take the form of e-mails.

Students involved in both variants of the case method described that feedback is necessary for the process of working through the case. It is important for them to know if they answered a question correctly. Therefore it is for important to them to receive feedback quickly.

Results of the category contact person

This category shows how the students rated having a contact person. The students who took part in the virtual approach were able to post questions on a discussion board, and these were answered by the professor. The students involved in the traditional approach were not offered any contact people except the professor, whom they saw while they were in class.

Opinions about the importance of a contact person were very diverse. They depended on whether the students were involved in a well functioning small study group or not. Students participating in well organized study groups did not think an additional contact person was necessary ([IV6, l. 1587ff.], [IV8, l. 1933ff.]). Students integrated into study groups which were not working very well, or students who did not have a study group requested an additional contact person [IV4, l. 1196ff.]. One student who participated in the traditional approach said that an additional contact person was not necessary, for questions could be collected throughout the week and then posted within the sessions [IV10, l. 2159ff.]. Other students also believed that it was not necessary to have another contact person, however, they considered going into the consultation hours the professor offered to all students, if they had had questions they could not have solved [IV7, l. 1789ff.]. Another student wished there would have been a contact person, even if it would had not been possible to contact him personally, he would have liked being able to reach him via e-mail or telephone ([IV8, l. 1936ff.], [IV1, l. 215ff.]).

Recommendation for action: In general students rated the possibility to have a contact person as being very good [IV8, l. 1981ff.]. An optimal situation would provide each student with an instructor or tutor. However, due to the high costs this is not possible.

It was already described that it is important for every student to be integrated into a learning team. If students find a good functioning small study group it is not necessary to offer an additional contact person, for questions can be answered and solved in the group. Supporting students to find a group and maintaining work within the group is of greater interest than offering them the possibility to rely on a contact person for questions. However, if resources are available, nothing speaks against also offering a contact person.

Students who chose to participate in the traditional version of the case method should also be granted access to the discussion board. This way they could also receive further going feedback during the time the between the sessions of the course ([IV1, l. 231f.], [IV8, l. 1999f.]). One of the main advantages of a discussion board is that questions can be answered promptly.

Results of the category motivation

This section defines motivational factors for participation.

The extra points which could be achieved by working through the case were a main factor of motivation ([IV1, l. 172], [IV4, l. 793ff.], [IV4, l. 1044ff.], [IV7, l. 1687ff.]). One student said that he did not care at all about what kind of exercise he had to do (e.g. the case, or mathematical problems). All he cared for were the extra points he could achieve for the exam [IV5, l. 1395ff.]. Another factor which was mentioned in context to motivation was that working through the case was an early preparation for the forthcoming exam ([IV1, l. 172ff.], [IV4, l. 793ff.], [IV6, l. 1544ff.]). The fact that the case itself was very interesting and the actual application of their knowledge also motivated the students [IV4, l. 1055ff.]. The direct link between the case and actual business situations was also rated as being a motivational factor [IV1, l. 183ff.].

Factors which decreased motivation were that great amounts of time were needed in order to work through the case [IV2, l. 502ff.]. Some students mentioned that because the case was not relevant for the exam, they were de-motivated to work through it [IV11, l. 2544ff.].

Recommendation for action: State of the art literature describes many motivational theories concerning learning in general (see chapter 4.1.5). The concept of the case method motivates in many regards due to its structure (see chapter 2.1.4). These motivating factors also prevail when online communication is used. Moreover, the students rated the motivation through offering additional points for working through the case as positive. Because cases call for a large amount of work, this kind of motivation should be included.

Conclusion

When implementing CMC into learning processes it is mandatory that all people involved have the appropriate hard- and software. Everyone needs to have the technical abilities to actually use the technologies involved. It is desirable that everyone involved can not only use, but also feels comfortable using the technologies. Working through the case method online demands a large amount of motivation. Learning processes need to be steered by each individual in a greater measure than within a traditional classroom setting. As can be seen in this exploratory study the pure online version had many areas of deficit which can be evened out by integration of elements of traditional communication. Working in small groups – not differentiating between traditional and computer-mediated communication - was regarded as positive. This phase of the CM can be supported through CMC. This support is realized by those who actually take advantages out of the CMC. Others felt more comfortable using traditional communication. By explaining use and functions of CMC interest can be awakened. Once the students have identified their personal use and advantages of using these channels they will automatically use them. If they are only forced to do so they will not do this in a consequent manner – and go back to traditional communica-

tion settings whenever possible. Homogeneous teams concerning abilities and preferences ease the use of CMC within groups. The plenum phase should not be relocated to a virtual setting – it needs the face to face scenario in order to unfold its advantages adequately.

As these results show, CMC within the plenum phase is very limited, while CMC within the small group phase has great potential. The large group phase is the part of the CM which is most predestined to be held in a presence setting. Current structuring possibilities e.g. of discussion boards is not very innovative, and therefore remains partially unclear. At the time being it makes more sense for students to learn aspects of computer literacy in small groups opposed to the plenum. On the other hand the plenum is the perfect environment to practice traditional communication competences. The small group setting is the setting most collaboration takes place in. This is the focus of the next chapter and will also be explicated further in chapter 7.

6.4 Specific design of the characteristic collaboration

Discussion in small groups lets learners become more acquainted to contents and actual problems of cases. Practical experience in speaking, listening, leading and moderating discussions etc. can be acquired through collaboration. As described in chapter 5.2.2 virtual teamwork has many of the same characteristics as traditional teamwork does, but it also has some special features opposed to traditional teamwork. In order to construct the characteristic collaboration it is necessary to find out how the target group users of the WBCM handle virtual teamwork. For this purpose it is necessary to conduct an empirical study.

The main goal of the research was to capture opinions of students concerning virtual team work. Purpose of this evaluation was to identify weaknesses and problematic areas. Additionally, recommendations for improvement concerning the setting for group work were generated. This was a multi-method evaluation using a qualitative and quantitative evaluation phase. These results were then used to generally evaluate and design a virtual teamwork setting which could be implemented into the specific setting of the WBCM described in chapter 7.

The study took place within the lecture "Wirtschaftsinformatik 4"[135] in the summer term 2003. Within the context of this lecture students had the possibility to work through 3 assignments[136] in small groups. Through correct solution of an assignment they could receive up to 2 credit points. These points were credited to the final exam at the end of the term. Within the study voluntary students worked through these assignments in small group work virtually. All participants of this

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[135] This is a required course for students studying business computing and selective for students studying other subjects.

[136] The students must independently build small groups and solve these assignments collaboratively.

lecture had the chance to participate in the virtual group work, referred to as "experiment" within this chapter. Not all participants who wanted to participate had the prerequisite hard- and software to do so. Therefore two rooms in each case with three fully equipped computers were prepared within the university. These computers were connected to a 100MBit/s network and also had microphones, headsets and web cams. Students' participation in the experiment was on a voluntary basis. From 70 students who took part in the lecture 22 participated in the experiment and solved the assignment in virtual teamwork. A description of the software which was used can be found in appendix G. At the end of the term all 70 participants of the lecture were asked to fill in a questionnaire concerning experiences made with collaboration (see appendix G for the questionnaire and results). The questionnaire intended to seize opinions of traditional and virtual group work of all students who participated in the lecture, as well as to compare them. Altogether 52 students filled in the questionnaire[137]. This is a return ratio of 74.3%. From the 22 participants of the experiment 18 answered the questionnaire, for this group the return ratio is 81.8%. Additionally, guideline interviews were conducted with 15 of the 22 participants of the experiment. Questionnaire and interviews complemented each other and will therefore be regarded collectively within the description of the results.

The results both of the interviews and questionnaires are structured according to the categories of the interviews. The interviews give information the participants of the virtual team work stated[138] while the questionnaire compares participants of the experiment to non-participants. The categories are: general impressions of group work, difficulties and problems with group work, advantages of virtual group work, communication in virtual groups, productivity and expenditure of time, group dynamics, implementation of virtual group work into universities, suggestions for virtual group work. Recommendations for action are given within each category. The next subchapters 6.4.1 to 6.4.8 are structured according to these categories. Chapter 6.4.9 then gives a conclusion of these findings.

6.4.1 General impressions of group work

This category shows which experiences the participants of the experiment regarded as especially important.

When asking the students for their most important impressions concerning virtual collaboration almost all of the students focused on the problems they had experienced. Due to many techno-

[137] From these 52 participants 47 were male and 5 were female.

[138] These interviews were held in German language. Because of the English language of this thesis no (German) quotes are integrated into these explanations. The quotes which support these descriptions are referenced through giving the numbers of the line of the German interviews. These can be accessed through appendix G.

logical difficulties it was hard for the students to actually work in teams [IV9, Z. 890f.]. This astounded many of the students, for they had not anticipated these problems [IV12, Z. 1160], [IV6, Z. 525]. Some students expressed that they believed that the technology is not developed far enough for productive virtual collaboration. Most of the interviewees described the general experience of virtual collaboration as being interesting and would enjoy trying it again, with more stable technological conditions [IV1, Z. 19ff.]. Other students assumed that further experience would support handling the new media [IV3, Z. 285ff.]. One student mentioned that his most important impression of virtual teamwork was positive, because he could work from at home, and lengthy arrangements of meeting times could be omitted. Technological problems negatively influenced virtual teamwork. The strong dependency on technology in this collaboration setting strengthens this opinion. Many negative impressions the students had can be traced back to the need to "experiment with the software".

The evaluation of the questionnaire determined how satisfied the students were with both traditional and virtual group work. These results showed that 52% were satisfied, 35% were neutral, 8% were unsatisfied and 2% were very unsatisfied with the group work. 0% of the students were very satisfied. This clearly shows that problems occurred within the collaboration. An assumed connection between satisfaction concerning group work and participation in the experiment can not be confirmed. The participants of the experiment rated their satisfaction slightly poorer (11% of the participants in the experiment were unsatisfied and 6% of the students who did not participate were unsatisfied; 39% of the participants and 59% of the non-participants were satisfied with their group work), although these differences are not significant. Therefore it can be concluded, that traditional learning groups also had problems solving their assignments. These problems will be focused on in the following category.

Recommendation for action: Generally students are interested in virtual collaborative learning. However, experience is still fairly low in this sector, and opinions can still be influenced by integrating and using positive models. Designing collaborative tools in accordance to expectations of the target group is necessary in order to fulfill their needs and wishes and thus increase their satisfaction.

6.4.2 Difficulties and problems within group work

This category gives information about difficulties and problems the students had while working in groups. It shows both concrete problems of the virtual group as well as general problems all participants had. Differences in the problem areas and interdependencies are researched.

As already illustrated in the preceding category technological problems were prevailing. Audio quality was not very good within the tool Netmeeting, even though connection to a 100 MBit/s network was given. The missing possibility to hold a conference with more than two people was

missed [IV12, Z. 1168ff.]. The program iVisit[139] was described more positively concerning the conferencing possibilities although this tool did not have a whiteboard feature (see [IV12, Z. 1173ff.], [IV7, Z. 653ff.]). Here the video quality was often not as good as it needed to be. Another point of critique was the delays in transmission of picture and audio. One student stated that even if this delay was only a couple milliseconds it was very annoying. This problem was especially noticeable to the students when they were not connected to the network of the university. Delays caused by using a modem, so one student, are intolerable (see [IV6, Z. 539ff.], [IV1, Z. 16ff.]). Another student said that options within the audio-adjustments were too sensitive. It was difficult to understand the communication partner because the audio-options needed to be adjusted perfectly to enable a transmission. According to this student, it was almost impossible to adjust these correctly ([IV12, Z. 1184ff.], [IV6, Z. 531ff.], [IV13, Z. 1305ff.]). Another point of criticism within iVisit was the fact that communication only functioned as long as the application was in the foreground, but sometimes it "slipped" into the background and then needed to be reactivated [IV5, Z. 457ff.].

In general the students outlined that the communication programs slowed them down rather than let them profit from their use. Not all integrated functions were intuitive. At this point it must be pointed out, that these students were all business computing students who have a high affinity towards computers. If they perceive functions as not-intuitive there is definitely room for improvement. Additionally, safety precautions hinder virtual collaboration. Several students who worked from their homes reported incompatibility of the communication software and installed firewalls [IV10, Z. 1015ff.] (see also [IV14, Z. 1416ff.]). Working on the assignment made it necessary to open many frames. It was hard to coordinate all frames on the screen while still keeping the overview of active frames. Especially the integration of several people into the video conference was seen as a problem [IV8, Z. 767ff.].

In addition to technological issues the actual tasks and problems that were to be solved through group work were described as being inappropriate. The students especially regarded "graphical tasks" to be difficult [IV7, Z. 647ff.], (see also IV2, Z. 127ff.], [IV9, Z. 915ff.], [IV13, Z. 1292ff.]). Other students believed that tasks which called for programming were difficult to solve via the web.

Due to these and general technological problems all "virtual" groups partially drifted away from, as they described them, "real" group work processes. Instead they distributed the tasks among the members and after working through them they were discussed virtually in the group [IV6, Z. 543ff.] (see also [IV14, Z. 1449ff.], [IV8, Z. 784ff.], [IV11, Z. 1013ff.]). Similar behaviour was

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139 Information and download under [iVisit 03WWW].

identified in the qualitative empirical study "Chat with a friend" which researched communication behaviour with an instant messaging tool (see [Draheim/Gaiser/Beuschel 01]). The question is if this is essentially different within face to face teams.

Evaluation of the questionnaire focused on giving an overview of collective difficulties which were encountered during handling of the assignments. Students were able to rate the difficulty level of the given assignments. They could choose an answer from a five point rating scale from "very difficult" to "very easy". It strikes out that the answer possibilities "very easy" and "easy" were not chosen by anyone. 29 students (56%) felt that solving the assignments was of medium difficulty level. 19 students (37%) believed it to be difficult and 2 students felt this was very difficult (4%). Significant differences between the participants of the experiment and other participants of the lecture could not be detected.

Fig. 6.4-1 shows *which* difficulties mainly occurred (multiple nominations were possible).

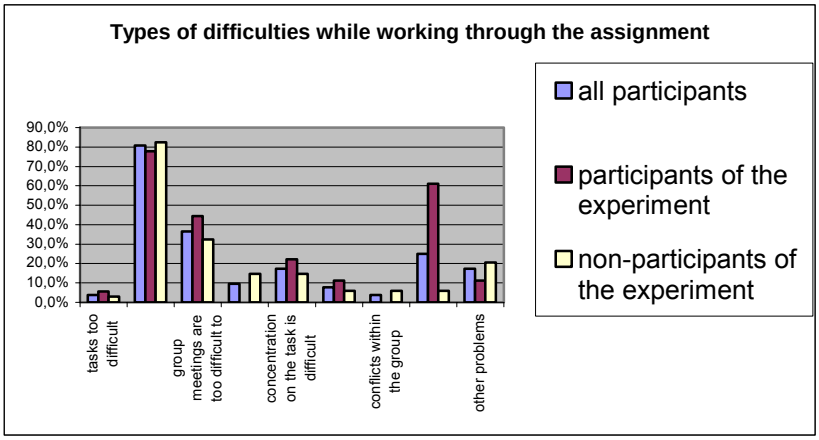

Fig. 6.4-1: Types of difficulties while working through the assignments

Obviously the category "technical problems" only applied to the participants of the experiment. Once the quotient of 25% of all interviewees is allocated to the 18 participants of the experiment the percentage rises to 61%. A connection between prior experience with virtual group work and synchronous communication tools was assumed but could not be confirmed in the contingency analysis. This could lie in the fact that nearly all students have had experience with such tools. However, these tools have probably only been used to support informal intentions and not productive work.

Besides difficulties which resulted from the fact that the tasks which were supposed to be solved in the assignments were to extensive, the categories "group meetings are difficult to coordinate" and "concentration on the task is difficult" attracted attention. Therefore it was examined if there

is a connection between these problems and participation in the experiment. However, the contingency analysis did not show significant differences.

Data concerning the reached amount of points for the assignments was collected in order to conduct a more objective evaluation of difficulties of working through the assignments. The maximum amount of points per assignment was 2; the maximum amount of assignments was 3. Out of the up to three individual values (26% of the students did not work through all three assignments) a mean was calculated for each student. It is remarkable that 25 students of the 52 participants in the questionnaire did not give an answer to this question. Apparently many thought of this data as being too trustworthy, even though anonymous handling of the data was assured. The mean of the average amount of reached points were 1.53[140]. When looking at this data through a variance analysis it shows that students who felt that working on the assignments was medium difficult had more points (average 1.61) than those who perceived it as being "difficult" (average 1.36). This connection turned out not to be significant. Confirming this assumption could be done by conducting this research again with more participants. A contingency analysis showed that students who perceived working through the assignments as difficult or very difficult quit significantly more often than fellow students who perceived this as being "medium difficult". Therefore the judgment of level of difficulty concerning the assignments can be regarded as reliable.

The average amount of points reached by the participants of the experiment was 1.58. The other students had 1.50. Due to the small data basis it is not possible to draw a general conclusion from this. However, it can be concluded that participants of the experiment did not do poorer than their fellow students – which could have been expected due to the number of difficulties they encountered. It can be assumed that this is due to the fact that the virtual groups split the tasks and solved them in single work. If this working style was prevailing in traditional teams was not assessed and is therefore not evident. It is also not clear to which extent the participants of the virtual groups met each other traditionally, even though they were not supposed to do this, and thus eventually evened out possible disadvantages of virtual collaboration.

No differences could be proven between the frequency of quitting the assignments concerning participants in the experiments and other students. There are students who aborted taking part in the experiment, but this was not measured within the questionnaire.

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[140] It may be assumed that especially students who reached less than an average amount of points did not give their information to this question.

Students were also asked to describe general problematic areas of traditional and virtual collaboration, not focusing on the collaboration within this specific setting. This resulted in the following results (multiple denominations were possible).

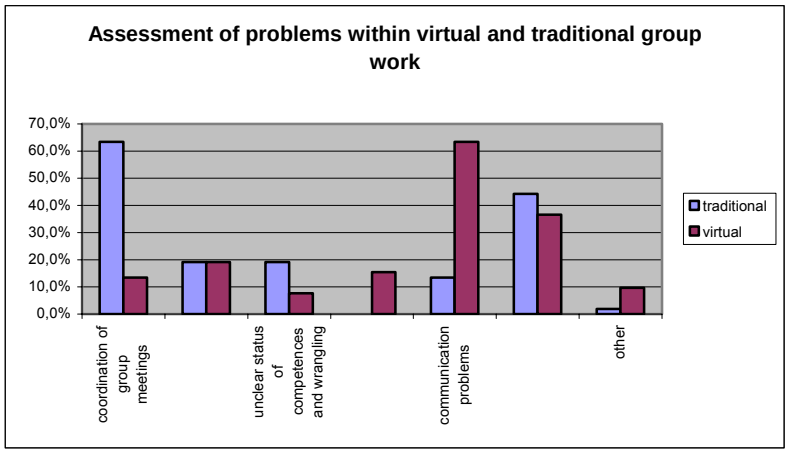

Fig. 6.4-2: Assessment of problems within virtual and traditional group work

Students saw clear differences between general problematic areas of virtual and traditional collaboration. 64% of the students believed coordination of group meetings is problematic within traditional teams, only 14% of the students believed this also applied to virtual teams. Conflicts were regarded the same within both cooperation possibilities (19%). Special kinds of conflicts regarding competences and wrangling for power were rated as more problematic within traditional teams (19%) than within virtual teams (8%).

The topic "missing trust between the team members" was not mentioned once within face to face cooperation. Within virtual cooperation this was seen as problematic in 15% of the cases. This is a clear result which shows that lack of social presence within virtual communication leads to a clear disadvantage concerning the climate within the team. The next point also supports this result: 64% believed that there are risks of communication problems in virtual teams. Within traditional teams this value is very small with 14%. Virtual communication is regarded as disadvantageous in this regard compared to face to face communication. The amount of time needed to work in groups is seen as problematic within both variants of group work, within virtual groups the percentages are slightly lower (37% in virtual teams, 44% in traditional teams).

Recommendations for action: In general it can be stated that the technological problems were not transferred to the perceived difficulty of working through the assignment. The results of the assignments did not differ substantially from those participating in the traditional groups. Consequently the overweighing technological problems within the virtual group work were sensed as inconvenient and de-motivating however the professional quality of collaboration was not influenced substantially. This can be due to the already mentioned splitting of tasks within groups and following discussion about solution to the subtasks. However, this would speak for the creative

problem solution of the students. Communication problems within virtual teams can be decreased by offering guidelines for communication (see appendix H) as well as explaining use of communication enhancing possibilities such as emoticons. Making personal acquaintance to fellow team members lessens the risk of distrust and helps to decrease communication difficulties. Selecting appropriate tasks (concerning difficulty level and amount of workload) for virtual group work is important. Assignments which support cooperative solution of problems should be chosen [CSCL 03[WWW]]. This clarifies that virtual group work still needs to be structured and planned and can not take place spontaneously. When implementing video possibilities it must be ensured and guaranteed that the participants are connected to a network with high bandwidths. Expecting students to do video-conferencing from their homes is not reasonable at the time being, due to lacks in necessary hardware and bandwidths. Lack of customization possibilities of present systems shows that at the time being it still makes sense to develop own communication tools, e.g. open source variants, which contain exactly the preferred.

6.4.3 Advantages of virtual group work

This category shows advantages of virtual group work compared to traditional cooperation. General opinions are collected as well as concrete experiences concerning the experiment.

The most mentioned advantage of virtual group work was the possibility to overcome barriers of distance (see [IV4, Z. 334ff.], [IV6, Z. 554ff.], [IV11, Z. 1144ff.]). The possibility to be able to work from the home was also seen as an advantage (see [IV10, Z. 1036ff.], [IV12, Z. 1196ff.], [IV14, Z. 1391ff.]). Less distraction was also mentioned as being an improvement. One student described that if several students sit together to work on a common assignment the possibility to drift away from it is very high. Instead stories e.g. about the weekend were told. The only time that presence meetings were really effective, so this student, was close before an exam. This distracting factor is generally not as high within virtual collaboration and in addition, when others are talking privately it is easier not to listen to it because the volume can be turned down or off. This way it is still possible to hear them but it is not as distracting as if they were sitting right beside them [IV1, Z. 55ff.] (see also [IV7, Z. 666ff.], [IV9, Z. 906ff.]).

Spontaneity is seen as another benefit of virtual team work. Spontaneous meetings can be called, without needing to travel to the university. This is especially advantageous to those living farer away from the university or on weekends, when not everyone comes to the university [IV9, Z. 970ff.]. However, in order for this flexibility to function properly, technological problems must be eliminated.

One student regarded virtual communication as being advantageous for he could formulate his thoughts better, and did not have to intersperse himself against others, it is the case in traditional

teamwork. He described that virtual communication let him read through comments before actually making them. Formulations could be improved after rereading them [IV15, Z. 1517ff.].

Coordinating group meetings was regarded as being problematic by 64% of the participants in traditional groups, only by 14% in virtual groups. Wrangling for competences and power were seen as less problematic within virtual teams compared to the face to face pendants (19% in traditional teams, 8% in virtual teams). As described in chapter 5.1.3 reduced social presence can also lead to advantages. Due to missing physical closeness the team members do not annoy each other as quickly. Individual characteristics of the team members do not show up as obviously as they do within traditional teams, therefore communication becomes more focused on the task. The students also seemed to realize this.

The possibility to save time through virtual collaboration was also recognized. The difference between traditional and virtual teams is only 8%, not as high as one would have assumed. This is probably due to the fact, that the students included their own experiences of the experiment into their evaluation. Because most participants in the experiment participated in the rooms prepared by the university, they did not save time compared to face to face meetings.

Recommendation for action: It makes sense to only implement virtual collaboration where it actually leads to advantages for the participants. This way the possible deficits of the new medium can be evened out through the advantages. Within this setting most groups needed to come to the university at the same time, therefore aspects of flexibility as well as spontaneity and reduced travel times could not be experienced. Analyzing the target group is important to know which advantages would apply to them (e.g. where do they live, how often do they need to come to the university, etc.).

6.4.4 Communication in virtual groups

This category is described through the interviews. No specific items of the questionnaire are allocated to this category. However, the questionnaires did show that students had prior experience with synchronous communication media. These prior experiences most likely lead to eased handling with the implemented communication media.

For many of the students who participated in the lecture and experiment it was the first time they had worked together to solve a common assignment (see [IV6, Z. 512ff.]). Within the interviews many features of the software tools were rated and described, but they also described basic features of virtual communication and the differences to traditional areas.

It was very astounding that 9 of the 15 interviewees stated that they believed video transmission was unimportant. One student even described the video picture to be irrelevant [IV8, Z. 749ff.] (see also [IV2, Z. 164ff.], [IV4, Z. 310ff.], [IV6, Z. 556ff.], [IV7, Z. 687ff.], [IV12, Z. 1222ff.],

[IV13, Z. 1298ff.], [IV14, Z. 1436ff.], [IV15, Z. 1529]). Opposed to video pictures the participants of the experiment perceived audio communication as very important [IV8, Z. 751ff.]. In order to enable productive videoconferencing the video frames must be larger than the ones offered by the software used in this experiment. Because this needs many resources and because additional video pictures are difficult to coordinate on the screen ([IV8, Z. 834ff.]) it may also make sense to use one video picture, which illustrates several people. One student described that it always took him several minutes until he had arranged his screen appropriately. He described that he had to open one frame for each video picture and additionally he had office applications etc. open with which he had to do the actual work [IV8, Z. 834ff.]. With an increasing number of participants the positive effect of a combined picture would increase even more. The disadvantage would be to accept lower quality and therefore less visibility e.g. of mimic of the other participants. However, it is also stated by some students that state of the art standards are not that clear in transmitting video pictures anyhow. Especially in groups which are not distributed, or where parts of the group are working together at one location and in one room, this summarization of video pictures should be made possible. The interviewees stated that the main focus was placed on audio and quality of transmitting speech. This result is the clear opposite of prevailing opinions within state of the art literature [Senst 01]. However, it needs to be stated that all group members knew each other. This probably decreased the necessity of having a video picture. The interviewees themselves also mentioned this factor [IV8, Z. 808ff.].

Opinions concerning nonverbal communication varied. Some students believed that nonverbal aspects could not be sent through the web cam [IV9, Z. 964ff.]. Others thought that nonverbal aspects were transmittable to a limited extent through video conferencing [IV12, Z. 1218ff.] (see also [IV3, Z. 244ff.]). In order to avoid understanding problems one student suggested materializing communication. By this he meant leaving out certain personal elements e.g. irony, and focusing only on the content level of communication, neglecting the other levels (see [Schulz von Thun 01], [IV13, Z. 1336ff.]).

It was added that the chat function was also seen as an important component [IV10, Z. 1031f.], [IV4, Z. 312ff.]. Especially foreign students had difficulties understanding audio comments of the others. One foreign participant stated that he had difficulties to understand audio comments of the other participants [IV10, Z. 1043ff.].

In general the students saw great differences between traditional and virtual communication. Virtual communication requires adjusting to it. One student outlined that he had to rethink certain processes. Steps that he had in his mind concerning group work needed to be adapted to the new medium. He said the new medium called for rethinking and improvisation [IV3, Z. 277ff.]. When asked to compare and rate virtual and traditional communication to each other traditional communication was the clear winner. Students described that sitting opposite to one another in

face to face communication "is just something different". Different means that understanding is easier and better within traditional communication. Virtual communication lets some elements of communication disappear. This student further described that this was particularly difficult in the group of four students [IV5, Z. 469ff.]. Especially the problems which occurred when working on graphical problems lead to this perception.

Advantages of virtual communication were also described although in less detail than the problems. Advantages concentrate mainly on the reduced risk of distraction and the more even distribution of communication parts.

Recommendations for action: These descriptions make it clear that as many communication channels as possible should be implemented to support virtual teams. Even though videoconferencing is the medium with the highest social presence, it alone does not guarantee successful collaboration – audio communication is much more important within virtual collaboration under the circumstance that the team members know each other. Design and organization of software tools still has room for improvement – especially concerning integrated functions, structure and intuition of use. The more communication possibilities the group members have the better. Allegedly disadvantaged text based media is of elementary importance. Synchronous and asynchronous media should be used in a combination in order to enable flexible and time-bridging communication.

6.4.5 Productivity and expenditure of time

This category compares productivity and needed time for virtual teamwork compared to traditional cooperation forms. Therefore data concerning needed time for the lecture "Wirtschaftsinformatik 4" was examined to find a possible connection between variants of working through the assignments and the needed time. Experiences of the participants in the experiment were examined concerning productivity.

Potential of virtual teamwork to save time was only realized in parts by the students. This is probably due to the fact that the majority of the participants taking part in the virtual group work had to come to the university to do so. Therefore they were not able to save time by cutting traveling times. Nevertheless the aspect of saving time was frequently mentioned within the interviews (see [IV1, Z. 85ff.], [IV9, Z. 981], [IV10, Z. 1055f.]).

Even though the students did not save travel time, they could imagine that this is a major advantage of virtual collaboration. Using electronic media to communicate was not regarded as being time saving in itself. One student expressed that by using electronic media it takes him substantially longer to work through something than sitting face to face to someone (see [IV2, Z. 158f.], [IV5, Z. 421ff.]). The students assume that time reduction and actually saving time starts after one has collected experience using these communication forms [IV4, Z. 362f.]. Of all interviewees one student already believed that the required time for virtual group work was lower than for

traditional group work. He believed that saving time due to missing coordination of meeting times is already enough to make virtual work more efficient. Within his team each member worked on one question very intensively and after solving it explained it to the others. He thought this was a very productive procedure [IV14, Z. 1449ff.]. Generally the students themselves were surprised by the enormous expenditure of time needed for virtual collaboration. One student emphasized the fact that they were all students of business computing and he stated that they all had great know how concerning working with computers. He said everyone in his team had already had to do with all single components: chat, video conferencing etc. This experiment was just about combining these elements and actually using them in a productive way. Before the experiment he thought "no problem for us at all!" But this experiment convinced him of the opposite. He was very disappointed of the technology and of the group. In his group they were not able to work as productively on an assignment virtually than they were traditionally. After working virtually for two hours the group was convinced that they had achieved almost nothing. Even the second and third times they worked together they were still astounded how little productive this setting was for them. Even when they tried working from their homes they felt no improvement. The key point of this statement is that this interviewee had expected more of virtual collaboration than was the case [IV6, Z. 512ff.].

The majority of the students believed that the main reason for the unproductivity did not lye within themselves, e.g. that they worked in an unproductive manner. Instead, they made technology responsible for this. They further stated that the actual learning process did not take longer virtually than traditionally (see [IV6, Z. 578ff.], [IV3, Z. 248ff.], [IV15, Z. 1550ff.]). Even though they mentioned so many problems, they estimated the needed time to work through the assignment as not being substantially higher/longer than within traditional group work (see [IV1, Z. 85], [IV8, Z. 824f.]). It is especially interesting to compare this to the statement made above, where one group described, that after two hours of working virtually they believed they had achieved nothing. The students self-critically realized that student group work in the environment of the university is often ineffective. One student described virtual team work to be as unproductive as traditional team work. He expressed that at the beginning of the term everyone discusses very much and chats. At the end of the term, when exams are coming up everything turns out to be very stressful. Concerning this aspect he saw no differences in virtual or traditional team work [IV7, Z. 664ff.].

25% of all students who filled out the questionnaire did not complete all three of the assignments. To estimate the actual expenditure of time students were asked to estimate the time they spent working through one assignment (in hours).

It is noticeable that the indicated times differ independent from the variant of work-through process. 1.5 hours were the minimum, maximum were 16 hours. The high standard deviation of

3.43 and an average of 7.4 hours emphasize this statement. The average duration of participants in the experiment amounted to 5.5 hours. The others needed an average of 8.4 hours to solve one assignment. Because of the great standard deviation of the data, this can not be regarded as meaningful. Therefore further going analyses concerning time needed to work through assignments will not be done within this thesis.

Recommendation for action: Saving time (especially travel time) through virtual collaboration is dependent on functioning software and experienced participants. This experiment setting did not facilitate saving time for most of the participants because due to lacking prerequisites in hardware, they came to the university to work through the assignments collaboratively. The first times electronic collaboration is used the minority of participants regards it as time saving. However, it is assumed that as the experience with these media increases the productivity does as well.

6.4.6 Group dynamics

This evaluation category gives an overview of the experiences the participants made within virtual group work concerning group dynamics. The interviews focused on the possibilities to develop a sense of team spirit and to build up trust to each other. Because all of the team members knew each other before beginning with the experiment there are some interesting statements concerning this aspect. Estimations concerning group dynamics and climate in their group of all participants of the lecture, participating in the experiment or not, were collected. Influences of the chosen work through form of the assignments on group dynamics were then focused on.

Some students missed the social contact, which is given in traditional group work. One participant said that he missed the interpersonal relationships. He stated further that in traditional teamwork colloquial conversations were often lead and this did not happen in virtual teamwork [IV9, Z. 901ff.]. One fellow student had a similar opinion and stated that social contacts were a form of motivation, and this was missing in virtual communication. Traditional teamwork, so this student, was more fun. He described further that the "virtual atmosphere" was not as comfortable as in traditional settings [IV9, Z. 954ff.]. The factor of social isolation is an actual risk when working in long-term virtual teams. This could have a negative influence on achievements of the group.

Lack of social presence within electronic communication media also influences the structure of roles within a team. It is assumed that the social roles which the individuals have did not become as clear to the others in a web-based environment [IV4, Z. 320ff.]. Another student concluded that within virtual cooperation more trust needed to be placed in the competences of the other members, especially when the participants did not know each other. He believed that getting to know each other was difficult in a virtual setting; therefore it was difficult to receive an accurate picture of the other team members. According to his opinion everyone's own behaviour needed

to adapt to this by behaving towards each other with more care, and by placing trust in the other team members. He further stated that the team members have to reduce jokes and fun, because these could easily be misinterpreted [IV8, Z. 865ff.].

None of the interviewees saw general negative effects of virtual communication on group dynamic processes. Virtual collaboration was fun for the students after they had adjusted to the changed environment [IV6, Z. 573f.].

Evaluation of the questionnaire also focused on group dynamics and compared virtual and traditional teams to each other. The general estimation of satisfaction with the collaboration (emphasizing on interpersonal aspects) is visualized in the following illustration.

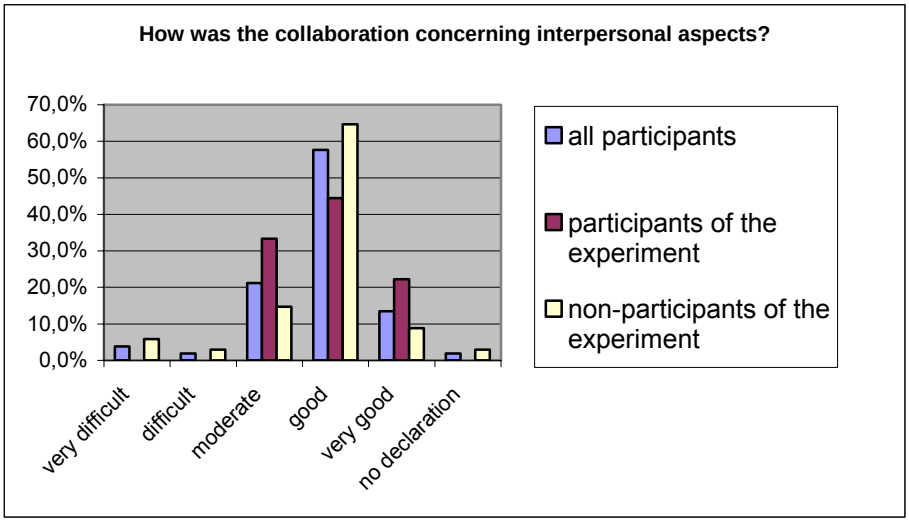

Fig. 6.4-3: Satisfaction with the cooperation focusing on interpersonal aspects

71% of the students felt that their cooperation was good or very good. 21% rated it as moderate, only 6% difficult or very difficult. In general the students seemed to get along with each other well. A significant difference between participants of the experiment and the others could not be determined. Because the groups knew each other before they began with the collaboration this result is not surprising.

Furthermore, the students were asked if the collaboration improved during the course of the semester. This was supposed to examine if a team building process was provable. 50% were of the opinion that collaboration did not improve. 20% believed in a noticeable improvement. 30% were uncertain. By doing a contingency analysis it was examined if the feeling that collaboration focusing on interpersonal aspects correlated with the general satisfaction of the group work. This connection was confirmed.

Recommendations for action: Virtual group-work misses the social component, thus having a less motivating function than traditional group work. It is seen as an advantage if the participants personally know each other before collaborating on the web. As a consequence getting to know each other should be facilitated in traditional phases, in order to ease virtual collaboration. If possible virtual teams should work together for a relatively long period of time. This way time is given for synergies and a team spirit to develop. Especially since this is still quite a new form of collaboration more time needs to be given than within traditional teams.

It can be summarized that a positive social climate within groups is important for satisfaction with the collaboration. No significant effects to the reached amount of points could be proven. Nevertheless it can be concluded that interpersonal problems negatively influence satisfaction and thus the quality of collaboration. At the time being virtual team work is at a disadvantaged due to the reduced social presence of CMC compared to traditional communication. However, statements of the students show that this must not be a serious problem. Future developments of communication programs should include as many functions as possible which should be integrated into communication programs. The more functions integrated into CMC the better for the group climate.

6.4.7 Implementation of virtual group work into universities

The evaluation of this category gives an estimation of the degree of implementation possibility of virtual group work into a university setting. The interviewees had many comments towards this topic. Within the questionnaire all participants of the course "Wirtschaftinformatik 4" could also state their opinions.

Most of the interviewees were for the general implementation of virtual group work into universities. But only under the condition that technological difficulties are eliminated [IV12, Z. 1160f.]. However, other students stated, that virtual group work should only be implemented where it was actually needed, for example due to geographical distribution of participants, or in order to go around and avoid the need for "normal" working times. The majority of students were of the opinion that replacing traditional group work completely did not make sense at the time being. One student stated that at the time being many of the students were at the university on certain days anyhow. Most of them probably live close to the university, only 10-15 minutes away. He said that he would prefer taking these travel times into account or place group meetings on days when he was at the university. However, if he lived further away from the university he believed that he would find virtual team work more effective than at the time being [IV6, Z. 552ff.].

Besides these factors the general technological infrastructure the students have still limits them. One student stated in this context that once it could be assumed that everyone has a high speed internet connection from his home, all delays in picture and tone transmission would disappear.

This student declared that the technology was the main problem [IV6, Z. 586ff.] [Stegbauer 01, 24ff.]. One interviewee had general doubts concerning electronic collaboration, but assumed that future generations would see this differently. He further says that he needed to always print materials out in order to have them on paper to work with them. He proclaimed that he had not frown up with these technologies and therefore he drifted back to "old" habits. He believed that future generations which grew up more with the computer than with books would probably be able to access and use these technologies more easily, read electronic papers instead of books [IV4, Z. 370ff.].

The questionnaire raised the following data: 52% of the students believed that virtual group work was generally positive within the area of university teaching. 56% believed that this could only be an addition to traditional group work. A complete substitute of traditional group work in favor of electronic collaboration was favored by only one student (2%).

When focusing on the differences between regular participants and those integrated into the experiment it becomes clear, that 33% participants of the experiment were against implementing virtual group. Only 15% of their fellow students, who did not participate in the experiment, were against it. The amount of problems within the virtual team work seems to have had a deterring effect on the participants of the experiment.

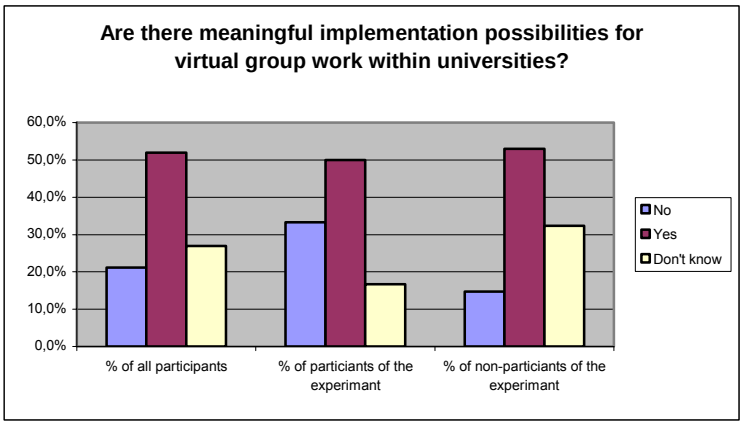

Fig. 6.4-4: Estimation if there are meaningful implementation possibilities for virtual group work into universities

Recommendations for action: Neglecting the technological difficulties and problems the perceived acceptance of virtual group work is high and implementation into universities is endorsed. However, students clearly state that virtual collaboration only makes sense where it leads to advantages. Therefore professors should evaluate whether advantages can be obtained by offering and implementing virtual group work. The majority of the students do not view virtual collaboration as developed enough for it to be a substitute for traditional group work. However, the students

are very open towards this new form of collaboration. They would be willing to implement these technologies once the development has progressed more. This broad acceptance towards new media will most probably be reduced in less technically oriented subjects.

6.4.8 Suggestions for virtual group work

This category contains suggestions the students had towards virtual group work. The questionnaires were not integrated into this category therefore the following statements are genuinely derived from the interviews.

Most suggestions for improvement focused on weaknesses of the implemented software. This clarifies that the technology was the main problem in the collaboration. Several products were tested, but the students did not rate any one of the software products as sufficient. Combining different features of different programs was suggested, in order to receive software which is explicitly designed for the area of CSCL (see [IV9, Z. 945ff.]). Starting point for the following description is the program iVisit. This product was rated best by the students. The videoconferencing function of iVisit was rated positively by most participants in the experiment. However, they criticized the too small video frame and the relatively bad quality of transmission. Documents were not recognizable in the video picture. Students suggested that the quality of the picture needed to improve. Additionally, it should be scalable to increase the size of it if this is wished. The audio transmission was also criticized. Especially the necessary adjustments for the microphone were described as being very complicated. One student said that this calibration must happen automatically [IV12, Z. 1184ff.].

IVisit contains a function which required pressing the Ctrl-key in order to begin with for a transmission of audio. This was rated as positive by most of the students, because participants could switch themselves into and out of discussions. This reduced background noises [IV7, Z. 718ff.] (see also [IV8, Z. 772ff.]). Only one student did not like this function, but got used to it during the course of the experiment [IV13, Z. 1363f.]. This in turn would call for clearer structuring.

The chat functionality was described as being very helpful. The reduced range of functions the chat within iVisit had to offer was criticized by one student. However, this student was not sure if maybe he had just not found the according functions within the program [IV13, Z. 1313ff.].

Generally all students missed a function which makes it possible to work together on one document. This could be patched up by integrating a whiteboard function [IV7, Z. 659]. Even though it was wished, some students described it as being almost impossible to draw on whiteboards with a mouse. Therefore a "drawing tablet" was requested in order to achieve usable results e.g. when drawing diagrams etc. [IV2, Z. 164ff.]. Ideally not only primitive drawing functions should be applicable, but also collective working e.g. on Word-documents, diagrams and similar complex data. The students described that this could be enabled by integrating a so called shared desktop.

This shared desktop, so this student should not be the desktop of one student, everyone should be able to work on it. It should be an additional desktop (similar to a group calendar) to which everyone has access. Everyone should be able to place and work on documents which lie on this shared desktop. One student compared this shared desktop to a table in the middle of a room [IV1, Z. 96ff.], [IV4, Z. 395ff.]. Almost all interviewees stated the necessity for a shared desktop, and a team working room. The terms used to describe this function varied and did not seem to be based on a known product. [IV12, Z. 1246f.].

Additionally, the students missed asynchronous components of the communication software. One student asked for "Lotus Notes functionalities" to enable asynchronous working processes. Within the experiment the students working in the university always had to work at the same time. It was annoying if someone in the team did not "feel like working right now" – for this asynchronous functionalities would be a great extension [IV6, Z. 589ff.]. A discussion board was implemented into the course, although this was not used by the participants of the experiment. Upon inquiry several students stated that generally they knew about this forum but just did not think to use it in the context of their group work, others did not know about this forum at all. Instead they used e-mail to send documents to each other. Therefore asynchronous features should not only cover structuring functions but also enable collective access to files (see [Senst 01], [Haywood 98]).

In general the students believed that the implemented programs are still too error-prone and complicated to enable spontaneous collaboration. For them virtual collaboration must focus on actually working together, not talking about it. Software for this purpose must be easy to install. The setup of the program needs to be easy and function at the first attempt. It must enable flexible and especially spontaneous collaboration. Additionally, it should really ease collaboration processes and not increase the length of these processes [IV3, Z. 205ff.]. Robustness is another central requirement for the implemented software. Therefore it is also necessary to introduce participants to the software in great detail. One student requested that before collaboration software was implemented the students should receive a training concerning this software – he believed this would increase effectivity immensely [IV5, Z. 498ff.]. Another opportunity to support newcomers would be to offer an online-coaching through a tutor who is reachable at clearly defined times. This coach could give feedback in critical learning situations, and by doing this motivate the participants again [Rosenberg 01, 51f.]. Additionally, the assignments should be better coordinated for virtual group work.

Recommendation for action: This section gave suggestions for the design of virtual group work. In conclusion it can be summarized that the main concerns and difficulties lie within the technologies. Technologies must be selected very carefully with the specific purpose in mind. Testing them is very important to ensure their structure and functionalities are clear. The students are

open to use and try them. Virtual teamwork needs functionalities such as application sharing and places where shared documents can be saved/stored. Asynchronous communication makes it possible for the team members to work independent of time, and thus independent of each others availability.

6.4.9 Conclusion

Generally the university students were willing to work in virtual teams. However, at the time being the disadvantages, due to technical problems, outweighed the advantages for most of the students. Therefore it is important to give great thought to the context of these applications as well as the implemented technology and the group constellations.

The main problems students encountered within virtual collaboration were bad video and audio quality, missing features, large amount of invested time but low productivity, coordination difficulties and unsuitable tasks and assignments. The technology involved must suit the needs and technical conditions of the students. The students in this experiment described the video transmission to be redundant – too many problems and too little advantages could be pulled out of this medium. They rather stressed the advantages of audio transmission – this actually helped them work together synchronously. It is also important to offer the chance to work with these technologies on a long term basis in order to overcome the initial difficulties and actually profit from the advantages. The main advantages identified were the possibilities to bridge distances, work at home, decrease the risk of distraction, spontaneity and an evened out ratio of communication parts.

Many of the difficulties and obstacles encountered could be evened out because the participants knew each other and had the chance to eliminate ambiguities in traditional face to face settings. For this specific setting of the WBCM it is essential that virtual collaboration is embedded into a traditional setting. Teams must meet each other regularly in a face to face environment in order to systematically reduce disadvantages encountered through virtual collaboration. Team constellations must regard personal prerequisites. Students living further away from the university will regard the decrease in traveling times as a larger advantage and thus take up more difficulties of virtual collaboration, than e.g. students living next to the university, who in addition to this do not have prerequisite hardware requirements. Offering computer facilities at the university supports those students who cannot afford the necessary technology.

6.5 Summary

Chapter 6 specified the design of the web-based case method, outlined in the introduction as being one of the two the main goal of this thesis. The conceptual design for the WBCM is constructed with close relation to the theoretical basics of the aspects pedagogy, e-learning and the traditional case method. Consideration of these basics, as well as conducting empirical studies based on found pedagogical methods where these theoretical basics were not sufficient formed the WBCM. The following graphic illustrates this:

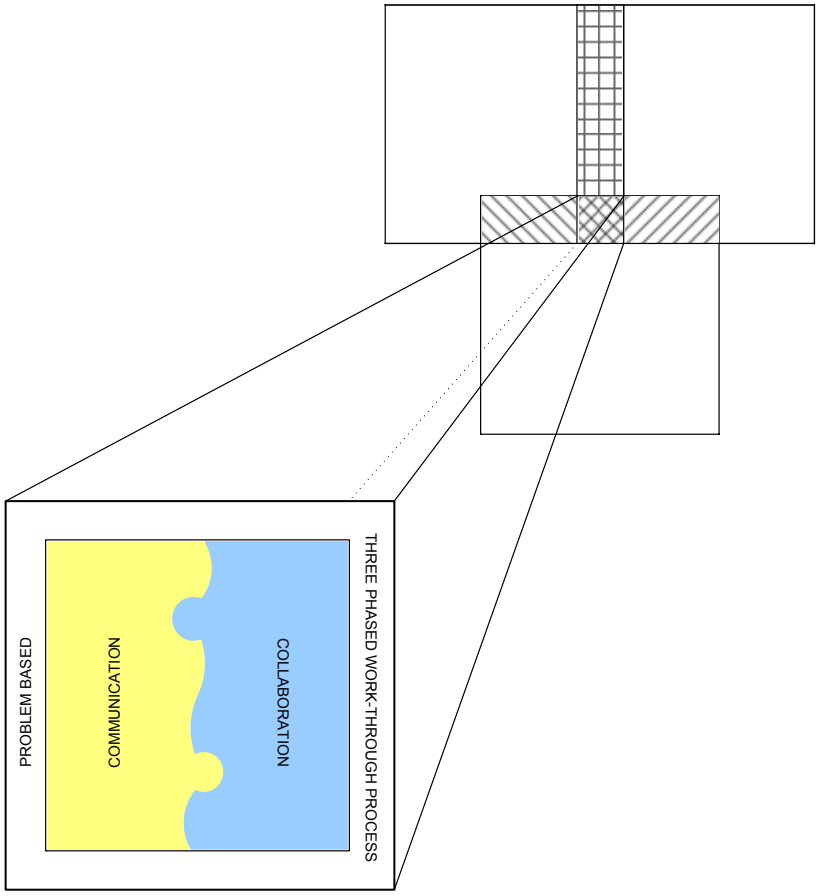

Fig. 6.5-1: Derivation of the WBCM

The concept of the WBCM builds on the six characteristics identified in chapter 4.2. These are systematically redesigned under a pedagogical focus. Opposed to approaches which can be allocated to the enhanced case method (described in chapter 2.3.1) this conceptual design considers the use of technology in every phase of the web-based case method and implements it into those areas where it can be integrated successfully. In opposition to the automated approach of the case method (see chapter 2.3.2) this concept maintains the non-linearity which is offered within the traditional case method. This gives the participants a great amount of freedom and supports problem based learning. The students themselves are responsible for their learning process and this is an important factor within the philosophy of the case method, which must be maintained

within the web-based approach. The conceptual design of the web-based case method described here is a holistic approach, focusing on the whole of the case method, not on certain aspects of it. Because the design of each aspect becomes comprehensible and traceable the reproducibility of this approach is ensured.

In general four of the six main characteristics remain the same. However, they integrate new technologies where possible and meaningful. They build the framework and must be implemented similarly into any setting which facilitates the WBCM. Integration of the two specific characteristics communication and collaboration is also obligatory although the form of integration is dependent on the specific environment. Therefore these features need to be customized to the given circumstances. This customization requires empirical studies and experts' knowledge of the target group users. Chapter 6.2 specified the outline of general design principles of all six characteristics of the traditional case method. Afterwards chapters 6.3 and 6.4 illustrated the fundamental design principles for the specific characteristics communication and collaboration. Three empirical studies, which were conducted for the scope of this thesis, generated these results. The main results of these three studies are summarized here. Chapter 6.3.1 focuses on the general perception concerning success factors of traditional versus virtual communication. This study evaluated, that target group users do not regard traditional communication as completely substitutable through virtual communication. At the time being the reduced number of communication channels offered in CMC (see chapter 5.1.3) is perceived as being disadvantageous. This deficit can only be evened out, so the interviewees, through combination with traditional communication. Chapter 6.3.2 then focused on determining the adequate mixture of traditional and virtual communication for the process of the WBCM. This study found out that CMC within the small group phase is especially suitable, compared to the plenum phase, where traditional communication is of advantage. Especially the combined use of these communication possibilities is meaningful, for trust can be built up in traditional phases and be built upon within moments of virtual communication. Furthermore, it was evaluated, that forcing students to use certain media does not work – they fall back into old habits, if they do not perceive advantages of the new formats. Therefore it must be the goal to offer them diverse media, to force them to use certain media in a special way. Design of communication habits must remain in the hands of the students. Positive motivation can be signaled to the learners e.g. by offering rules in order to standardize communication and/or by being a good role model and participating in virtual communication and by encouraging others to do so too. The empirical study in chapter 6.4 focused on the characteristic collaboration and evaluated the willingness of students to work in virtual teams. Additionally, the most frequently occurring problems with virtual teamwork were assessed and compared to those of traditional teamwork. This study showed that students are enthusiastic to work in virtual teams but that there are many technological hurdles to overcome in order for the technology and the use of it to function properly. It is the responsibility of faculty to construct

and choose communication and collaboration media which suit the demands and are constructed in an appropriate way concerning the abilities of the target group. Depending on the target group trainings should be offered which mediate handling of these new media.

The second main goal of this thesis shows how this conceptual design can be realized. This is exemplified in the next chapter. In order to outline the specific realization it becomes necessary to integrate descriptions of the respective technology. Therefore several technological descriptions are integrated into chapter 7.

7 Specific realization of the web-based case method

This chapter focuses on the second main goal of this thesis: the specific realization of the conceptual design of the WBCM according to the general and specific design principles. As it was specified in the introduction to this thesis, this realization does not describe a technological implementation it describes an application example. This example shows how the conceptual design which was developed in chapter 6 is implemented into a given setting. Of course, this description includes technological components, but these were not technologically developed by the author. However, the design of these tools was influenced by the author, for the design and development of several functionalities was conducted in accordance to the requirements stated through the author. Criteria for successful e-learning, outlined in chapter 2.2.4, are considered within this realization. Special thought is given to the pedagogic-didactic dimension, by giving the aspects conception, motivation, social contact and teaching and learning process particular consideration. Successful contents are ensured by a close connection to an existing course. The technological dimension is covered by embedding it into an existing technological framework (see chapter 7.4). Integrated functionalities can therefore be extended to a maximum amount, which in turn offer the students the greatest possible learning effect. The organizational component is also supported as well as an implementation into an existing curriculum. No additional environmental factors need to be acquired – existing environmental circumstances are built on. The economic dimension is also regarded, for this concept does not generate high costs. When first implementing this concept it will cause additional investment, but in the long run existing resources are simply used in a different way, which is very profitable for the students and thus also for the faculty. This section can be regarded as an instantiation and a concretion and role model of the conceptual design of the web-based case method. This chapter structures the description of this example according to the factors organizational integration (chapter 7.1), curricular embedding (chapter 7.2), work-through process (chapter 7.3) and technology (chapter 7.4). The following table points out that within this chapter the perspective of this thesis changes. While the preceding chapters focused on the characteristics, which are described vertically within this table, chapter 1 now focuses on the aspects organizational integration, curricular embedding, work-through process and technology, which are named horizontally. The allocation describes which section focuses on which characteristic of the web-based case method.

Table 6.5-1: Emphasized characteristics of the web-based case method

Realization of the case method	Organizational integration (chapter 7.1)	Curricular embedding (chapter 7.2)	Work-through process (chapter 7.3)	Technology (chapter 7.4)
Constructivism	x	x		
Problem-based	x	x		
Perception of participants	x	x		
Three phased work-through process			x	
Communication			x	x
Collaboration			x	x

7.1 Organizational integration

The organization of this specific realization is the chair of Business Computing at the University of Paderborn, called DS&OR Lab. The DS&OR Lab is coordinator of a project called "Virtual Operations Research/Management Science" (VORMS). The goal of this project is to develop a virtual, web-based study course focusing on the subject OR[141]. The development of a virtual study course presupposes the willingness to redesign existing contents for use on the web. This benefits the implementation of the web-based case method for a general understanding of the complexity of designing contents for use on the web, and the necessary expenditures of time are realized and accepted. The DS&OR Lab has experience with up-to-date technologies and implements these throughout everyday operations. These technological conditions will be focused on in chapter 7.4, where the technology used to implement the WBCM is described. Additionally, the DS&OR Lab has staff members who are specialized concerning web technologies. During the implementation of the WBCM these are contact people for the technological realization.

[141] VORMS (Virtual Operations Research/Management Science) is a project funded by the BMBF (Federal ministry for education and research). The goal of this project is to develop new organizational forms to effectively mediate individualizable contents out of the area of quantitative business studies, especially Operations Research/Management Science, based on modern information and communication technologies. This project is funded by the German government under grant PT-NMB-08NM094A. Further information concerning this project is given on its homepage: http://www.vorms.org.

After implementation they function as support for the students. As described in chapter 6.4 it is very important to ensure this support, for technological problems will occur and need to be cared for. Students studying at the DS&OR Lab are mainly students of the subject business computing. For a detailed characterization of these students see chapter 3.1.

The setting into which the WBCM is integrated must enable this methodology to unfold itself. Therefore it is important that the constructivist position is represented within the environment. The descriptions of the DS&OR Lab made in the requirement analysis through alumni (see chapter 3.2) points out that the constructivist position is represented through the DS&OR Lab. As described in chapter 2.2.4 not every topic lends itself to e-learning. When integrating the WBCM it is necessary to structure the contents in a way to conduct problem-based learning.

The next section describes the embedding of the WBCM.

7.2 Curricular embedding

Communication difficulties of the target group within pure web-based communication scenarios were described in chapter 6.3. Additionally, the empirical study in chapter 6.4 showed that technological difficulties still occur frequently, even with up-to-date programs and experienced users. Because at the time being these difficulties seem to be inescapable through pure web-based alternatives the WBCM is applied in a blended learning approach. Within the traditional moments it is counteracted against problems which occur in the areas of communication and collaboration. This perception corresponds to state of the art trends within the area of e-learning (see also chapter 2.2.6). Traditional and web-based communication and collaboration elements are mixed. To facilitate this mixture the WBCM is implemented into a traditional course. This course must have at least 30 participants. The WBCM should not be implemented for less than 30 students because diversity is necessary in order to receive diverse solution processes (see chapter 2.1.7 and results of the empirical study describing success and hindering factors of traditional and virtual communication in chapter 6.3.1). Additionally, CMC lives from participation – the more people are included the more likely it is that feedback will be given quickly and participants remain motivated (see the conclusion of the empirical research describing success and hindering factors of traditional and virtual communication described in chapter 6.3.1).

The course into which the WBCM is integrated takes place traditionally within the premises of the University of Paderborn. Students take part in this course on a regular weekly basis. Participation in this course is prerequisite to participate in the WBCM. The learning goals of the course (which are present and accessible to all participants) are the basis upon which cases for each lecture within the course are selected. Once learning goals exist for both the course and the chosen cases, it is necessary to synchronize them. Within this realization of the conceptual design the learning goals of the lectures overlap. This means that it is possible to achieve a higher level of

the same learning goal when the combined approach of lecture and case is applied (see chapter 4.1.4). As described in chapter 1.1 teaching contents of OR are fairly constant. Therefore the expenditure of choosing cases which match the contents of the lecture is justifiable. Lectures have their strengths in knowledge mediation therefore teaching theoretical basics will remain in lectures and be arranged before using the WBCM. However, motivational aspects are not very high in lectures. This motivation is increased by extending the lecture through the WBCM. The WBCM shows connections of theory to actual practice. Results of the empirical study with alumni, described in chapter 3.2, showed that this link between theory and application practice is requested and motivates students. This combination makes sense because according to interviews with the experts at The Richard Ivey School of Business one of the main shortcomings of the traditional CM is the lacking mediation of factual knowledge (see chapter 2.1.7). The WBCM is implemented to apply theory, to develop soft skills, computer literacy and to strengthen self determined learning (see chapter 2.1.3). Advantages of both lecture and WBCM are emphasized through this combined approach.

Communication competences are mediated in two areas: traditional and virtual communication (see chapter 6.3). Within both areas prerequisite skills need to be present and through application of the WBCM they are extended. Computer literacy also divides itself into two areas: prerequisite and further going qualification. Prerequisite qualifications describe those competences which must be existent before working with the WBCM. These must be trained before and during students' work with the WBCM. Therefore trainings focusing on the technologies involved in the WBCM should be offered to the students before the course and if time allows it they can be described within the first lectures. "Speaking-hours" are offered by the professor and by his employees to supports students using the technology. During their involvement in the WBCM further abilities concerning computer literacy are acquired, developed and solidified. These focus mainly on virtual communication and collaboration processes, which are increasing in importance within authentic business scenarios (see chapter 2.2.6). The WBCM teaches students to learn to be self responsible for their own learning. Students need to show initiative and bring themselves into their learning process – these abilities need to be trained for future learning activities.

The professor giving the course decides on the amount of cases he implements. He should implement a minimum of five cases into a course. The maximum is to integrate one case into each lecture. This helps students to become comfortable with the teaching and learning style. Students often feel overwhelmed when introduced to this teaching and learning method. The more cases are implemented, and the longer they can work in this setting, the more they will be able to learn from it (see results of the empirical research described in chapter 2.1.7). As shown in the empirical research concerning virtual teamwork in chapter 6.4 teams often have difficulties working together through new media at first, but after a phase of getting used to it productivity can definitely increase. In conclusion, the more cases which are implemented into a course the better. For

the further realization of this conceptual design one case is integrated into each lecture after the introduction within the first lecture of the course. Within the introductory lecture basics concerning the course, expectations and technology used within it are explained. The actual work-through process of the WBCM is described in the next chapter.

7.3 Work-through process

Within the first traditional lecture the professor gives an introduction to the WBCM, how it functions and how participation is anticipated. He emphasizes the advantages the students can take out of this. This eases the awareness for the procedures involved and misunderstandings can be cleared up right away. Official contact people (e.g. people giving technological support) are introduced, and fear of contacting these people is thus reduced. Besides advantages which evolve from the application of the WBCM itself, the professor can integrate additional motivating factors. Within this setting bonus credit points are given for successfully working through a case through the WBCM. Items such as required hardware or accessibility of computer pools in the university are explained to the students. Within this setting a pool room which has 8 workstations equipped with AMD processors 1400, 512 MB RAM, and 40 Gigabyte hard drives are offered through the DS&OR Lab. The students also have access to three further going pools, offered through the University of Paderborn. Additionally, all information is made available to the students electronically within the WBCM for rereading purposes.

After describing the work through process of the WBCM the professor encourages students to build teams for the small group work. These teams are built in this face to face setting to ease acquaintance and to support getting to know each other – which in turn will ease virtual communication. Students preferring a similar approach concerning the amount of web-based and traditional components to the WBCM are formed to teams. This means the small groups are built according to student preference. This way teams with homogeneous prerequisites are constructed (see chapter 6.4). No matter which favorites were stated concerning communication preferences in this first setting, the small study groups will independently be able to re-choose other variants of communication and collaboration or decide for a combined use of all offered communication possibilities. Switching between communication scenarios is possible at any time presupposing that the team members agree. This process will slowly lead learners towards CMC, but always give them the alternative to make use of traditional forms (see also chapter 6.3). There is no need to exclude these. Once the students know how to handle media and actually have advantages when using it they will switch to CMC on their own. Empirical research showed that the free choice of new media, as well as the chance to evade to better-known settings, helps student get over fear of contact with the new medium. Additionally, it was determined that simply "forcing" students to use certain technologies does not work out, they "escape" to better known and more comfortable settings when possible (see results of the study described in chapter 6.3.2). Within

the first lecture where the teams are built, the professor gives them time to get to know each other, e.g. by telling them to arrange meeting times and exchange contact information for the future work with the WBCM. These teams will meet each other traditionally on a regular basis in the traditional lecture for participation remains mandatory. Additionally, they will also meet each other outside of the lecture, virtually or in traditional small groups, in order to work through the small study group phase of the WBCM.

Within the following lectures the professor mediates factual knowledge which is prerequisite to work through the case. After mediating this know-how the professor describes a case which is to be prepared individually and then by the small groups until the next lecture (one week lies between these lectures). If necessary and adequate the professor describes the connection between the case and the contents of the lecture. The following illustration exemplifies this work-through process.

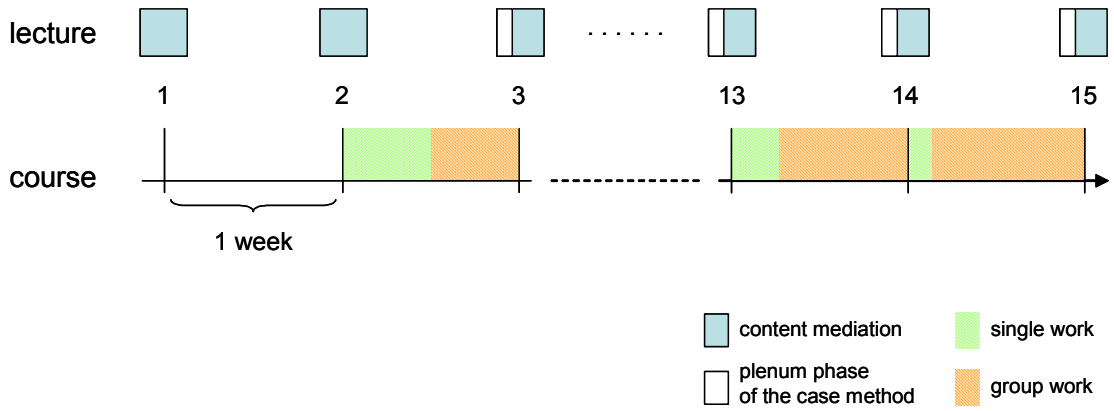

Fig. 7.3-1: Illustration of the work-through process of the web-based case method

As this illustration clarifies the amount of single and group work is not set – it varies according to case as well as personal engagement and prior knowledge of the students. Furthermore, it also becomes evident through this illustration that from now on, the plenum phase of the web-based case method will take place traditionally within the lecture. This illustration also shows that once the learners have more experience on solving cases the single work phase generally becomes shorter while the small group discussion becomes longer. The decreasing single preparation time results from additional experience concerning the approach of how to solve problems of this nature. Increasing group discussions result from the fact that viewpoints are more likely to be presented once accustomed to this approach. The complete work-through process of the web-based case method will be explicated in the next paragraphs in accordance to this illustration.

After mediating the necessary know-how within the lecture through the professor the *single work phase* begins for the learner. The case itself and additional materials the professor selected are

accessible only through the web. Links to websites, text and simulations and graphics are additional materials. To make these materials accessible the open study management tool (OpenSMT) is used. This tool is a student management tool, which covers several features. These are described in greater detail in chapter 7.4. OpenSMT is internet-enabled. Thereby students can choose if they want to work from their homes or e.g. in computer pool rooms within the university. This tool was designed within a diploma thesis in accordance to the requirements stated by the DS&OR Lab. For a closer overview see [Lohmann/Roth 03]. Requirements placed on this system include requirements necessary to realize the conceptual design of the web-based case method. A closer overview of this system and the integrated functionalities is given in chapter 7.4.

Motivation within the single work phase is enhanced by offering the above described additional information through the web. Hints to interesting websites, simulations, demonstrations and further going electronic materials are easily implemented (and thus offered to all students) by the teacher. Additionally, the technological realization of the conceptual design of the WBCM offers the possibility for students to exchange their own materials. This is done by offering a virtual group work room. A group work room can be generated by all participants in the system. After generating a room other people can be admitted to this room. Therewith the small study groups can create group work rooms on their own. It is possible to place documents into this group work room in order to share these. Even though this room is called group work room, the documents which are placed into it can of course also be used to support the single work phase. This enables a comprehensive single work phase and a flowing transition to the small group work.

After the students have prepared the case in single work, the phase of *small group work* begins. Typically the small groups will meet via electronic, web-based communication possibilities. This however is their free choice (see chapter 6.4). The groups decide which communication form they prefer – combining traditional and virtual combinations is explicitly allowed. The following section describes which synchronous and asynchronous communication possibilities are offered through the WBCM. Access to a general discussion board offers the possibility to communicate with all small groups of the course. This board is monitored through faculty. This communication possibility is integrated because in the empirical study which focuses on success and hindering factors of traditional and virtual communication described in chapter 6.3.1 it became evident that this kind of discussion board was appreciated very much by the students. Access to a private discussion board enables communication for a limited, designated group of users (small group). Discussion can further take place through the supported communication forms: instant messaging, chat, and e-mail. If students have the hardware requirements they can also use audio conferencing possibilities. Students who do not have the mandatory hardware, but do not want to do without audio conferencing can use specially set up computer pools. The characteristics of

the supporting tool are designed in accordance to the suggestions made by the students in the study concerning the design of the characteristic collaboration in chapter 6.4. The main result of chapter 6.4 is to place the focus on audio conferencing rather than on video conferencing.

Most interaction takes place within the small groups. Besides being able to place documents in the group work room in order to share them it is also possible to edit and continue working on them and thus upload them again. How this interaction takes place is up to the students. They decide on the amount of used implemented technology. The following graphic clarifies this.

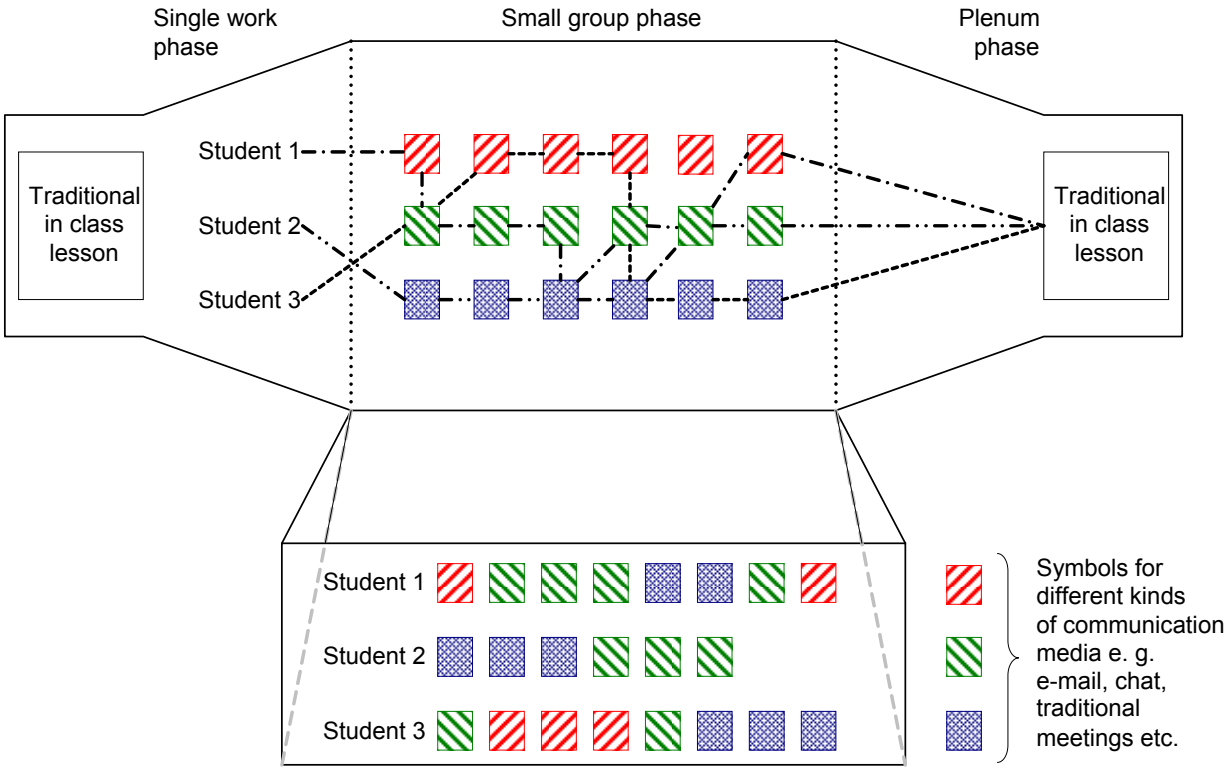

Fig. 7.3-2: Schematic process of the media used within the small group phase

This illustration shows that the amount and choice of computer-mediated and traditional communication processes is up to the students. Choice and amount are conform to the preferences of the students.

Interaction with other small study groups is not forbidden. Cases are constructed in such a complex way (see chapter 2.1.2) that they can only be solved through teamwork. The ability to find resources to solve a case is a necessary competence for the future. Therefore cooperation in this phase will not be prevented. Cooperation in between teams will be prohibited as soon as teams unite and solve the case in a large group. It is legitimate that they help each other out but they are not allowed to unite. This is forbidden, for this would decrease diversity of solution approaches

and rob students the opportunity to improve social competences. A mandatory summary to the solution and the solution process of the case (as far as they could solve them) supports students to conclude their results. This summary is only accepted within the small groups– no united summaries of 2 or more study groups will be accepted. These summaries must be made available to the professor one evening before the next lecture. This ensures that the small group phase actually takes place. The summaries are handed in electronically, per data upload - no matter how the group designed the communication process. This upload functionality is also possible through OpenSMT.

The *plenum phase* is conducted traditionally within the course. Results of the evaluation described in chapter 6.3.2 showed that this phase is not suited to be conducted virtually. By placing this phase into the traditional part of the course, namely by integrating the plenum phase into a lecture, students learn the social competences associated to this phase. Discussion in the plenum is not exactly a discussion; rather it is an expanded summary. This is due to the fact that the lecture also needs to mediate factual knowledge; therefore there is not enough time to discuss for a complete hour. Additionally, there are too many students to include everyone into the discussion. Depending on the contributions and number of participants voluntaries will be selected during the class to present their ideas. Alternatively study groups are assigned to present their results ahead of time. If participation lacks and study groups need to be assigned to present their results this assignment is given to two or more groups to facilitate a discussion within the classroom. It is prohibited for presenting study groups to prepare together. Within the traditional case method participation in this plenum phase contributes to the overall grade of the students. Due to the large plenum size this is not the case within the WBCM.

If items remain unclear they can be discussed virtually after the lecture within the discussion board accessible to everyone. Additionally, the professor summarizes the key learning points and posts these online. This is necessary for a summary of key learning points given by the professor, which was described as very valuable in chapter 4.2.3. Identification of the key learning points is only to be made available to those groups who turned in their solution summary. These summaries are to be graded by the professor, whereby the professor needs to develop a grading scheme. Specifying this grading scheme would go into too much detail for this thesis – therefore the following authors are referenced for additional reading material concerning grading schemes [Erskine/Leenders/Mauffette-Leenders 98] and [Eastman/Swift 02].

As described before, the integration of the conceptual design is carried out within the framework of already existing electronic learning and teaching offers. The next section gives an overview of the technological implementation.

7.4 Technology

The subject OR is taught to students who are in their major course of study. At the University of Paderborn the subject OR is mainly taught through a course held in form of lectures. Additionally, the students are offered a virtual learning environment, called "OR-Welt"[142] with which they can work through the contents of the lecture electronically. This VLE does not offer any communication or collaboration possibilities, it focuses on single learning (see chapter 2.2.2 and [Blumstengel 98] for a detailed overview). Traditional exercises are offered through tutors to support students with the actual application of the mediated knowledge. Resources, especially human resources, are very limited. Since October 2003 the students studying at the DS&OR Lab also have the possibility to access a virtual study course called VORMS. In order to pursue the goal of the project VORMS it was necessary to develop an appropriate student management system and a technological framework. This is called OpenSMT[143]. VORMS is fully integrated into this technological framework. For a more detailed overview of the detailed technological realization see [Lohmann/Roth 03].

Within this specific realization of the WBCM it will be embedded into the existing framework of this virtual study course which is an e-learning portal and thus allocated to the variant telecooperation (described in chapter 2.2.2). Thereby the functionalities offered through OpenSMT will also be accessible. Within this section it is specified how this is done. Integrating the WBCM into existing structures is of advantage, for this offers a wide variety of advantages to the learner e.g. being able to look up prerequisite knowledge in the e-learning portal VORMS. This implementation of the WBCM integrates existing contents of VORMS as well as the possibility to design and integrate new contents, which are necessary for the WBCM. Additionally, the functionalities within the technological framework of OpenSMT are also integrated. Due to the simultaneous development of this dissertation thesis and the development of OpenSMT it was possible to realize and plan necessary communication and collaboration tools for the WBCM within OpenSMT. However, due to restrictions in time not all tools necessary to support computer-mediated communication and collaboration within the WBCM were specially developed within OpenSMT. This results from the fact that programming them would have been to time extensive

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142 Translation: "Operations Research World"

143 OpenSMT is an abbreviation for open studying, managing and teaching. This technological framework combines the various technological approaches which were developed throughout the project VORMS. Diverse technological developments are thus combined in this approach and given a standardized appearance to the users. OpenSMT has many components. The most important ones are the following ones. OpenSMT is an authoring tool. With OpenSMT courses can be split into segments and allocated to single lessons. OpenSMT also offers the possibility to administer courses as well as participants. It also supports electronic uploads of homework which is to be turned in to the teacher. OpenSMT offers a variety of CMC possibilities.

compared to using alternatives. These alternatives are open source products[144]. In these cases interfaces were prepared (some are still being prepared) in order to connect these external products. Detailed descriptions concerning communication and collaboration features are described later in this section. For the further description of the technology within this realization of the WBCM it is important to differ between the virtual study course VORMS and OpenSMT.

Contents used within the case, e.g. the case itself or further reading material will be stored in VORMS. Students access these materials through corresponding links which are managed and administered through OpenSMT. This means that students access the material through OpenSMT and are then linked to VORMS. Before describing the actual implementation of the case, additional material and communication and collaboration possibilities within OpenSMT the technological approach of VORMS is described in the next section.

The technological approach of VORMS is primarily content oriented opposed to course oriented. These are connected to each other as a (virtual) network. Navigation through the networked information can take place in form of free surfing or through guided tours. "Constructing courses out of learning objects is similar to building toy houses with Lego bricks: Put together in one way they build an introductory course to operations research. Some of the objects used can be reused in a different combination i.e. in a course of business administration." [Frank/Suhl/Tan 02, 1135].

The concept of VORMS is based on structures of different granularity levels. "This means that the framework supports the following building blocks to be used in constructing flexible, reusable learning environments:

- a *media element*, like text, animation, simulation, video or audio sequence,
- a *learning element* consisting of one or more media elements,
- a *content module* consisting of one or more learning objects, and is understood as a node in the hypermedia network,
- a *thematic metastructure* defining guidelines how to use content modules to build thematic structures relevant for a specific study goal; such a structure can be put together in individual ways, thus adapting to different combinations and profiles." [Frank/Suhl/Tan 02, 1136].

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[144] The term open source describes software which includes the source code. Software developers who support the open source concept believe that by allowing interested people to modify the source code, the application will be more useful and run error-free on a long term basis. The development industry considers software to be open source when the following criteria are met. The program must be freely distributed. The source code must be included. Everyone must be allowed to modify the source code. Redistribution of modified versions is allowed. The license must not require exclusion of other software or interfere with the operation of other software [Opensource[WWW]].

This structure is described in the following graphic.

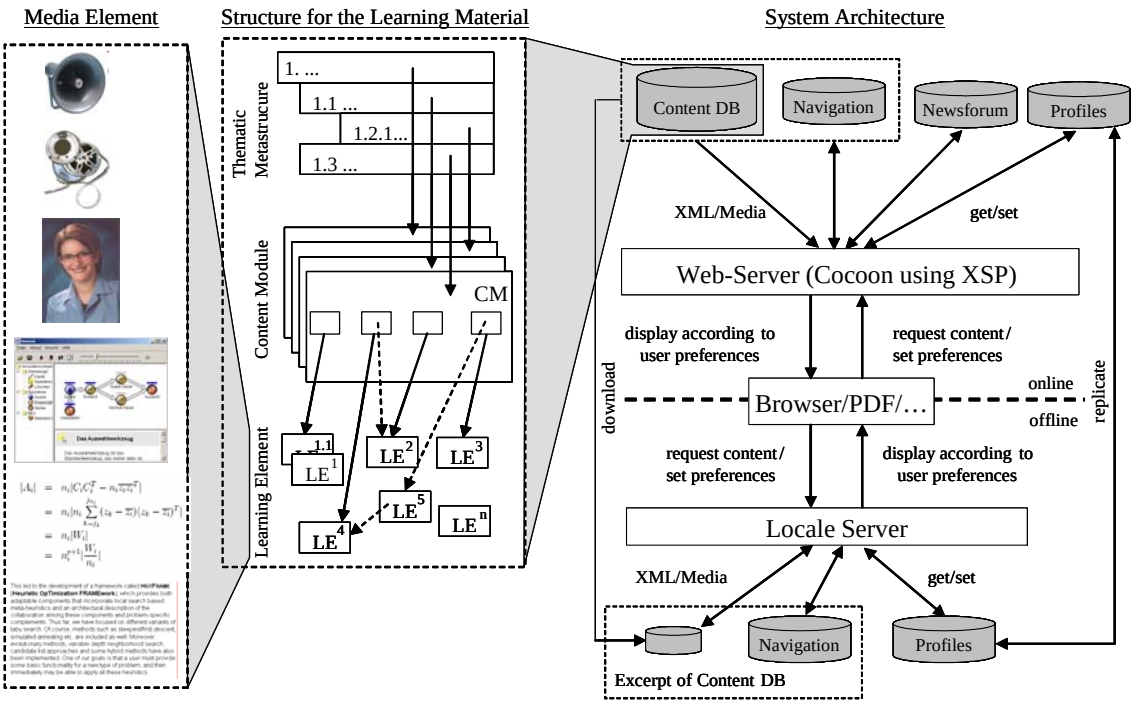

Fig. 7.4-1: Technological structure within VORMS

On the left side, different media elements (media files, applets, text, and formulae) are shown, which can be combined to learning elements and content modules and thus construct the thematic metastructure. The right side shows a simplified system architecture with all relevant components, e.g. the databases which store the learning material as well as further going information. The term learning object is used to refer to elements at any level. Further information concerning the actual size and condition of these learning objects is given by [Frank/Suhl/Tan 02]. Contents of the case or additional material can be set up through these learning objects and can thus be offered to the students. This extends the possibilities of traditional cases, which are paper-based. Animations, simulations, audio or video-sequences are very enriching for an authentic description of contents and environmental circumstances. A wide variety of documents (e.g. access to artificial databases or specially designed knowledge management systems) can be made accessible through this web-based approach. The flood of information due to increased use of technology can be simulated very well through this approach. Students must learn to differentiate between important and unimportant data – within a web-based approach competences within this selection process can be trained and practiced. Additionally, the reusability of the components which are created for each case justifies their expenditures of time. The designer of the materials added to a case can easily make these accessible in different contexts to different audiences who access them through VORMS.

Students access components of the case, which are visualized and stored in VORMS, through OpenSMT. Additionally, they are also able to communicate through CMC possibilities made accessible within OpenSMT. Thereby the WBCM relocates feedback which is given by the professor in the traditional case method to the web in form of peer feedback. Prompt feedback about success or failure of a task is supportive for learning processes (see results of the empirical study described in chapter 2.3.2). Especially in the context of group work feedback from other learners has been proven to be very motivating (see chapter 5.2.4). Direct feedback strengthens group cohesion and leads to mutual support between the participants thus increasing the motivation concerning the task. Feedback is especially important, because it shows contrary positions, which must be discussed. Just as it is intended within a constructivist model, learners construct their own opinions and integrate knowledge elements of others into their existing framework (see chapter 4.1.3). Being able to ask questions, give comments and answers and the receptive processing of feedback concerning own achievements as well as achievements of others is an essential prerequisite for active and collaborative virtual learning. To enable receiving this feedback and in order to support discussion processes, synchronous and asynchronous communication possibilities are included. Communication barriers such as time and place are omitted once synchronous and asynchronous communication media are implemented. Small groups can flexibly communicate with each other and use the electronic communication to coordinate face to face meetings. Archives of discussions can be generated, protocols of former conversations can be reused, communication can occur very spontaneously.

Within OpenSMT the following communication possibilities allow cooperation according to the needs defined in chapters 6.3 and 6.4 of this thesis. To begin with the verbal description of the case is implemented into the system as a so called material. By designing the description of the case as a learning object and storing it within VORMS this material will then be described through a link. This is of advantage for the concept of hypermedia can then be integrated into the representation of the contents of the case (see chapter 4.1.3). This textual case description can thus be enhanced through a redesign of the contents considering hypermedia. Due to the environment of the virtual study course VORMS links can be made to parts of this virtual course in to enable the students to acquire prerequisite or further going knowledge.

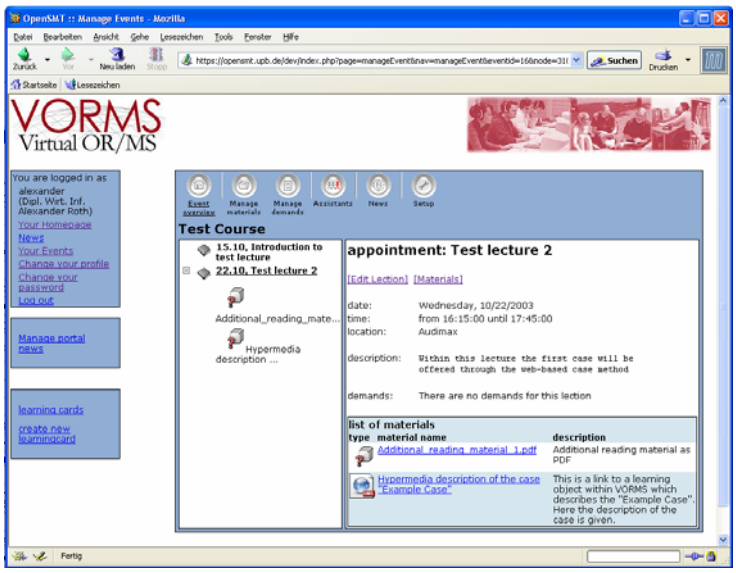

Fig. 7.4-2: OpenSMT showing the description of a case (screenshot)

After the students have either worked through the case in individual preparation, or if they are not sure how to succeed, the next step is to visit a group work room. These group work rooms can be arranged and administered by the students themselves. How this is technologically realized will not be focused on within this explication. For a detailed description see [Lohmann/Roth 03]. The group work room gives students the opportunity to offer materials to the people whom access to this room is granted. This is shown in the next screenshot.

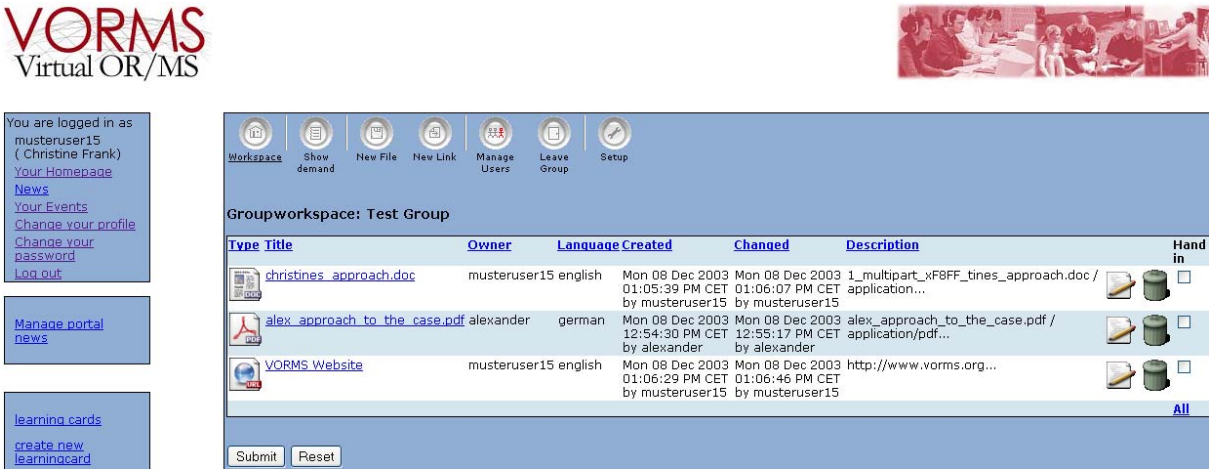

Fig. 7.4-3: Group work room within OpenSMT (screenshot)

Out of this group work room the offers of computer-mediated communication possibilities will be reachable. Through an empty rectangle the following screenshot indicates where additional buttons for access to CMC possibilities will be integrated.

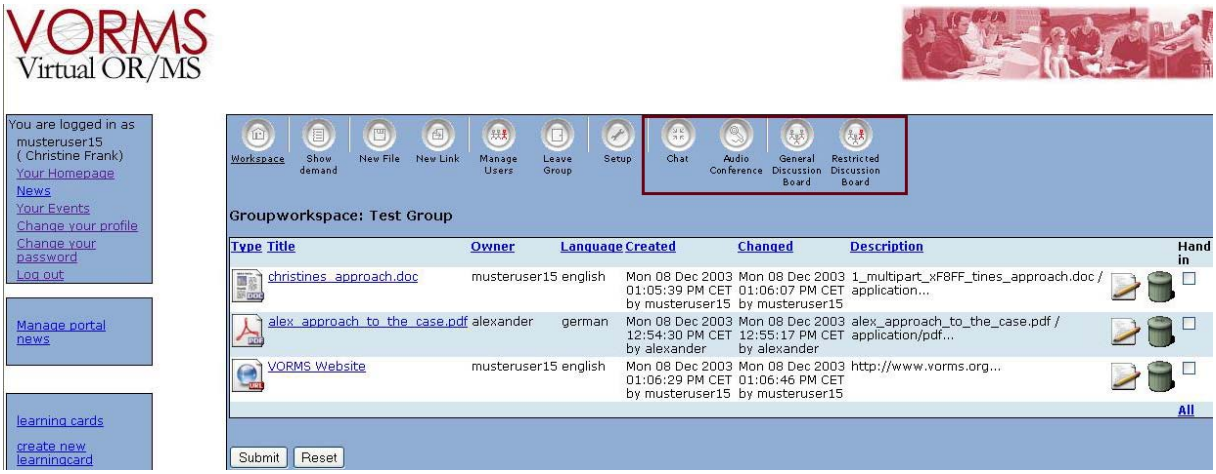

Fig. 7.4-4: OpenSMT indicating where buttons will appear which offer access to CMC (screenshot)

Through this screenshot it becomes clear that interfaces for these communication possibilities are still being developed and they are still in a test phases. These functions are intended within the concept of OpenSMT, but they have not been realized yet. Several components and their interfaces for OpenSMT are still being developed at the time being through diploma theses of students. The chat functionality is one of these missing components. An interface to the open source Bablyon Chat has already been created by Rott [Rott 03], however the implementation is still in progress, within the test phase. The interface for the open source tool Babylon Chat will soon be integrated into OpenSMT. Once this is done, an icon will appear in the above described rectangle and offer access to this chat program.

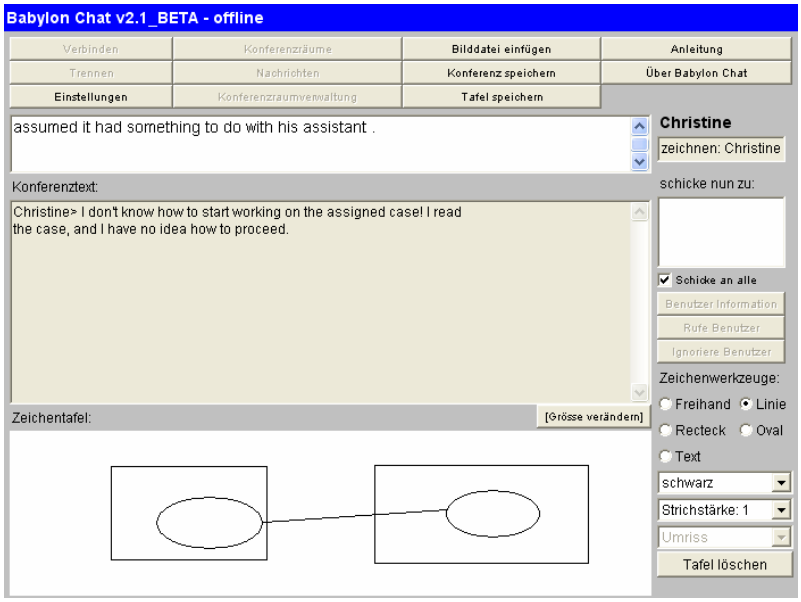

Fig. 7.4-5: Babylon Chat (screenshot)

The same applies to the audio conferencing functionality. The realization of this interface, is also still in progress. Again, once this functionality is integrated another button will be added to the rectangle in the above described screenshot and access to the audio conferencing functionality will be enabled through this interface. The chosen open source tool for this is "Speak freely" [Speak freely 03[WWW]]. The instant messaging functionality is also still considered as work in progress.

Two kinds of discussion boards are offered to the students. The first kind is a general discussion board to which everyone in the course has access. The second discussion board is only reachable for the participants within each small group. These discussion boards will also be made accessible through interfaces integrated into OpenSMT and symbolized through icons similar to the audio conferencing and chat functionalities. Discussions in the restricted discussion boards can be archived by the participants.

Because both of these interfaces are also still missing the temporary solution is to offer students discussion boards for their small group work which are not connected to OpenSMT. The general discussion board is integrated into OpenSMT by a link.

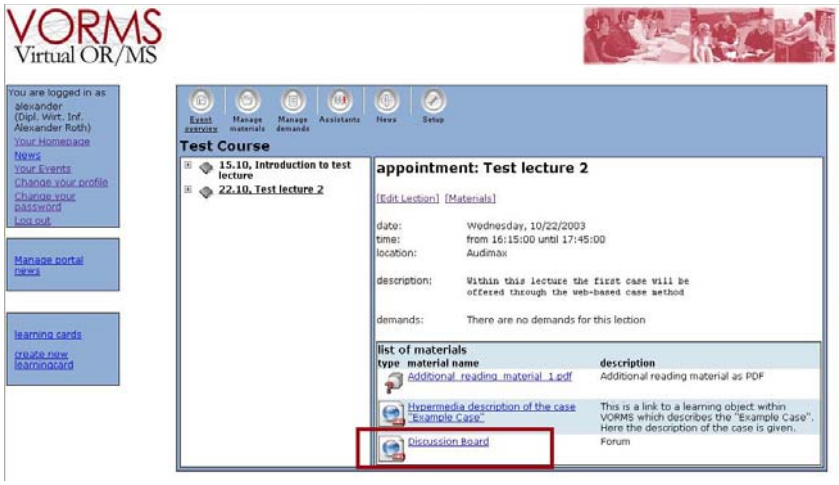

Fig. 7.4-6: Link to the discussion board within OpenSMT (screenshot)

These discussion boards are structured according to the common design of discussion boards (see chapter 5.1.4). Within the general discussion board it is the job of the teachers to moderate these discussions (see chapter 6.3.1).

It is again to emphasize that within the concept of the WBCM students are not forced to use these technologies. They can choose freely. They can switch between traditional and virtual approaches and combine them as they like. Only if they really approve of these technologies, if they have advantages through using them, if they feel comfortable with them and find all the functions they are looking they will use these CMC possibilities for their advantage/success. Forcing them is the wrong way to get them to use these technologies. Asking them what exactly they

want, what experiences they have made and training them in the use of these technologies beforehand are important factors to positively influence use of CMC. Communication processes will take place through the web, but also in traditional scenarios. It is not advisable to neglect one social form completely, for a combination seems most reasonable (see chapter 2.2.6).

The goal of chapter 7 was to demonstrate the functionality of the conceptual design developed within this thesis. The descriptions in this chapter show that realization of this approach is possible but strongly dependent on existing technological infrastructure. These are the basics which must be considered and extended in accordance to the necessities of the respective target group.

8 Conclusion

Within this chapter a summarizing review of this thesis is given. Therefore the main results are summarized and regarded in a critical manner. Further prospects concerning the results of the thesis are also introduced.

The goal which was formulated at the beginning of the thesis was to develop a conceptual design for the web-based case method. Through the results generated within this thesis this goal was reached in a comprehensive and convincing way. The procedure in order to reach the main goal of this thesis was divided into four steps. The course of argumentation adheres to these.

The introduction gave the motivation of the thesis. It was described that the overall intent of this thesis is to increase the quality of teaching and learning scenarios. Traditional practical learning can only be facilitated to a restricted number of participants, due to the large amount of prerequisite resources. One methodology which enables application of knowledge is the case method. The traditional case method is a teaching and learning method which has a long tradition and is known to be successful in terms of applying knowledge. However, the traditional version of this methodology is not applicable into a variety of settings because necessary resources are frequently not available. New possibilities to apply theory must be generated in order to satisfy the state of the art demands of students. Current trends show that e-learning applications can facilitate this and, additionally, through implementation of e-learning a higher order of cognitive learning goals can be reached. However, state of the art applications of e-learning frequently miss adequate pedagogic and didactic principles, and therefore their application as well as success remains limited. Therefore this thesis develops a conceptual design for an e-learning application called the web-based case method based on the traditional case method.

Within chapter 1 a demarcation of the problem of this thesis was given. Afterwards chapter 2 described basic principles of the case method and of e-learning. The existing research deficits concerning technology enhanced developments of the case method were also identified. The systematic derivation of the above mentioned goal through the illustrated deficits describes the starting point for the research conducted for this thesis.

The development of the conceptual design of the web-based case method begins by evaluating necessary requirements for it. For this purpose the target group was identified and described and three empirical studies were conducted. The results of this research are described in chapter 3.

Identification of the main characteristics of the traditional case method in accordance to the target group is the foundation for the development of the conceptual design of the web-based case method. Before these characteristics are identified through empirical research chapter 4 gives insight into learning theoretical basics, which influence the conceptual design. At the end of this chapter an empirical study identifies and derives the main characteristics of the web-based case

method. These characteristics are the basis for the further research within this thesis. These features are the fundament for the development of the web-based case method.

Two of the main characteristics of the case method are of special relevance for the further procedure of the thesis and therefore they require further clarifying. These are communication and collaboration and they are the focus of chapter 5.

Chapter 6 explains the conceptual design of the web-based case method. The design principles for the WBCM are constructed according to the main characteristics of the case method described in chapter 4.2. These features are now divided into two groups: general design principles and specific design. General design principles describe characteristics which form the framework for the conceptual design. This framework is fixed and remains the same not regarding the environment into which it is implemented into. The specific design is also a fundamental component of the WBCM although its structure needs to be designed to suit the respective environment. Within chapter 6.3 these characteristics are designed in a way to fit into the setting of the subject OR at the University of Paderborn. Besides developing the conceptual design, this thesis also described a specific implementation of this conceptual design. This implementation is described in chapter 7 and demonstrates the functionality of the approach. This implementation includes the framework of the four general characteristics as well as empirical research described in 6.3 to design the two specific characteristics adequately according to the target group users.

The conceptual design, developed within this thesis, differs from the existing variants of technology enhanced variants of the case method by being systematic and thus reproducible. The conceptual design developed in this thesis focuses on the pedagogical perspective, not on technological aspects. The pedagogical perspective of the conceptual design was reached by integrating pedagogical methods and focusing on pedagogical attributes rather than on technological ones. The conceptual design of the WBCM describes an e-learning application which has a solid pedagogic and didactic foundation for it is founded on the characteristics of the traditional case method defined in chapter 4.2. It is neither possible, nor was it the intention of this thesis to develop a web-based version of the traditional case method which inherits all of its advantages and features with reduced (personnel) resources. Moreover, by identifying the main characteristics, from the viewpoint of the target group, it was evaluated how state of the art technology is able to facilitate e-learning according to these explicit features. This was realized by regarding each characteristic in isolation and examining whether and how this characteristic can be implemented into a web-based setting (see chapter 6.2). It quickly became clear that four of the six main characteristics namely, constructivist, problem-based, perception of participants and three phased work-through process, of the WBCM are constant and form a stable framework. Two of the main characteristics, communication and collaboration, are features which need to be researched and redesigned for each specific implementation of the WBCM. The design of these two charac-

teristics can vary between environments and individuals, depending on their preferences and prerequisites. The conceptual design of the WBCM, which strives to adequately satisfy individuals' needs, must be constructed in the tradition of blended learning. Students must be able to influence and allocate distribution of traditional and virtual elements according to their situation and preferences. Offering learners the possibility to choose communication and collaboration elements according to their wishes and combine them to their own learning scenario is given by the concept of the WBCM described in chapter 6. Various advantages the traditional case method has to offer can now be facilitated to a larger amount of students, who are studying in an environment which does not support implementing the traditional case method. It is now also possible to integrate application of theoretical knowledge into the scope of offers the university can make. This increases the level of reachable learning goals, facilitates further learning goals besides factual knowledge and supports remembering theory due to the embedding it into stories. Creativity is increased and social skills are enlarged, just as the continuously increasing amount of jobs is calling for. Students are taught to be team players instead of single fighters. Networks between students are increased, and these will be valuable once they are integrated into the business world. Computer literacy is improved – another valuable skill for the future.

A self critical annotation to the research conducted within this thesis is a missing evaluation of the overall implementation of the developed concept. An evaluation would give further information about improvement potential which can be used to re-define the design and form of the characteristics communication and collaboration, for the remaining four attributes will remain the same. However, results of such an evaluation serve as quality assurance of the specific implementation of the designed concept rather than influencing the design of the concept itself. Therefore this kind of evaluation is regarded as a component of a continuous quality improvement procedure, rather than adding this to the phase of designing of the concept. This ensures giving up outdated technologies and considering and implementing state of the art technologies.

The conceptual design of the WBCM develops and adapts to the further development of information and communication technologies and can integrate these according to the given setting. Four set characteristics form a solid framework into which the two adaptable components can be integrated – thus building a framework with a long term range of application. This solid yet formable framework is based on found pedagogic and didactic principles and is able to adapt to future demands and technologies while it is possible to integrate it into a variety of teaching and learning scenarios. In accordance to state of the art findings, its approach is constructed in the tradition of blended learning, for at the time being it is not possible to substitute all phases and stages of a traditional education process through virtual components.

In order for computer-mediated communication and virtual teamwork to become generally accepted old habits of the students and faculty need to be changed. This can only happen in a

meaningful way if faculty can actually point out advantages to the students, and students in return must actually profit from these advantages. Existing cultures must be changed, and this of course, can not happen at once. This is dependent on the actual insight of the participants involved. Attaining new habits can be difficult and lengthy, but once accepted they will be internalized durably, opposed to requirements placed upon them through third parties. The conceptual design of the WBCM is a chance to break into the existing culture and offer a new way of learning, including new ways of communicating and collaborating.

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Appendix

A. Identification of the key factors of the traditional case method

Goal of this empirical research was to identify key factors of the CM out of the perspective of experts.

Purpose of this evaluation was to validate characteristics described in state of the art literature, and to identify them according to importance to the interviewees. The results of this evaluation are: to

- to give the researcher a detailed overview of the characteristics of the case method.
- to give the researcher a detailed overview of the advantages and disadvantages of the case method.
- to collect ideas to support this methodology through web-based applications.

Interviewees were eight students studying at The Richard Ivey School of Business (London, Ontario, Canada) who have already had experiences using this methodology. Five of the interviewees were signed up in the MBA1 program. One interviewee was enrolled in the HBA1 program. One interviewee was registered in the HBA2 program, and the last interviewee was enrolled in the MBA2 program. The students had all had experiences using the case method; some of the interviewed people had had experiences of working through 200 cases or more. The interviews were held in English therefore direct quotes are included within the interpretation of the results.

Guideline questions including further going questioning are as follows:

1. What do you associate with the case method?
   Describe the experiences you have had with the case method.
   For which subjects is the case method suited best?
   Describe the advantages and disadvantages of the case method.
   Who do you think learns best with the case method?
2. Describe the prerequisites needed to successfully work with the case method.
   Which role does communication/do communication abilities play?
3. What do you learn when learning with the case method?
4. Describe the different roles/sequences within the case method.
   Describe the phases where you work alone.
   Describe the phases of the small group work.

Describe the phases of the discussions in the classroom.
Describe the roles of the people involved (e.g. teacher, fellow students etc.).

5. Describe how you could transfer the different roles/sequences (e.g. small group work, discussions etc.) onto the web.
   Describe the role of online communication within this setting.
   Describe how online communication can be realized.
6. Describe the advantages and disadvantages you could imagine of an entire or partially web-based case method.

Evaluation of these interviews is structured according to six categories which were developed according to the structuring content analysis (according to [Mayring 95, 78]).

I. Experience with the case method
   - 1.1 Characteristics of the case method
   - 1.2 Learning objectives
   - 1.3 Subjects which are suited best for learning with the case method
   - 1.4 Advantages of the case method
   - 1.5 Disadvantages of the case method

II. Prerequisites for the case method
   - 2.1 Learner prerequisites
   - 2.2 Teacher prerequisites
   - 2.3 Environmental prerequisites

III. Phases of the case method
   - 3.1 Single work phases
   - 3.2 Small group phases
   - 3.3 Large group phases

IV. Roles of the people involved
   - 4.1 Role of the teacher
   - 4.2 Role of the students

V. Communication within the case method
   - 5.1 Role of communication
   - 5.2 Virtual communication

VI. Web-based case method
   - 6.1 Feasability of transfer in general

6.2 Feasibility of transferring individual preparation

6.3 Feasibility of transferring small group work

6.4 Feasibility of transferring large group discussion

6.5 Advantages

6.6 Disadvantages

These categories cannot be defined so clearly, that there are no correlations/overlaps between the categories. Statements of the category constructivist correlate with statements of the category problem-based. This leads to the fact, that some attributes are named more than once.

The detailed results of the interviews are described in the following section.

I. Experiences with the case method

This category describes the experiences the students have had with the case method. This category is subdivided into five further subcategories. In subcategory one an overview of the characteristics of the case method is given. The second subcategory focuses on the learning objectives of the case method, while the third subcategory describes which subjects are better suited for the case method. Within the fourth and fifth subcategories advantages and disadvantages of the case method are described. These are integrated into the text of the dissertation within chapter 2.1.7 therefore they are not included here.

1.1 Characteristics of the case method

Almost all of the interviewees stated, that the real life problems, which the case method works with, as well as the participation are very special characteristics of this learning and teaching method. The case method teaches the learner to apply theory to actual situations. "Reading is one thing. This is application versus theory. How it is applied is often very different from how it reads. The case method moves beyond theory – it shows you what to do in context and in perspective." [IV8, l. 14-17]. The case method offers the learner contexts for theory. "The real life situation gives […] a context that you can relate to" [IV2, l. 22-24].

The case method gives the learner more insight into a company, than any other teaching method. "You never get so much insight into a company as you do with the case method." [IV2, l. 121] You also learn to take on diverse roles within a company. The case method forces the learner to learn actively, as opposed to being a passive recipient of knowledge. Therefore, participation is an important attribute for the case method. "A special characteristic of the case method is the collaboration of the entire class, discussing a situation, when do you have 80 people discussing one topic?" [IV2, l. 124-25]

Students work together when learning with the case method. They take on responsibility for their own, and the learning of the others. "The role of the student is different in the case method than

e.g. in a lecture. You do not just sit there and are a sponge and soak up the information – it is your responsibility to teach yourself and teach others in the class." [IV2, l. 129-131] The case method builds on the experiences of the students, and allows them to integrate their experiences.

Furthermore, the case method is described as a holistic approach. "It uses your entire repertoire of experience to solve the case, as opposed to: this is a math problem, or this is a marketing problem, you use things from every subject, you need to bring in everything you have ever learned." [IV1, l. 18-20]. This supports the students in learning how to analyze one and the same problem from many different angles. By learning and applying this, students develop new ways of thinking. "At the beginning I always made the experience that I thought 'I did not think of that'. Now, as I have had more experiences with the case method, I am readjusting my way of thinking." [IV3, l. 17-19] In order to work with the case method successfully students need to be able to analyze large amounts of data quickly and thoroughly. "You get very good at synthesizing a large volume of information." [IV6, l. 32] The roles of the students and teachers within the case method are also described as being special features of the case method. Teachers within the case method guide and control students less than they do within other programs. Students must work much more self responsibly. These roles are described in detail in the category IV"roles of the people involved".

1.2 Learning objectives

Learning with the case method has various learning objectives. "I learn in areas of factual knowledge, social competences, teambuilding, -leading, how to work cooperatively, etc." [IV3, l. 99-100] The case method focuses on application of knowledge. The case method also encourages the learner to see the "[…] same problem under different lights […] you see that there are other creative solutions to the problem" [IV1, l. 72-73]. Learners learn about the background of many businesses, and about actual, real life problems, that had to be solved. The case method "[…] trains to structure your thinking and analysis skills" [IV8, l. 83]. After having worked through a number of cases, the learner builds up a framework of how to go about analyzing the problem and finding a solution. By having to separate between important and unimportant data analytical skills are enhanced. The case method focuses on "[…] knowledge on how to solve problems, rather than having focused on a specific area" [IV7, l. 143]. A case typically does not give the learner all the information he needs to solve the problem. This "[…] creates an efficiency [on] how you handle yourself in business: you will never have all information you need to make a decision, but you take what you have and make the most comprehensive decision possible – and it trains you to go on from there and think about how you would proceed. […] This is very valuable in business" [IV8, l. 86-90]. Self confidence, time management as well as communication and presentation skills are also built up when studying with the case method.

1.3 Subjects which are suited best for learning with the case method

The case method is not equally suited for each subject. "There are definitely subjects for which the case method is suited better." [IV7, l. 39] Generally speaking, the students believe, that the case method is suited better for less technical subjects. "Not suited for subjects that are very technical. It is not suited for accounting." [IV2, l. 36] "I think it is best suited for less technical subjects e.g. strategy, marketing. Subjects where you make decisions, not so much number crunching." [IV2, l. 33-34] "When decisions have to be made, then the case method should be used. When learning to apply theoretical basics to business situations the case method is good." [IV3, l. 28-30]. The case method is "[…] most suited for marketing, communication, management behaviour, even operations, finance […]." [IV4, l. 27-28]. Another student describes it similarly. According to this student the case method is "[…] best suited for: finance, strategy, managerial accounting, organizational behaviour. These are the subjects where you make managerial or strategic decisions, opposed to crunching numbers" [IV6, l. 22-24].

II. Prerequisites for the Case Method

Necessary prerequisites for learning and teaching with the case method are described in this category.

2.1 Learner prerequisites

Keywords mentioned when describing the learner prerequisites are: communication skills, participation, experience, self responsibility, theoretical background, high quality students, computer skills, identify and analyze problems, open mind, learner diversity, basic business understanding, self confidence and the ability to live with no definite answer at the end of a case.

As described in the category "disadvantages of the case method" the basic understanding for business is a prerequisite, which the learner has to have when learning with the case method. "You need to have a theory background to benefit from the case method - you need be able to do the initial quantitative background work." [IV8, l. 122-123] Due to the focus of the program at Ivey, it is also important to have computer skills, for these are presupposed within the program.

When working through a case, it is necessary to identify a problem and analyze it. Students must feel comfortable with this approach in order to successfully work with the case method. Students learning with the case method should be open minded, not keen on memorizing facts, but willing to solve problems in creative, innovative ways. The learners within one classroom should be diverse, in order to offer many viewpoints concerning one problem. "The case method can only truly work, if diversity within the classroom is ensured. Only by contributing different viewpoints, based on different backgrounds and environments, you can compare opinions, because you may think differently. If everyone is from a similar background, everyone thinks just about

the same. Then I would prefer a lecture from the professor." [IV2, l. 26-30] The learners involved in the program should not only be diverse, they should also be "high quality students"– this improves the quality of the case method. The students interviewed believe that prior experience is a very important prerequisite when learning with the case method. They believe that age and experience correlate. "[…] [I]f you are too young to have work experience and life experience, you will get less out of the case method." [IV2, l. 71-72]. Learning with the case method is also a question of responsibility. It is up to the learner to prepare himself for the course. No one forces him to do so. It is the responsibility of the students to teach themselves and teach others in the class.

They need to be able to motivate themselves and be "[…] independent learners, students who don't rely on the teacher" [IV7, l. 88] for everything.

Students need to be self confident, and believe in what they say. This becomes especially important, when they need to convince others of their opinion. "Communication skills get built up within the program, but you need some qualities to begin with." [IV8, l. 149-150] Students need to have the ability to "[…] express ideas in a clear manner, and defend your ideas" [IV2, l. 95]. "Strong communication skills are a prerequisite. Communication is incredibly important. You learn as a part of a group, the groups that form want to be groups to learn from each other. You can't learn much from someone who does not speak." [IV4, l. 105-108] Communication abilities are focused on in category V.

2.2 Teacher prerequisites

Teachers using the case method must be willing to let the discussion go the way the participants want it to, and not always steer it towards their own "correct" answer. For this purpose, the teacher needs to think of and prepare "[…] different discussion threads, which make the preparation so time consuming" [IV8, l. 113]. Experience with the case method is an often called for prerequisite concerning the teacher: "It takes a professor a lot of time to learn how to manage a class – distribute participation, how to draw quality comments […] [and] shut down other comments which don't contribute to the discussion" [IV8, l. 107-109]. It is the responsibility of the teacher to maximize the potential of the discussion. A necessary prerequisite to do so is to "[…] provide their own skill sets and their background, their expertise" [IV1, l. 107]. The "[…] case method is not efficient when it is drawn down to the smallest common nominator that way the conversation never gets to the highest common nominator – and that can frustrate" [IV6, l. 66-68]. The choice of the common nominator is up to the teacher. His competencies must enable him to make the decision which one is of maximum advantage for all participants.

2.3 Environmental prerequisites

The most important environmental prerequisite is that the class size is manageable. Opinions concerning the optimal number of students within one class vary among the interviewees be-

tween a maximum of 80 students to a maximum of 50. The following two quotes show this. "The upper limit of participants is 80, because participation is graded so highly, going beyond 80 participants would hinder the grade – it would then become very de-motivating, because you would not get the chance to speak out as much as you would like." [IV8, l. 129-133] "Not too small, 6 people would be too little. Optimum would be around 50 students." [IV3, l. 73-74]

Interestingly, only one interviewee mentioned that comfortable chairs as well as a beamer and a sufficient number of blackboards are needed as environmental prerequisites. The size of the rooms, arrangement of chairs, as well as equipment such as wireless LAN network, further going web support, receiving the cases ahead of time, being offered additional reading material etc. were not mentioned. This might be due to the ideal conditions offered at The Richard Ivey School of Business.

III. Phases of the Case Method

The case method consists of three phases. The students start out with a single work phase, where they read and analyze the case. In this phase first attempts for possible solutions are made. These solutions are then presented within the small group phase, also referred to as study groups. These groups consist of 5-7 students, and within this setting each student introduces his views and receives feedback. After this phase all of the students gather together in the large group phase, also called plenum. Now viewpoints of students or study groups are introduced. This leads to a discussion. The professor moderates and facilitates this discussion. A detailed description of these phases is given in the following subcategories.

3.1 Single work phase

The single work phase is described as a phase, where facts are learned. "Time is spent trying to process information of a case and come up with your own way of solving the case." [IV3, l. 116-117] Typically, this is done by reading the case and articles which are associated with the case. Usually, the case is skimmed once, and then read through in detail. This phase offers the possibility to work through exhibits, and to do numerical analysis. Two interviewees described that approximately 2 hours are required to work through one case. "Usually about 2 hours of preparation per case involve reading, reading supplemental readings, analyzing the case to the best of your ability. Usually you can not solve the case. You can usually get 75% or 80% done, but not more. Not on your own. That can be frustrating." [IV6, l.100-104] Another student describes this phase a bit more positive: "Making sure that my understanding is there and enough to go to the small group" [IV2, l. 140-41]. This phase is a necessary prerequisite in order for the group work to become meaningful. "The phase where you work alone is critical! Working alone enables you to digest the case. Working alone lets me benchmark my opinion […]. If that hasn't been done, no benefit will come from small group discussion." [IV8, l. 207-210] The impact of the personal preparation increases as more experiences are made with the case method. "At the beginning of

the program my individual preparation did not get me as far, it grew over the course of the years. My analytical skills were progressing with experience in case analysis." [IV8, l. 215-217]

3.2 Small group phase (study group)

Study groups consist of approximately 5-7 students. Students are assigned to a learning team by faculty. The constellations of the teams rotate. The main goal of the study group is to discuss the main aspects of the case, and answer the questions concerning the case. Every student introduces and validates his ideas, and receives feedback. This "[…] adds another layer of complexity to the case […] [which] enhance[s] your own analysis by hearing what your learning team has to say." [IV1, l. 91-94] Because of the different viewpoints the small group phase "[a]dds a different element of learning" [IV7, l. 171] to the learning process. This phase is generally perceived as being "Very valuable to debate, discuss and learn from others. It allows more direct discussion on the issue." [IV4, l. 141-142] Depending on the case, this phase of the learning process can take between 1 – 3 hours. During this time "[…] the group members have to justify their position to others. You get closer to the solution than in the individual preparation" [IV6, l. 106-109]. This extension of the learning process is due to the fact, that the individuals can supplement each others knowledge. "Sometimes you don't know something and one person will know it, and you will be able to go on with the case." [IV7, l. 174] Sometimes, after the study group phase, individuals will need to go back to the phase of individual preparation and revise their work.

Study groups also teach how to work with different kinds of people. "Learning in the small groups forced you to work with different persons, learning styles etc. You just had to make the best of it. […] That can happen in the real world. Small groups replicated a true office environment." [IV8, l .223-225]

One interviewee mentioned that the study groups are only productive, when the participants come from different backgrounds. "If we were from completely different backgrounds, OK, then there would be value in the small groups, because the point of the small group is to give you different viewpoints as to how you see something. When you are in a small group with other North Americans, with similar background, they can't tell me anything I don't already know. They have no additional insight." [IV2, l. 144-151] After preparing the case in the small study groups the students go to the plenum. Some small study groups meet again after the discussion in the plenum. "Some groups meet after the large group discussion to debrief. To see what their opinion is. That phase is very short, approximately 5 minutes." [IV6, l. 119-120]

3.3 Large group phase (plenum)

The phase of the large group discussion is a "[…] multi layered, multi opinion approach of the problem […]" [IV1, l. 96-100]. It is described as being "[…] very productive, because of the people in the big group. If they had all been the same as the people in my small group, it would not have helped, but the class is so diverse" [IV2, l. 155-158]. Productivity within this phase is

only given, once the other two phases have been completed successfully, otherwise it is not possible to profit from this phase. If prepared correctly, this phase broadens the viewpoints even further than the two preceding phases did.

"Often you come up with a very comprehensive answer. You would not have been able to do that alone or in the small group." [IV6, l. 114-115] This phase offers "[…] a forum to hear all the possibilities that you did not cover" [IV3, l. 129]. This lets the learner develop "[…] a bigger picture of the aspects involved" [IV3, l. 130]. Frequently this "[…] clarifies what you should have done – often in the small groups everyone has done it in the same way, but in the large group you see different ways that are much easier" [IV3, l. 131-133]. However, the discussion in the plenum often goes where the other students want it to go. The individuals do not have as much impact on steering the discussion, as they do within the small study groups. The "[c]lassroom is more guided, coached, and manipulated to where the professor wants to take the discussion. It's more fragmental in a big group." [IV4, l. 151-154] Because this phase is moderated by a teacher, the students can be sure that once they have gone through this phase, they will know what the key learning points are within this case. This can not be assumed after the small group phases. "Being moderated by a professor, you know you have the key learning points covered – that you wouldn't know after being with your small groups. The summaries of the professors are very beneficial – that's what I remember most of the case." [IV8, l. 232-236]

Within this phase it is important that everyone contributes. Only by doing this everyone can get the most out of this phase. "[…] [W]hat disappoints me the most, is that some people are very bright and don't say anything […] if you don't contribute, it hurts the other people" [IV5, l. 121-123]. The quality of this phase increases as the backgrounds of the participants vary. It is only possible to generate many alternatives and different ways of solving the problem when the backgrounds vary and if there is enough specialized expertise throughout different branches within the classroom.

IV. Roles of the people involved

Students involved in the case method take on many different kinds of roles. The roles and duties of the teachers differ from teachers who teach using different teaching methods. The key roles and their descriptions are described within this category.

4.1 Role of the teacher

To start out with the "[…] teacher chooses the case." [IV6, l. 124] which is to be worked on. The teacher starts, leads, and structures the discussion. "Textbooks I can read on my own, but within the case method you depend on the teacher! The teacher gives you the focus and clarity." [IV7, l. 121] The teacher gives this focus and clarity by having the abilities to:

- mediate, guide and push discussions.

- organize and control the classroom.
- distribute participation throughout the classroom.
- bring in his/her own experience and expertise.

"The role of the professor is a special characteristic of the case method. The professor is a mediator and a guider of a conversation, more than a teacher who tries to teach you. They are pushing the discussion, letting it flow in a certain way they don't stand in front of you and teach you." [IV2, l. 126-28] How they go about this is very delicate, and calls for intuition. The teacher "[…] needs to have the ability to control the classroom – not too much, not too little [this is a] very delicate subject" [IV3, l. 75-76].

The teacher filters contributions. The "quality of the comments need to be enforced by the professor" [IV5, l. 124]. The "[t]eacher directs conversation, and draws out all important facts and positions" [IV6, l. 129]. Furthermore, he facilitates, moderates, and mediates. "[…] [T]hey are moderators, mediators, they are sources of information; they are there to help us clarify our ideas" [IV3, l. 138-139].

The teachers are appreciated and respected very much within the case method. They are regarded as a very valuable resource. "You learn yourself, your teacher guides you. If they don't guide and push you in the right areas, it's useless." [IV7, l. 236-237] Another key factor, why the guidance of the teachers is described as being so precious is because once a case has been worked through with the support of a teacher, the learners can be sure, that the key learning points were covered. "Hearing that you covered all key learning points from the teacher is important." [IV8, l. 248] This gives the students the security that the learning objectives which are assigned to this case are covered.

4.2 Role of the student

The "[…] role of student is different in the case method than e.g. in a lecture. You don't just sit there and are a sponge and soak up the information – it is your responsibility to teach yourself and teach others in the class" [IV2, l. 129-131]. Some interviewees refer to the students as being the actual teacher within the case method. Students within the case method must criticize, offer alternatives, give feedback, offer their own expertise, and give their fellow students psychological support. This psychological support concerns mutual support, when the stress takes overhand. Students must trust the faculty to "[…] choose the right cases […] [and to] direct the conversation to the right direction" [IV6, l. 144-145]. Even though students are very self responsible within the case method they are also very dependent on their teachers.

Within the learning process students take on certain roles. However, these roles are not set, they vary according to case, experience, and expertise they have concerning the case. "Within small groups it is interesting to see that each person takes on different roles. There always tends to be a

leader. A second in command. Someone who lets something happen around them. [It is] interesting to see how that develops. [It is] interesting to see that those roles change when being put on another learning team. Different people exploit different roles when in different combinations." [IV8, l. 241-246]

It is of advantage when students in one course are very diverse concerning their background, experiences and expertise because this facilitates many contrary viewpoints and thus generates creative solutions, where the students actually supplement and extend each other's viewpoints.

The interviewees declared that there are some differences in the roles of the students. For example non native speakers do not participate as often as native speaker. One interviewee believes this is due to the fact that "[…] the people who don't speak the language very well, feel less comfortable and tend to speak up less" [IV3, l. 63-64]. Some interviewees perceive differences in the roles of the students according to gender. However, the opinions concerning the roles are opposite, as the following two quotes show:

"There is no equal balance in females and males in my class. There are 2/3 men and 1/3 women. […] Class discussion is male dominated – more males speak." [IV7, l. 94-98] Another student said: "[…] [I]f anything it is the reverse, the women speak out more than the guys." [IV3, l. 62]

V. Communication within the case method

The importance of communication within the case method as well as virtual alternatives and virtual extensions of traditional communication are described within this category.

5.1 Role of communication

Communication plays an important role within the case method. The following quote demonstrates this very clearly: "If you have trouble communicating you either a) get over it, or b) do not go to a case program" [IV2, l. 101-103]. Communication, so another interviewee, is the whole point of the case method: "[…] the whole point of the case method is to force you to communicate your thinking and justification to others" [IV6, l. 72-73]. Students do progress and advance their communication skills while in the program, but they also need to have well trained communication abilities as a prerequisite when indulging into the case method. "Strong communication skills are a prerequisite. Communication is incredibly important. You learn as a part of a group, the groups that form want to be groups to learn from each other. You can't learn much from someone who does not speak." [IV4, l. 105-108] Redundant conversations take place during the process of working through a case. This annoys some of the interviewees, but they do not have ideas how to eliminate redundant conversations. Communication difficulties are often encountered because "[…] sometimes people misinterpret other's comments […]" [IV5, l. 68]. "[…] [C]ultural communication barriers […]" [IV5, l. 69] are also a reason for breaks within communication. Good communication abilities do not only describe good speaking abilities,

moreover they also require the participants to go beyond that. In order to make "[…] valid contributions you need to be able to listen effectively, otherwise you will not know what's going on" [IV3, l. 84-85]. "[…] [P]eople who can understand ESL [English second language] persons get lots more out of it. It is important to have good listening abilities; you need to be careful to listen to exactly what ESL's say – to puzzle through it." [IV3, l. 81-83]. Communication abilities also influence cooperative, collaborative working as well as interpersonal skills.

5.2 Virtual communication

All of the interviewed students use means of virtual virtual communication as supplements to traditional communication forms. Microsoft messenger is an instant messenger, that was used by all of the interviewed candidates. Additionally, they write each other e-mails, however not as often as they "MSN each other". "To start off with a general comment: we do quite a bit of web work informally. MSN messenger is our best friend in first year. Sometimes you read the case and don't know where to start. What we often do is MSN someone. Where did you start? How did you go about doing this case? That often helps your own analysis. We do a bit of MSN chatting about it." [IV8, l. 208-212] One teacher integrated the possibility to use the MSN messenger within the classroom during the large discussion phases. This enabled the students to either participate in the traditional discussion in the classroom, or to participate in various other discussion threads on the MSN messenger. Following more than one discussion simultaneously is described as being hard: "[…] when real-time chat is used in a class it makes it hard to follow both conversations" [IV5, l. 163-164]. However, offering different discussion threads through MSN messenger is interesting because often the in class discussion leads to a direction that is not interesting for everyone. Through MSN messenger students can discuss the topics they prefer to discuss, not the ones the students in class want to talk about. This adds another possibility for participation, and thus also to grade participation.

VI. Web-based case method

How the general transferability of the traditional case method to a a web-based case method is viewed is explained in this section.

6.1 Feasibility of transfer in general

General opinions concerning the transfer possibilities of single sequences or the entire case method into an online scenario are skeptic. "I don't think that doing the case method online would work, because the people won't be motivated enough if they don't come to class all the time. People need to do the work, and I think even we would not do the work, if we weren't forced to do that [come to class] – and forcing them on the web seems difficult." [IV3, l. 159 - 163] Issues of concern within online scenarios are the dynamics of the discussion: "It would, however, I think, take away some of the dynamic which is offered in a class" [IV8, l. 274] as well as the structure and structuring of online discussions: "If you don't discuss in the classroom at all,

if you only communicate online, the online channels need structuring to get that type of dynamic, you would need everyone online to follow it at a certain time" [IV8, l. 272-274]. Depending on the phase of the case method, the students can skeptically imagine online support or supplements to a larger or smaller degree. These ideas will be described within the next categories.

6.2 Feasibility of transferring individual preparation

Transferring the phase of individual preparation to the web is not perceived as being difficult. "[…] [Y]ou could transfer the individual preparation to the web - no problem" [IV1, l. 117]. Because this phase almost only consists of reading: reading the case and reading additional literature, it almost makes no difference from where you retain the reading material. Within this phase, there are also some advantages, when transferring it online: "When learning on your own […] [there is] no difference if you see it on a piece of paper or on the screen of your laptop. The only gain in this first level is to gain more background information on the case through the WWW" [IV4, l. 174-176]. Additional reading materials as well as further going internet links could be provided very easily. The quality of individual preparation could be increased by making the contents even more self explainable e.g. by integrating demos, simulations and other interactive components.

6.3 Feasibility of transferring small group work

In general the students believe that it is hard to transfer this phase into a web-based environment. After being asked this question many of the interviewees answered that they believe it's hard to transfer this phase. After thinking about it for a while, however, they did have some ideas. Possibilities to transfer this phase would be to use "[…] discussion boards or chat to let the small groups meet online" [IV1, l. 118-119]. One student described the following transfer possibilities: either a "[…] conference call: microphones and cameras and people conduct a conversation […] [or] instant messaging." [IV6, l. 153-154].

Students mentioned some concerns for online small group work. When working with a group of 5-6 students "[…] it's good to have voice or face-to-face. I would have difficulty using web chats" [IV4, l. 178-179]. Another student describes that message boards could be used, but "[…] they are difficult to work with" [IV5, l. 142]. The interviewed students agreed that when using online scenarios to support these traditional phases, "[…] a great amount of time needs to be put in to structure it" [IV8, l. 276-278].

6.4. Feasibility of transferring large group discussion

Similar to the small group phases, the interviewed students are cautious in this matter. Most of the interviewees who state ideas are unsure about the effectiveness of online large group discussions. Additionally they believe it is hard to actually realize them. Large group discussions are "[…] difficult to transfer on the web. Large group discussion on the web is even harder than small group discussion" [IV4, l. 181-182]. One student could imagine facilitating up to 20 people

online, but not any more than that. Another student thought of facilitating the discussion within a chat. However, according to this student it would be limited to ten people, for various reasons: "Once more than ten people are in a chat room, it gets confusing. When did someone say something is not really trackable. How do you pick people? You could make the students engage in synchronous communication, and make them 'raise their hand' by pressing the enter key, but who will the professor take on? Role play would also not be possible, etc." [IV3, l. 154 -159].

The discussion board is an often mentioned possible transfer of the large discussion group. "The only way to do it is to offer a discussion board. I don't think instant messaging would work, because it is too fast. Each person must get the chance to speak, and get an adequate amount of time to get their point out, and give other people time to respond to it." [IV2, l. 175-179] Another student believes that an organized chat could be a solution: "Organized chat and have people 'beep in' and tell the professor that they want to make a comment, and he 'calls' them." [IV5, 1. 43-144]. Real-time chatting is the alternative mentioned most often when it comes to transferring the large group discussions. Regarding this technology the interviewees mention concerns, disadvantages and advantages these technologies could bring. The main concern is the missing structure of the chat or of the instant messaging. "If you were to discuss the case on the web, you would need a structure, e.g. pre-assigned questions about the case, to plant seeds, to start discussion. Discussion needs to be facilitated otherwise the issues would be mixed up. Comment forms must be structured just the way a professor structures comments within a classroom setting." [IV8, l. 263-267] Structuring could also be realized through reduction of topics discussed: "[…] the discussion threads need to be limited, to get an overview" [IV5, l. 162]. While some interviewees proposed that posting comments should be made possible within class, others feel that this is distracting. They prefer being able to post before and after class. "[…] when real-time chat is used in a class it makes it hard to follow both conversations" [IV5, l. 163-164]. Timing contributions is another suggestion, to structure the process "e.g. assigned times should be required" [IV8, l. 278].

The transcriptions of the interviews can be found on the accompanying CD-ROM. For reasons of clarity the transcriptions were not printed out.

B. Evaluation of the automated case method

Goal of this empirical research was to identify the influence the automated case method had on the learning behaviour of the students.

Purpose of the interviews was to receive an overview of the consequences and the impact of this specific design of the case method. The results are used in order to a) improve the prototype implementation of the automated case method and b) support the design of the web-based case method.

Participants taking part in the interviews were selected out of the course "production management" at the "Freie Universitaet Berlin", where the prototype of the automated case method is implemented. The course "production management" is taken by students who are in their major studies. Out of 48 participants in the course nine were selected randomly and anonymously, and were interviewed.

The term case method, used in the following, refers to the "automated case method". When referring to the traditional case method, this will explicitly be described through the term "traditional".

Guideline questions including further going questioning are formulated as follows:

1. When you think of your experiences with the case method which key words come to your mind?
2. How did working with the case method influence your learning behaviour?
   How did it influence your motivation in the learning process?
   How did it influence your behaviour concerning decision making?
   How did it influence your self steering within the learning process?
3. What did you especially like concerning the case method?
   What did you not like?
4. When you compare this implementation of the case method to the traditional case method what is different? What is the same?
   When comparing single work with work in small groups, what is the same? What is different?
   What were the results out of this for you?
5. Now, after having worked with the case method, which suggestions for improvement do you have for this specific implementation of the case method?
   And which suggestions for improvement concerning working with this implementation of the case method do you have?

6. Are there any other annotations or remarks you want to make concerning this specific implementation of the case method?

Evaluation of these interviews is structured according to five categories. These were developed in accordance to [Mayring 95, 78].

I. Influence of the automated case method on the learning behaviour
   - 1.1 Learning goals of the case method
   - 1.2 Impact of the case method on the learning process
   - 1.3 Impact of the case method on the motivation
   - 1.4 Impact of the case method on the decision making behaviour
   - 1.5 Impact of the case method concerning the exposure to making mistakes
   - 1.6 Conditions for learning within the case method

II. Feedback within the automated case method
   - 2.1 Feedback through the personal instructor
   - 2.2 Feedback through fellow students
   - 2.3 Feedback through the virtual learning environment

III. Function of communication within the automated case method

IV. Suggestions for improvement of the automated case method
   - 4.1 Technical improvements
   - 4.2 Optimization concerning feedback
   - 4.3 Optimization concerning group work
   - 4.4 Optimization concerning environmental conditions

These categories cannot be defined so distinctively, that there would be no correlations/overlaps between the categories. Therefore attributes might be named more than once.

The detailed results of the interviews are described in the following section.

I. Influence of the automated case method on the learning behaviour

This category describes the influence of the case method on aspects concerning the learning behaviour of the students. These are divided into the subcategories: learning goals, learning process, motivation, decision making behaviour, exposure to making mistakes and conditions for learning with the case method.

1.1 Learning goals of the automated case method

The results of the interviews show that students mainly associate three learning goals with the case method: learning the mediated information within the case method [IV5, l. 232-235], learn-

ing the strategic procedure to solve a problem [IV2, l. 147-149], and optimizing competences to solve problems [IV9, l. 188-189]. By working through the case method the students believe that the information will be retained better and that they will be able to implement this knowledge more flexibly than knowledge mediated "statically" e.g. through a lecture [IV7, l. 162-164]. Beyond these the students also described the promotion of capabilities such as individual initiative and independence [IV2, l. 104], creativity [IV2, l. 77] as well as promoting flexibility [IV, 3, l. 175] as further learning goals.

1.2 Impact of the automated case method on the learning process

The authentic problem situations the students are confronted with within the case lets theory become more concrete and therefore easier to understand. Contents learned before the engagement with the case method are applied while trying to solve the problem and lead to a verification of the individual understanding [IV2, l. 54-56]. Prerequisite knowledge e.g. out of the basic course of studies, is activated and connected to new theories [IV1, l. 49-52]. The students described that the engagement with the case method called for intensive and long commitment. Information or solutions were not offered they had to be compiled interactively with the system [IV1, l. 5-6]. The procedure within the case was clear to the students in part due to the possibilities that it was always possible to move backwards within the system and because the thread was always recognizable [IV4, l. 42-44]. This supported the feeling of independence and lead to motivation [IV5, l. 75-76]. Once the students realized that there is more than one possible solution they dealt longer with the subject than they would have if they knew there is only one correct solution [IV1, l. 79-91]. Some students described that the linearity of the system restrained them from following their approach, even after receiving positive feedback for it [IV5, l. 409-417]. Following different solution threads is important in order to give students the possibility and the feeling to develop their own solutions. In this case, however, this is not possible due to technological circumstances. Multiple choice questions, which are integrated in this implementation of the case method, can be counter productive when students are displeased after giving a wrong answer. Some students described that after giving a wrong answer they changed their solution strategy to an eliminating strategy, which lead to choosing an answer, which they thought of as the least wrong [IV3, l. 181-185].

1.3 Impact of the automated case method on the motivation

All students rated working with the case method as motivating [IV9, l. 46-49]. This is due to the interactivity within the case method. Five of the interviewees mentioned that the possibility to work actively and independently on the basis of a concrete problem affected their motivation in a positive way. The feedback they received upon actions contributed to this [IV1, l. 62-64]. Furthermore, the students perceived their independence as a confirmation of their actions or knowledge and therewith also as a control over their standard of knowledge [IV4, l. 221-224]. The case

method was also perceived as being fun – this also motivated the students to work through the case [IV5, l. 6-7]. They described working with the case method as a pleasant variation to traditional teaching settings [IV5, l. 98]. The connection between theory and practice was made responsible for a certain feeling of success, for a feeling that they have understood the process of solving the problems in general – this in turn also influenced their motivation positively [IV1, l. 159-160]. Searching for their own errors also motivated the students [IV4, l. 12-16]. After each entry the students received feedback. This feedback was described as very motivating (see [IV1, l. 103-104], [IV9, l. 94-96]. Some features of this feedback were also described as de-motivating, e.g. the fact that the feedback came up too quickly. After receiving feedback that the given answer is wrong some students started guessing the right answer instead of thinking. Another de-motivating factor was the stereotype feedback given to the unstructured text fields. Some of the interviewees soon assumed that these fields are not relevant [IV8, l.118-121]. In general students described that working autonomously increased their motivation to do so [IV5, l. 95-97].

1.4 Impact of the automated case method on the decision making behaviour

Feedback to this category is very diverse. While some students described that working with the case method influenced their decision making behaviour [IV3, l. 174-175], others said that it did not [IV7, l. 119-121]. Some students described the process of making decisions as a spontaneous action [IV4, l. 30] others felt they were being forced to make decisions [IV3, l. 175]. One value-free comment described that working through the case method caused the students to develop a willingness to make decisions [IV3, l. 174-175].

1.5 Impact of the automated case method concerning the exposure to making mistakes

The results of the interviews show that all students had to deal with their own mistakes. They did this e.g. by stepping backwards and looking for the causes. This helped them to see the connection of the tasks which in turn helped them to find their mistakes and the causes for these mistakes [IV7, l. 237-238]. This was due to the fact that they could not proceed in the program with a wrong answer. Therefore they had to go back and find the reasons for their mistakes in order to correct them [IV4, l. 24-25]. The control of and correction of mistakes proved to promote motivation [IV4, l. 11-13]. Furthermore, the students perceived it as helpful that the more mistakes they made, the more concrete the help became. Because the students worked through the case method alone, they were very dependent on such a helping function [IV2, l. 208-210]. Once the students felt that they did not have enough guidance, they felt alone and started guessing answers – this was not the case when they could use the helping function [IV4, l. 135-136].

1.6 Conditions for learning within the automated case method

Statements concerning the environmental prerequisites emphasized that the students believe it to be important that they can handle learning contents flexibly. This is shown in the statements describing that they aim to arrange working times, speed and place flexibly [IV2, l. 115-117]. How-

ever, it was also stated that within all this freedom students also liked to know that someone is reachable, who can help out, if there are problems [IV1, l. 261]. A clear thread of the learning contents as well as a clear navigation which always shows where one is at the moment are very important for this [IV4, l. 42-44]. Working through the case alone resulted in minor distractions for the learner. This was regarded as an advantage compared to other learning scenarios [IV2, l. 121-123].

II. Feedback within the automated case method

Different feedback possibilities as well as their relevance to the students are introduced in this category.

2.1 Feedback through the personal instructor

The advantage of feedback through a personal instructor is the customization of this feedback. If a student is off-track the instructor can bring him back on track again [IV2, l. 155]. The possibility to choose the time of the feedback of the instructor is also important to the students [IV1, l. 271]. All interviewees described the supervision of the instructor while they were working on the case as helpful and very important. This also includes receiving help concerning technological problems or questions concerning the contents, which the program can not answer automatically [IV5, l. 10-14].

2.2 Feedback through fellow students

Feedback between fellow students was regarded as an exchange of ideas rather than as feedback. Ideas for solutions were exchanged, complemented, affirmed and compared. Because the students felt closer to each other than to the instructor, they felt it was easier asking fellow students' questions than it was to ask the instructors [IV1, l. 265-266]. However, feedback received through fellow students was not perceived as being a helpful function rather it was described as an affirmation or as a supplement of their knowledge [IV1, l. 187-190]. Therefore feedback between students was seen as a consolidating action. Thoughts could be exchanged and therefore the responsibility for actions could be split [IV2, l. 186-187].

2.3 Feedback through the automated case method

Increasing feedback of the automated case method became more concrete and was thus regarded as being very helpful [IV1, l. 126-127]. Sometimes results of questions were visualized by the VLE – this was also regarded as being helpful feedback [IV10, l. 100-102]. However, feedback of the VLE was described as being less flexible than that of the personal instructor [IV7, l. 105] because the automated feedback could not focus on possibly occurring questions. Another student described that sometimes there was too much automated feedback, letting him feel "I'm not that stupid!" [IV9, l. 73-75]. At other times students relied on the helping function of the feed-

back and did not think in order to find the answer, they guessed, according to the feedback which was given [IV5, l. 176-179].

III. Function of communication within the automated case method

The role of communication is the focus of this category. In this setting the students were to work through the case method alone. They missed the relationship to their fellow students [IV2, l. 162-165]. They would have enjoyed discussing their solution alternatives with others in order to affirm their answers [IV2, l. 173]. This would insure them that they are on the right track. Therefore the students criticized that communication with fellow students was not allowed in this setting. Beyond that discussions function as an evaluation of their own thoughts and let students estimate their position within the group. These features are thus missing within this concept of the case method [IV8, l. 30-32]. The students furthermore stated that they perceive it as stimulating to go to university in order to meet others and have contact to them therefore they do not like missing out on this the case method [IV9, l. 170-172]. They also described it as more stimulating to learn through discussing circumstances [IV9, l. 188-194]. Students also stated that the risk of distraction is not as high while working alone than when working in a group [IV9, l. 197-200].

Within the case method the students described that the preferred the questions where it was possible to answer through unstructured text [IV7, l. 205-206]. They needed to deal with the subject in more detail to do so, and they enjoyed it [IV7, l. 210-214]. They also described the learning effect to be higher, due to the engagement with the topic while discussing it (see [IV10, l. 74-76], [IV1, l. 224-227]). Communication and articulation support understanding and remembering [IV8, l. 67-68].

IV. Suggestions for improvement of the automated case method

This category summarizes suggestions for improvement the students made. These are divided into the subcategories technical improvements, optimization concerning feedback, group work and environmental conditions.

4.1 Technical improvements

Within this category it is important to respect the wish of the students to learn autonomously as well as independently. Some of the interviewees recognized that the case method was built up in a linear way, and that they were thus not able to build up their own solution. For this reason some students felt limited concerning their scope [IV5, l. 211-212]. Learning with the traditional case method implies also being possible to follow other solution threads than the optimal one. This is not possible within this implementation of the case method [IV10, l. 21-27]. Some interviewees also described that they would prefer the feedback not to pop up so quickly [IV5, l. 175-159]. They describe this as being repressive for the learning process. Therefore the students

should have the option to freely choose feedback. Other students described the visibility of the helping function to be bad, for it is at the bottom of the page, and therefore some students did not find it. Another suggestion was to implement the possibility to receive intermediate results of the solution process so far [IV2, l. 226]. Furthermore, results could also be displayed through a video, a graphic or a presentation [IV2, l. 229-232]. The students also want to see how many pages they have left to work through. They want to prepare themselves for the upcoming pages [IV8, l. 195-198]. Other additional features such as an encyclopedia [IV9, l. 82], a calculator [IV10, l. 236], or the possibility to take notes within the program [IV10, l. 242] are wished for. In order to communicate to fellow students the interviewees requested the possibility to communicate with each other through the web [IV2, l. 138-140].

4.2 Optimization concerning feedback

Almost all interviewees perceive the attendance of a personal instructor while working through the case in this approach of the case method as indispensable. He gives them feedback when they need individual support, or when they encounter problems with which the computer program can not help them [IV2, l. 208-209]. Some students even requested that the support through a personal instructor who is attendant should be intensified. They don't want to have the feeling that they are being left alone [IV10, l. 132-134].

Feedback concerning the helping function was already described above. It is summarized here, that the students would appreciate it, if the helping function would not give help so quickly. They would have liked having a function which shows them where they started pursuing a wrong path concerning the solution [IV8, l. 133-136]. One interviewee described it to be of advantage for the feedback within the case method to work through the case again in a small group, or with an instructor [IV10, l. 138-140].

4.3 Optimization concerning group work

To optimize the case method some students pleaded to extend the case method through group work [IV3, l. 11-12]. It was suggested to build small groups of two to three students before they start working on the case. When building these groups it is necessary to make sure they fit to each other and the students suggested the groups being relatively small to ease organizational details and communication within the group [IV1, l. 332-334]. Furthermore, it was also suggested to combine single and group work in order to make the best of both worlds [IV5, l. 316].

4.4 Optimization concerning environmental conditions

In order to optimize the case method concerning the environmental conditions it was suggested to design the aspect of time more flexibly [IV5, l. 197]. Within the evaluation there was a time limit of four hours and this stressed some students, for they were not able to estimate how much time it would take them to work through the case. Others described the case as being too long. They said that their concentration could not last that long [IV4, l. 93-96]. The suggested that two

appointments should be offered in order to solve the case, not just one. It was also requested that it should be made possible to work through the case from home, and thus arrange the time even more flexibly [IV5, l. 77-78]. The students also requested receiving a good introduction into the case method to know what would before them [IV5, l. 389-393]. In addition to the optimal correct solution the interviewees asked for the integration of other correct solution procedures to compare these to the optimal solution [IV5, l. 417-419]. The students could imagine integrating case studies into their studies [IV10, l. 179-184]. However, the students also described that they can not imagine this implementation of the case method being a substitute for a lecture, they could only imagine it being an extension to a lecture [IV2, l. 92-94].

C. Alumni requirements concerning learning scenarios

Goal of this empirical research was to identify students' awareness of implemented learning and teaching methodologies at German universities, focusing on the area of OR.

Purpose of the interviews was to receive an overview of preferences allocated to certain methodologies. Additionally, wishes and needs concerning the structure of these methodologies were evaluated.

Interviewees were alumni, former students, of the University of Paderborn, who majored in the area of OR. Eight alumni students were selected randomly and anonymously, and were interviewed. These interviews were held in German language. Direct quotes are not included within the interpretation of the results in order to not mix up these two languages. References to the interviews are given in square brackets. The quotes can be found on the accompanying CD-ROM.

Guideline questions including further going questioning are formulated as follows:

1. What comes to your mind when you remember studying at Prof. Suhl at the University of Paderborn.
   Which methods of knowledge mediation come to your mind?
   Which teaching and learning methods com to your mind?
2. How do you rate the following statement today, after having started a job after your studies? "Within the university and at the chair of Prof. Suhl single fighters are promoted, but within companies social competences such as cooperation and collaboration are important"
3. Rate the following statement according to what you know today. "Contents and technologies mediated at the university, especially those mediated at the chair of Prof. Suhl, have almost nothing to do with reality in companies."
4. Which suggestions for improvement would you give Prof. Suhl and her employees concerning teaching and learning methods?

Evaluation of these interviews is structured according to five categories. These were structured in accordance to [Mayring 95, 78].

I. Studies of business computing in general

II. Studies of business computing at the chair of business computing IV (DS&OR Lab)

2.1 DS&OR Lab and employees

2.2 Relationship of theory to practice at the DS&OR Lab

2.3 Single fighters and competition compared to mediation of social competences

2.4 Promotion and mediation of competences concerning presentation techniques

III. Lectures at the DS&OR Lab

3.1 IT-Consulting

3.2 Web-based systems

3.3 Basics of optimization systems

3.4 Simulation

3.5 Networks and logistics of transportation

IV. Projects at the DS&OR Lab

4.1 Project IT-consulting

4.2 Project Decision-support systems

V. Seminar/term paper

These categories cannot be defined so clearly, that there are no correlations/overlaps between the categories. Therefore attributes can be named more than once.

The detailed results of the interviews are described in the following section.

I. Studies of business computing in general

The category "studies of business computing in general" explains how alumni view their studies of business computing in the retrospective. In general the course of studies of the subject business computing was regarded as being very positive. Education at the University of Paderborn is described as being very close-to-reality [IV3, l. 238f.], [IV1, l. 243ff.].

The contents taught are also described positively. The alumni emphasized that capabilities such as logical thinking, understanding problems and a general problem consciousness as well as overall capabilities to organize were stressed [IV2, l. 376f.]. The capability to organize oneself was seen as a special ability which was trained here, which is not common in other subjects [IV7, l. 784ff.]. Study conditions within the University of Paderborn were praised. In this context diverse areas were described. The multimedia offers were regarded as being exemplary for other universities [IV1, l. 426f.]. Besides this the relatively low numbers of students were emphasized positively [IV1, l. 428f.]. Finally it was stressed in a positive way, that the University of Paderborn has four excellent chairs for business computing [IV1, l. 430f.], [IV3, l. 243ff.]. Another indication that the studies of business computing at the University of Paderborn are something special results out of the fact that the students have the possibility to focus their studies on the area of business, or on other areas, according to their own estimations [IV4, l. 375ff.]. However, it was criticized by the students that a general overview of business is often not achieved because students do not have to engage in an obligatory course giving an overview of business [IV2, Z. 409ff.]. One alumni remarked that the connection between business and business computing did not always become clear [IV7, l. 686f.]. Furthermore, the alumni emphasized that even though

they regarded the education at the University of Paderborn as being positive the reputation of the University was not as positive as it could/should be [IV6, l. 469ff.]. Another interviewee believed this was due to the fact that the University of Paderborn is still very unknown [IV6, l. 479f.]. Furthermore, the alumni state it as being negative that there is no centralized planning and execution of courses concerning presentation techniques, group work and behaviour in groups. Every chair tries to include these features into their educational offers, but there is no central coordination for this [IV3, l. 216ff.]. Due to this problem it is increasingly necessary for companies to offer educational offers concerning these capabilities [IV8, l. 634ff.]. Moreover it was stated that the English language was not focused on enough within the studies of business computing. The focus of the alumni concerning English varies between learning English in general, towards learning business English and the wish to be able to visit courses held in English. The opinions about the importance of these areas are diverse. The common denominator is the fact that the English language needs to be promoted more intensely within the educational setting (see [IV4, l. 223ff.], [IV4, l. 227ff.], [IV3, l. 282ff.], [IV7, l. 661ff.]. Besides lacking English skills it was criticized that the course of study does not require an obligatory internship [IV3, l. 289ff.]. Another factor which was criticized was the fact that the German diploma is not recognized internationally [IV5, l.744ff.]

II. Studies of business computing at the chair of Business Computing IV DS&OR Lab

This chapter gives an overview of how alumni rate the studies of business computing focusing on the chair of business computing IV (also called DS&OR Lab). In this context diverse subcategories can be built. The first subcategory summarizes statements concerning the climate between educators and students at the chair business computing IV. The next subcategory describes the connection of theory to practice at this chair. The third subcategory gives a view of how the terms "single fighters" and "social competences" have their authorization at this chair. The fourth and last subcategory describes how capabilities such as presentation techniques are trained at the chair business computing IV.

2.1 DS&OR Lab and employees

Numerous alumni described the relationship between the employees at the DS&OR lab to the students studying at the University of Paderborn as something special [IV5, l.6ff.], [IV6, l.6f.]. The personal contact between the employees and students is especially emphasized [IV5, l. 637f.]. Furthermore, it is stated that the employees are very close to the students, which means that they do not regard themselves as "better" or "higher" than the students [IV5, l. 645ff.]. The contents mediated at the DS&OR Lab are generally rated as positive by the students [IV2, l. 237f.]. They are specified as being timeless which is of advantage because contents will still be up-to-date in several years [IV2, l. 253ff.]. Furthermore, it is stated that the contents are very practical, which, so one alumni further, is not the case at every one of the four chairs for business computing

[IV7, l. 568f.]. In this context the alumni refer to the courses which connect theory to practice, which will be described later. The range of offers at the DS&OR Lab is characterized as being very positive [IV2, l. 6ff.], [IV7, l. 8ff.]. It is also emphasized that the DS&OR Lab offers the combination of mediation of theoretical knowledge connected to actually applying it in practical contexts. One course was described as being to difficult [IV3, l. 153ff.]. In general the given grades at the DS&OR Lab were rated as being too good [IV6, l. 571ff.].

2.2 Relationship of theory to practice at the chair of business computing IV (DS&OR Lab)

Application of theory into practical contexts is supported at the DS&OR Lab [IV7, l. 568ff.]. This combination, so an alumni, supported learning how to learn independently. This is especially important, because in the context of future jobs learning independently and being able to acquiring skills individually becomes especially important because there is not always someone to describe everything in great detail [IV6, l. 352ff.].

Programming languages which are learned during the studies are outdated quite quickly. However, the alumni do not regard this as a reason not to learn these programming languages moreover they emphasize the necessity to learn how to generally learn programming languages, and to learn the basics to be able to work themselves into new technologies in future ([IV1, l. 174ff.], [IV5, l. 558ff.]).

According to the alumni there are some courses at the DS&OR Lab which combine theory and practice to a large extent, as well as there are some courses which don't [IV8, l. 615ff.]. This section does not go into great detail concerning this topic – this is done in the categories "projects at the DS&OR Lab" as well as "lectures at the DS&OR Lab".

2.3 Single fighters and competition compared to mediation of social competences

Single fighters and competition are often associated with education in universities. However, in the everyday life in business social competences are increasingly focused on.

One alumni stated that according to his view universities should fulfill two tasks which concern competition to a different extent. On the one hand universities should create knowledge. On the other hand universities should practice knowledge acquisition and working in groups [IV6, l. 296ff.]. Concerning the education at the DS&OR Lab the alumni did not observe single fighting or competition [IV3, l. 195], [IV4, l. 158ff.]. The interviewed alumni believed that at the DS&OR Lab social competences were trained to a large extent [IV7, l. 521ff.], [IV2, l. 175ff.]. Another interviewee explained that the students studying at the DS&OR Lab distinguished themselves from others because they had great team competences [IV3, l. 183ff.]. However, the alumni also stressed the fact that even though group work was promoted to a large extent at the DS&OR Lab the achievements of the single students within this group work were viewed rated separately [IV7, l. 534f.]. Another alumni outlined that competition between students had not been

rewarded. This interviewee stated that learning together in groups increased the learning success, and this was promoted at the DS&OR Lab [IV5, l. 385ff.]. The opinions of the large relevance of teamwork were also supported by other alumni (see [IV7, l. 535ff.], [IV8, l. 514ff.]). It was also emphasized that working in teams promoted social competences and was a good preparation for students for future jobs. In jobs students must also solve problems in teams [IV7, l. 537ff.]. The interviewed students, who all studied business computing, mentioned that competition between students and single fighters were not present in their course of studies, however, they could be observed in related studies, e.g. business studies (see [IV8, l. 479f.], [IV5, l. 469ff.], [IV2, l. 168f.]. Within business studies it was stated that students who wanted to compete with each other damaged and thus disadvantaged themselves [IV5, l. 397f.], [IV7, l. 556ff.]. Due to this fact, so the alumni, they did not let themselves in to competition with others [IV4, l. 152ff.].

The alumni also expressed that competition was also dependent on the time when they studied. The job market had become worse in the last years. Approximately three to four years ago students who completed studies of business computing did not need to be afraid of not getting a job after finishing their studies. Unfortunately, this is not the case anymore today. One alumni makes this responsible for competition between the students [IV1, l. 155ff.]. One alumni stated, that due to the great job marked during his course of studies, too little competition came up underneath the students. He believed that competition had to be learned during the course of studies [IV6, l. 308].

In general it can not be said how important social competences become in future jobs. The alumni outlined social competences as being indispensable nowadays (see [IV6, l. 316ff.], [IV4, l. 173ff.].

2.4 Promotion and mediation of competences concerning presentation techniques at the DS&OR Lab

Generally it can be said that all alumni were confronted with presentations at the DS&OR Lab [IV5, l. 137ff.]. Due to the time spectrum which lies between them, the alumni had access to courses which were designed in differing ways. It could also be observed, that the offers of the DS&OR Lab were not publicized adequately, for some quotes of the alumni show, that they did not know about existing offers (see [IV1, l. 217ff.], [IV5, l. 142f.]). Other alumni did know about and also took part in courses which mediated theoretical and practical experiences concerning presentations (see [IV3, l. 212ff.], [IV6, l. 174]).

The course which was held to mediate competences concerning presentation was called "Proseminar". This Proseminar was structured into two phases. The first phase described theoretical basics. This was done usingn a presentation. This was regarded as positive [IV4, l. 76ff.]. The second phase was conducted by building small groups of the participants. These small groups had to prepare and hold presentations. The participants enjoyed the practical part of this

course. Under time pressure the students had to identify the important aspects and present these to the other participants of the course [IV6, l. 179ff.]. One alumni stated that it was especially important for students to receive the possibility to actually practice presentations [IV2, l. 265ff.] Another alumni annotated this statement for he believed that even if one has often held presentations, one can not practice presenting often enough [IV7, l. 355ff.].

III. Lectures at the DS&OR Lab

The category "lectures at the DS&OR Lab" outlines how the alumni experienced the lectures at the DS&OR Lab. Therefore the different kinds of lectures held at the DS&OR Lab as well as their characteristics are portrayed. At the beginning statements concerning the lecture "IT-Consulting" are described. Thereafter the lecture "web-based systems" is focused on. Afterwards the procedure and the characteristics of the obligatory lecture "Basics of optimization systems" are introduced. This chapter closes with the lectures "simulation" and "networks and logistics of transportation".

3.1 IT-Consulting

This lecture is a mandatory prerequisite in order to participate in the project IT-consulting [IV7, l. 25ff.]. In this lecture the basics needed to work in the project IT-consulting are mediated [IV5, l. 111f.]. Further the alumni emphasize that they regarded the introduction to the project IT-consulting through this lecture as having been very meaningful [IV3, l. 28f.]. The structure of the lecture was also described as meaningful [IV6, l. 424f.]. Especially the practical relation of the lecture was emphasized by the alumni. The alumni described further, that this lecture was not only made up of contributions by the teacher, it was extended by also including consultants coming out of practical contexts. These guest lectures emphasized the practical relevance of the topics discussed in the lecture. This emphasized the strong practical orientation of this lecture [IV6, l. 425ff.]. The lecture ended with a test which includes the theoretical basics which were mediated, as well as the content the guest lecturers introduced [IV6, l. 28ff.]. The test was described as demanding but fair [IV6, l. 33ff.]. The alumni remembered the materials which were included in the lecture (e.g. foils etc.) as having been very good [IV5, l. 72ff.].

3.2 Web-based systems

The lecture web-based systems is remembered by the alumni because it had no script [IV7, l. 434f.]. Furthermore, in this lecture a methodology mix was conducted [IV5, l. 300f.]. At the beginning of the course a "normal" lecture was held. In this phase the elementary basics were taught [IV7, l. 435ff.]. Similar to the lecture IT-consulting, external speakers coming from companies were included in the lecture to demonstrate the relevance of the topics to actual businesses [IV7, l. 437ff.]. One alumni critically annotated that the danger in including external speakers is always, that the contents of the teacher and guest speaker do not completely match [IV5, l. 319f.]. Generally the alumni regarded the guest speakers as being helpful. After the external

speakers described circumstances of theory in practice, the students were to solve a practical task concerning this theory [IV5, l. 325ff.]. These practical tasks were designed in a way that students could decide between given topics or problems created on their own, based on the earlier mediated theory [IV5, l. 307ff.]. These developmental tasks were to be solved, documented and presented in small groups [IV7, l. 448f.]. This task is graded instead of a test at the end of the lecture [IV5, l. 309]. The alumni described it as being a good preparation for future jobs to also grade the documentation of the task. Documentation is a task which often needs to be done in future jobs, and it needs to be done professionally [IV5, l. 361ff.].

3.3 Basics of optimization systems

The lecture "basics of optimization systems" is a mandatory lecture for students studying business computing. The course can also be taken by students studying business pedagogics and business [IV7, l.400ff.]. Due to this heterogeneous group of participants the course is divided into two variants. One variation is for students of business computing, who have more prerequisite knowledge in specific areas, and one is for students studying business who have less of this prerequisite knowledge. This division was regarded as being very meaningful by one alumni [IV7, l. 403ff.]. According to the alumni there is no explicit exercise course associated with this lecture, where theory could actually be applied [IV5, l. 21f.]. The students have the possibility to earn additional credits for the final written exam by working on so called exercises [IV2, l 92ff.]. These exercises were to be solved in small groups [IV8, l. 384f.]. This procedure was perceived as being very enriching for the lecture [IV8, l. 387ff.]. One alumni stated that receiving these additional credits is very important to have a chance to pass the exam at the end of this lecture [IV3, l. 146f.]. This alumni further stated that the efforts needed in order to pass this exam were extremely high compared to the credits received. The postulated demands are too high [IV3, l. 153ff.]. Furthermore, this alumni also mentioned that he was not interested in the contents of the lecture. Other alumni did not illustrate this lecture as being as difficult as the preceding alumni stated [IV8, l. 396f.]. Another alumni declared that he enjoyed going to this lecture [IV7, l. 425]. Yet another alumni emphasized that the further going materials (e.g. script, foils etc.) were of very high quality [IV4, l. 118ff.].

The varying perception of the difficulty may result out of the fact, that the alumni visited this lecture at different times and in different years. One alumni confirmed that the level of difficulty increased dramatically in the last years [IV8, l. 397ff.].

3.4 Simulation

Only one interviewee attended the lecture simulation. Therefore the following results are limited in their significance. This lecture is described as being a traditional lecture, containing only elements of frontal teaching [IV8, l. 328]. Following the lecture a practical project is offered which offers the students to apply what they learned according to a predefined problem [IV8, l. 329f.].

After the accomplishment of the project the results are introduced [IV8, l. 336]. The interviewee was not sure anymore about the form of examination – he believed it took place as a written examination at the end of the term [IV8, l. 353ff.].

3.5 Networks and logistics of transportation

Statements given to this category have the same "issue" as the ones given to the category simulation. Only one interviewee mentioned this lecture. Therefore these statements are again to be seen as being limited in their significance.

This lecture also only consisted of frontal teaching sequences. However, an exercise was also offered in order to deepen the theoretical knowledge [IV8, l. 362ff.]. The contents of this lecture, to this interviewee, were focused on mathematics and, according to this alumni, not relevant for practice [IV8, l. 362ff.]. He believes this lecture was only of interest for someone interested in focusing on very specialized jobs after finishing his studies [IV8, l. 365]. According to the alumni, this lecture seemed to be the only one which was not applicable to a variety of practical contexts – opposed to the other lectures the DS&OR Lab offers.

IV. Projects at the DS&OR Lab

The category "projects at the DS&OR Lab" gives information regarding the experiences the alumni made with projects offered at the DS&OR Lab. For this reason the subcategories differ between all projects and describe the general procedure conducted within each one. The first project described is the project IT-consulting, thereafter the project decision support systems is described.

4.1 Project IT-consulting

The project IT-consulting was described by the majority of the alumni as being a very important course. One interviewee even goes so far to describe this project as being the most important course of his entire studies [IV3, l. 10f.]. The alumni enjoyed this project and they believe that this project was most relevant to their activities today [IV1, l. 16ff.]. Furthermore, the alumni believe that this project was a good preparation for their professional career [IV8, l. 118ff.]. The project is characterized by the strong relation of theory and to practice. Within this project the students have the chance to apply the previously learned theoretical basics [IV5, l. 51ff.]. However, the prior acquisition of knowledge is stressed in this context. These theoretical basics build the basis for conducting the project in a professional manner [IV1, l. 39ff.].

In the project twenty students build one large "consulting group". They receive a task out of a company. This task usually involves developing new software or finding appropriate software for the specific needs of the customer. In order to do this, processes within the company need to be identified. Most commonly this is done by conducting interviews with employees of this company. During this project the twenty students divide themselves into task force teams. They

all have an area they are responsible for and they communicate with each other in order to ensure all activities are coordinated. At the end of the project the results are introduced to the company through a final presentation. Additionally, a comprehensive documentation is handed out to the company, describing every step of the project in great detail.

The grades for this project were given through a combination of a grade given by the tutor as well as an assessment given by fellow students [IV7, l. 225ff.]. Even though some alumni described that this lead to commotion at the beginning of the project, because some students were scared that personal sympathy would influence grades, it turned out to be a very accepted and fair grading scheme (see [IV5, l. 177ff.], [IV6, l. 89ff.]).

4.2 Project Decision support systems

Similar to the project IT-consulting the participants of the decision support systems project also have to solve a task independently. However, this project is offered accompanying the semester, not in the semester break like the IT-consulting project [IV7, l. 318f.]. According to the alumni there is no introduction in the sense of describing necessary theoretical basics within this project [IV2, l. 42ff.]. Another alumni remarked that this was not necessary in the context of this project because many of the necessary basics are similar to the contents mediated in the mandatory lecture "basics of optimization systems" [IV7, l. 391ff.].

At the beginning of the project various topics are introduced to the participants. The participants build small groups and each small group works on a different topic. After the topics are distributed the groups meet with their tutor on a regular basis – up to once a week – and present the actual status of the project. The tutor has the role of a supporter and a counselor [IV7, l. 299ff.]. The students independently organize their meetings in small groups [IV8, l. 255f.]. At the end of the term the results of each small group are presented to tutors, professor and other small groups [IV7, l. 323]. This project was rated as being very positive [IV8, l. 301ff.].

Grades within the decision support project were made up of the grade for the actual task, the grade for the presentation of the results within the context of the university as well as the grade for the presentation of the results to the companies. The grades concerning the presentations consist of elements of the presentation as well as the ability to answer questions in a competent manner.

V. Seminar/term papers

This category describes how the students rated the seminar at the DS&OR Lab. Before going into the details of the perception of this course, it is described in more detail.

At the beginning of the seminar topics for so called term papers are publicized. Students can choose a publicized topic or they can propose their own topic [IV7, l. 469ff.]. They could also choose whether they want to write the term paper on their own, or in a small group consisting of

up to three participants [IV7, l. 471f.]. The group work which was conducted in this setting was generally described as being harmonic by the alumni. Some groups split the tasks of the term papers into the number of people and each worked on their section alone in order to be more effective and faster [IV6, l. 263f.]. The perception of support from the employees of the DS&OR Lab varied. Some participants described it as being low [IV4, l. 56ff.]. They described that this is due to the task – writing a term paper does not call for very much support, once topic and procedure are agreed upon [IV4, l. 268ff.]. Other alumni remembered receiving intensive and very helpful support (see [IV7, l. 473ff.], [IV6, l. 268ff.]). In order to participate in the seminar, and thus be able to write a term paper, it is mandatory to attend a prerequisite course called "Proseminar", in which the basics concerning writing scientific papers are mediated. This mandatory attendance was described by the alumni as being very helpful and good [IV4, l. 76ff.]. The grade for the seminar is the grade for the term paper. If a prototype was developed and implemented in the context of this term paper, this was of course also graded [IV7, l. 488f.].

D. Student requirements concerning virtual learning

Goal of this empirical research was to identify students' requirements concerning virtual learning.

Purpose of the interviews which were held in group discussions was to receive an overview of needs and wishes concerning virtual learning.

Participants taking part in the course "GOS"[145] in the WS 01 received the opportunity to express their wishes concerning virtual learning. From 220 students who were registered to this class 110 students participated in the evaluation on a voluntary basis. These students were grouped into groups of 10 students in order to carry out the group discussions. These group discussions were not transcribed – this would have been too lengthy. The results of all 11 group discussions are summarized according to the following category system.

Structuring of the group discussion was divided into three phases: orientation, formulation and closing phase.

I. Orientation phase:
Welcome participants, personal introduction and explanation of the evaluation, "Introduction round" participants introduce themselves (semester, prerequisites with VLE)

II. Formulation phase:
- Free associating
  Which characteristics does a good computer supported learning program have to have for you? Which thoughts do you have on the spur of the moment?
  Are there any other characteristics that come to your mind?
  What do you expect of virtual learning?
- Substantiation and cluster
  Explication of characteristics through further going questions e.g.:
  What exactly do you mean with…?
  Do I understand you correctly, that….?
- Further terms can be explicated and complemented. Discussion about these terms.

III. Closing phase:
Round up discussion if no more wishes are stated.
Thank participants for participating.
Describe further procedure.

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[145] This is a German abbreviation for "Grundlagen von Optimierungssystemen" (GOS) which means "Basics of optimization systems".

Evaluation of the results was completed through the following category system:

I. Technical prerequisites
   1.1 Software/Hardware
   1.2 Installation/Uninstallation

II. User orientation
   2.1 Introduction
   2.2 Structure
   2.3 Navigation
   2.4 Adaptation possibilities
   2.5 Examples
   2.6 Animations in examples

III. Software ergonomics

IV. Contents

V. Learning control
   5.1 Exercises
   5.2 Questions for learning control
   5.3 Sample tests
   5.4 Solutions of exercises

VI. Helping functions

VII. Internet-functions

Results of these group discussions are only described in key words for clarity reasons.

Detailed results are described in this section. The representation of these results takes place in form of a summary.

I. Technical Prerequisites

1.1 Software/Hardware:

- Low demands on hardware
- Platform independence
- Free of charge
- Operation free of errors
- Stability

- Guaranteed low interference
- No additional software required

1.2 Installation

- Program should be utilizable without additional installation
- No additional software for installation required
- User-oriented installation possibilities e.g. for notebook or palm pilot
- An installation guide is desired
- An alternative installation path should be declarable
- A quick user guide concerning the installation should be annotated on the cover
- The program should easily and quickly be installable/de-installable
- In the beginning the required system resources should be pointed out
- An automatic start function is desired

II. User orientation

2.1 Introduction to the program

- An introduction in form of a guided tour, which shows how to work with the program should be integrated.
- The program should be intuitive to use

2.2 Structure of the program

- Clear, logic structure of the program
- Structure should be oriented according to common standards

2.3 Navigation within the program

- Intuitively, arranged clearly
- Overview of where one is situated at the moment
- Assigning and highlighting topics to a certain color
- Navigation via meta-information (classification, grids or index)
- History function to navigate to prior pages
- Navigation in accordance to browser-standards
- "Mouse-over" descriptions for buttons
- Pages which have been visited should be marked as such
- Diverse modes: explore mode, guided tour mode, simulation of tests through test mode

- Diverse guided tours should be offered, which are in accordance to the script (lecture notes), lecture

2.4 Adaptation possibilities

- Possibility to place and remove bookmarks
- Possibility to view a total view (synopsis) of all bookmarks
- Add notes to pages
- Virtual post-it stickers
- Highlighting pen
- Introductory test so that the VLE can estimate the proficiency level
- Choice to decide between text or formula descriptions
- Varying access possibilities according to learning style
- Varying versions for different target groups, e.g. sorted according to course of study
- Export functionalities, in order to export parts of the VLE and construct personalized learning documents

2.5 Examples

- Many examples should be integrated
- Examples should be practice oriented
- Three dimensional examples should also be integrated
- Examples given in the lecture should be integrated
- Examples describing further context should be integrated

2.6 Animations in examples

- Parameter of the animation should be configurable through the user
- Support through audio
- Animations should only be integrated where necessary
- It should be possible to pause an animation at any time

III. Software-ergonomics

- Design/choice of colors
- Good visual format
- Program should run as a frame
- Program should be usable with a mouse as well as with a keyboard

- User interface should not differ from current standards
- Adherence to common colors and shapes
- Intuitive buttons
- Specific expressions and notations match the terms used in the lecture
- Mouse over popup information

IV. Contents

- A complete overview of all contents should be given
- Topics tested in exams should be explicated in detail
- Contents should be free of errors, understandable and precise
- Continuing information concerning literature should be available for each topic
- Learning contents should be summarized to meaningful units
- Learning units should be annotated with the time needed to work through them
- Learning units should have a summary at the end
- Script, lecture and electronic version should be coordinated
- The electronic version should be detailed enough to be sufficient for exam preparation without visiting the lecture or reading the script

V. Learning control

5.1 Exercises/Questions for learning control

- Many attemts should be enabled
- The learning environment should "remember" the learning level and ask questions accordingly
- Manual reset of learning level should be enabled
- When repeating the exercise the learning environment should only ask the questions which were answered wrong by the user in the turn before
- There should be a modus which enables free choice of difficulty of learning control questions
- The learning environment should automatically identify weaknesses and ask questions accordingly
- Possibility to direct questions to a personal tutor
- Praise and reward is desired for correct answers and advancements in learning

- Questions should contain links to the according learning units within the learning environment
- Learning control questions which were solved correctly should not be displayed in the next turn

5.2 Exercises

- Anticipatory questions concerning the content should be asked

5.3 Learning control questions

- At the end of a learning unit a test (learning control questions) should be implemented

5.4 Sample tests

- Test simulation should be offered. This means that a constellation of questions which could be posted in exams must be solved in a limited amount of time
- Previous examinations (from former semesters) should be integrated in the learning environment
- Proposed solutions for prior exams should be integrated

5.5 Solutions for all types of questions

- Not only the solution, also the steps towards the solution should be described
- Solutions should be explained in detail. Going from a general to a more specified level.
- Extensive description of mistakes should be offered by the learning environment
- Hints towards the right solution should be retrievable when stuck in a problem
- An electronic assistant is wished for, which clears up commonly made mistakes, answers frequently asked questions
- Problem reports should give advice concerning further going literature

VI. Helping functions

- Glossary
- Handbook
- English dictionary
- Abbreviation index
- Online help functions
- Overview of used symbols
- Contact person
- Feedback formula concerning the learning environment itself should be integrated

- FAQ (frequently asked questions) function
- A search function should be available
- Each page should receive an identification number, this way each page can be called up through this identification

VII. Internet-functionalities

- Update function
- Cooperation between internet and CBT
- Offer discussion boards
- Possibility to download the program from the internet
- Server-based learning to enable learning in groups
- Program should be available through the internet in order to use it location independent
- New exercises and learning control questions should be integrateable through internet updates

E. Success and hindering factors of traditional and virtual communication

Goal of this empirical research was to identify success and hindering factors of traditional and virtual communication from the viewpoint of future target group users of the web-based case method.

Purpose of this evaluation was to receive an overview of familiarity and use of traditional and virtual communication media in order to be able to rate which media can be implemented in the context of the target group. For this reason an entire course of 20 students communicated traditionally and web-based through a discussion board. This course was "Statistics B" and took place over an entire semester. At the end of the semester the students were interviewed concerning the use of the discussion board.

Interviewees were 15 students all within their 2nd to 4th semester. All students studied a subject allocated to business, e.g. business pedagogics, business computing, or business.

Guideline questions including further going questioning are as follows:

1. Which use did the electronic discussion board have for the participants of your course?
   Which were your expectations concerning the discussion board?
   Why do you think has the use of discussion boards increased within the web?
2. How did you perceive the communication behaviour of the participants within the discussion board implemented into this course?
   Which positive or negative effects could you observe concerning the influence of participants on the board?
   Which effect did this influence have on the communication behaviour?
   How did you rate the support concerning you questions through participants and the teacher?
3. What were the reasons for the relatively low participation within the discussion board?
   Which aspects influenced your participation within the board?
   Describe factors which could support participating on a regular basis
   How do you rate the possibility to communicate via e-mail within this board?
   Describe further communication possibilities which would be important for this kind of communication.
   Which additional communication possibilities would you wish for within a discussion board?

4. Which aspects could lead to virtual communication being used more than traditional communication?
   Which success factors do virtual communication possibilities have over traditional communication?
   Which success factors do traditional communication possibilities have over virtual communication?

Evaluation of these interviews is structured according to ten categories which were developed in accordance to [Mayring 95, 78]. These categories are: face to face communication, virtual text based communication, audio visual communication, communication in virtual groups, virtual support through officials (moderator, tutor, professor, administrator), discussion board as a discussion platform, user orientation, communication behavior of the participants, usage behavior of the participants, extending traditional communication through virtual communication. Because the results of these interviews were described in such great detail within the thesis they are not described here. Rather it is referred to the accompanying CD-ROM, which contains an allocation of (German) quotes to the categories. The transcriptions of the 15 interviews are also included on this CD-ROM.

F. Distribution of traditional and virtual communication within the web-based case method

The findings of this evaluation were described in detail in the text of the thesis. Therefore they are not focused on in the appendix. The transcriptions of these interviews are found on the accompanying CD-ROM.

G. Evaluation of virtual group work in a university setting

This study focused on the evaluation of virtual group work in a university setting. For this purpose students who worked on certain tasks in traditional small groups were offered the possibility to work on these tasks through web-based group work. Out of an entire course 22 students participated in the virtual group work experiment. After the course the experiences made with both traditional group work and virtual group work were compared. This research is made up of two parts: qualitative and quantitative. Description and interpretation of the qualitative interviews precedes the results of the questionnaire.

Interviews: Virtual group work in a university setting

Goal of this multi-method research was to judge virtual group work in a university setting.

Purpose of this evaluation is to identify weak points and problematic areas within virtual group work compared to traditional group work. Recommendations for actions in order to improve this will then be given.

Interviewees were 15 students out of 22 participants who participated in the experiment. Within the experiment 22 students worked in virtual teams throughout one semester.

Guideline questions including further going questioning are as follows:

1. What are your main impressions of the virtual group work?
2. Which problems and difficulties did you encounter during your virtual group work?
   - Concerning technology (hard- and software)
   - Concerning communication and comprehension
3. How do you rate virtual group work compared to traditional meetings?
   - Concerning nonverbal communication
   - Concerning team spirit and the possibility to build up trust
   - Concerning productivity
   - Concerning the required amount of time
4. Which suggestions do you have to improve virtual group work?
   - Concerning the technology
   - Other suggestions for improvement

Evaluation of these interviews is structured according to eight categories.

I. General impressions of the students concerning group work

II. Difficulties and problems within group work

III. Advantages of virtual group work

IV. Communication in virtual groups

V. Productivity and expenditure of time

VI. Group dynamics

VII. Implementation of virtual group work into universities

VIII. Students' suggestions for virtual group work

The interpretation of these categories takes place in the thesis, therefore these results are not explicated here.

Questionnaire: "Virtual group work in a university setting"

This questionnaire was handed out in German language. This is the original questionnaire, it is not translated. The answers are regarded separately concerning participants of the experiment and non participants.

"Gesamt" describes the absolute numbers of answers to this category. "TN" is an abbreviation for the participants of the experiment. "Nicht TN" are non participants. "Ges. %" describes the percentages of all of the participants. "%TN" the percentages of the participants and "% Nicht-TN" the percentages of those students who did not participate in the experiment.

Table G-1: Results of the questionnaire virtrual group work in a university setting

Bist Du maennlich oder weiblich?						
	Gesamt	**TN**	**Nicht-TN**	**% Gesamt**	**% TN**	**% Nicht-TN**
maennlich	47	16	31	90,4%	88,9%	91,2%
weiblich	5	2	3	9,6%	11,1%	8,8%
∑	52	18	34	100,0%	100,0%	100,0%

Hast Du am Experiment "Virtuelle Kommunikation in Gruppen" teilgenommen, also mindestens einmal einen Aufgabenzettel in virtueller Gruppenarbeit bearbeitet?

	Gesamt	TN	Nicht-TN	% Gesamt	% TN	% Nicht-TN
Nein	34	0	34	65,4%	0,0%	100,0%
Ja	18	18	0	34,6%	100,0%	0,0%
∑	52	18	34	100,0%	100,0%	100,0%

***Wenn nein*, haettest Du evtl. teilgenommen, wenn Du die noetige technische Ausstattung gehabt haettest, um von zu Hause aus teilzunehmen?**

	Gesamt	TN	Nicht-TN	% Gesamt	% TN	% Nicht-TN
Nein	12	0	12	34,3%	0,0%	35,3%
Ja	15	1	14	42,9%	100,0%	41,2%
Weiß nicht	8	0	8	22,9%	0,0%	23,5%
∑	35	1	34	100,0%	100,0%	100,0%

***Wenn ja*, habt ihr zu Hause gearbeitet oder in den praeparierten Raeumen in der Uni?**

	Gesamt	TN	Nicht-TN	% Gesamt	% TN	% Nicht-TN
zu Hause	5	5	0	25,0%	27,8%	0,0%
in der Uni	15	13	2	75,0%	72,2%	100,0%
∑	20	18	2	100,0%	100,0%	100,0%

Aus wie vielen Personen bestand Deine Gruppe urspruenglich?

	Gesamt	TN	Nicht-TN	% Gesamt	% TN	% Nicht-TN
2	2	2	0	3,8%	11,1%	0,0%
3	10	2	8	19,2%	11,1%	23,5%
4	25	10	15	48,1%	55,6%	44,1%
5	6	4	2	11,5%	22,2%	5,9%
mehr als 5	0	0	0	0,0%	0,0%	0,0%
keine Angabe	9	0	9	17,3%	0,0%	26,5%
∑	52	18	34	100,0%	100,0%	100,0%

Hat sich die Gruppengroeße im Laufe des Semesters veraendert?						
	Gesamt	**TN**	**Nicht-TN**	**% Gesamt**	**% TN**	**% Nicht-TN**
Nein	36	18	18	69,2%	100,0%	52,9%
Ja -kleiner	7	0	7	13,5%	0,0%	20,6%
Ja - groeßer	0	0	0	0,0%	0,0%	0,0%
keine Angabe	9	0	9	17,3%	0,0%	26,5%
∑	52	18	34	100,0%	100,0%	100,0%
Hattest Du vor dieser Veranstaltung schon Erfahrungen mit virtueller Gruppenarbeit?						
	Gesamt	**TN**	**Nicht-TN**	**% Gesamt**	**% TN**	**% Nicht-TN**
Nein	34	11	23	65,4%	61,1%	67,6%
Ja	16	7	9	30,8%	38,9%	26,5%
keine Angabe	2	0	2	3,8%	0,0%	5,9%
∑	52	18	34	100,0%	100,0%	100,0%
Hattest Du vor dieser Veranstaltung schon Erfahrungen mit synchroner virtueller Kommunikation?						
	Gesamt	**TN**	**Nicht-TN**	**% Gesamt**	**% TN**	**% Nicht-TN**
Nein	4	2	2	7,7%	11,1%	5,9%
Ja	46	16	30	88,5%	88,9%	88,2%
keine Angabe	2	0	2	3,8%	0,0%	5,9%
∑	52	18	34	100,0%	100,0%	100,0%
***Wenn ja*, mit welchen Tools? (Mehrfachnennungen moeglich)**						
	Gesamt	**TN**	**Nicht-TN**	**% Gesamt**	**% TN**	**% Nicht-TN**
Chat	45	15	30	97,8%	93,8%	100,0%
Webcam	11	4	7	23,9%	25,0%	23,3%
Videokonferenz	8	5	3	17,4%	31,3%	10,0%
Sonstiges	9	3	6	19,6%	18,8%	20,0%
∑	73	27	46	158,7%	168,8%	153,3%

Wie lange hast Du im Durchschnitt fuer die Bearbeitung eines Aufgabenzettels gebraucht?						
	Gesamt	**TN**	**Nicht-TN**	**% Gesamt**	**% TN**	**% Nicht-TN**
1,5 Stunden	1	1	0	1,9%	5,6%	0,0%
2 Stunden	1	1	0	1,9%	5,6%	0,0%
2,5 Stunden	1	0	1	1,9%	0,0%	2,9%
3 Stunden	4	2	2	7,7%	11,1%	5,9%
4 Stunden	2	2	0	3,8%	11,1%	0,0%
5 Stunden	8	5	3	15,4%	27,8%	8,8%
5,5 Stunden	1	1	0	1,9%	5,6%	0,0%
6 Stunden	5	1	4	9,6%	5,6%	11,8%
7 Stunden	2	0	2	3,8%	0,0%	5,9%
8 Stunden	5	0	5	9,6%	0,0%	14,7%
9 Stunden	2	0	2	3,8%	0,0%	5,9%
10 Stunden	8	4	4	15,4%	22,2%	11,8%
11 Stunden	1	0	1	1,9%	0,0%	2,9%
12 Stunden	3	0	3	5,8%	0,0%	8,8%
13 Stunden	3	0	3	5,8%	0,0%	8,8%
16 Stunden	1	0	1	1,9%	0,0%	2,9%
keine Angabe	4	1	3	7,7%	5,6%	8,8%
∑	52	18	34	100,0%	100,0%	100,0%
Wie schwer fiel Dir die Bearbeitung?						
	Gesamt	**TN**	**Nicht-TN**	**% Gesamt**	**% TN**	**% Nicht-TN**
sehr schwer	2	0	2	3,8%	0,0%	5,9%
schwer	19	4	15	36,5%	22,2%	44,1%
mittel	29	14	15	55,8%	77,8%	44,1%
leicht	0	0	0	0,0%	0,0%	0,0%
sehr leicht	0	0	0	0,0%	0,0%	0,0%
keine Angabe	2	0	2	3,8%	0,0%	5,9%
∑	52	18	34	100,0%	100,0%	100,0%

Was waren die groeßten Schwierigkeiten bei der Loesung der Aufgabenzettel (Mehrfachnennungen moeglich)?						
	Gesamt	**TN**	**Nicht-TN**	**% Gesamt**	**% TN**	**% Nicht-TN**
Stoff zu schwer	2	1	1	3,8%	5,6%	2,9%
Stoff zu umfangreich	42	14	28	80,8%	77,8%	82,4%
Gruppentreffen schwierig zu koordinieren	19	8	11	36,5%	44,4%	32,4%
Arbeitsaufteilung ungerecht	5	0	5	9,6%	0,0%	14,7%
Konzentration auf Aufgabe schwierig	9	4	5	17,3%	22,2%	14,7%
Kommunikationsprobleme	4	2	2	7,7%	11,1%	5,9%
Konflikte innerhalb der Gruppe	2	0	2	3,8%	0,0%	5,9%
Technische Probleme	13	11	2	25,0%	61,1%	5,9%
Sonstige Probleme	9	2	7	17,3%	11,1%	20,6%
keine Angabe	1	0	1	1,9%	0,0%	2,9%
∑	106	42	64	203,8%	233,3%	188,2%
Hast Du alle Aufgabenzettel bearbeitet?						
	Gesamt	**TN**	**Nicht-TN**	**% Gesamt**	**% TN**	**% Nicht-TN**
Nein	13	2	11	25,0%	11,1%	32,4%
Ja	38	16	22	73,1%	88,9%	64,7%
keine Angabe	1	0	1	1,9%	0,0%	2,9%
∑	52	18	34	100,0%	100,0%	100,0%
Wie viele Punkte hast Du in den Aufgabenzetteln erreicht? [Hier wurde der Durchschnittswert der angegebenen Punktzahlen pro Person errechnet]						
	Gesamt	**TN**	**Nicht-TN**	**% Gesamt**	**% TN**	**% Nicht-TN**
0,5	1	0	1	1,9%	0,0%	2,9%
1,25	5	3	2	9,6%	16,7%	5,9%
1,5	7	1	6	13,5%	5,6%	17,6%

1,66	3	1	2	5,8%	5,6%	5,9%
1,75	7	6	1	13,5%	33,3%	2,9%
2	2	0	2	3,8%	0,0%	5,9%
keine Angabe	27	7	20	51,9%	38,9%	58,8%
∑	52	18	34	100,0%	100,0%	100,0%
Wie hast Du die Zusammenarbeit in der Gruppe menschlich empfunden?						
	Gesamt	**TN**	**Nicht-TN**	**% Gesamt**	**% TN**	**% Nicht-TN**
sehr schwierig	2	0	2	3,8%	0,0%	5,9%
schwierig	1	0	1	1,9%	0,0%	2,9%
mittelmaeßig	11	6	5	21,2%	33,3%	14,7%
gut	30	8	22	57,7%	44,4%	64,7%
sehr gut	7	4	3	13,5%	22,2%	8,8%
keine Angabe	1	0	1	1,9%	0,0%	2,9%
∑	52	18	34	100,0%	100,0%	100,0%
Hat sich die Zusammenarbeit im Laufe des Semesters verbessert?						
	Gesamt	**TN**	**Nicht-TN**	**% Gesamt**	**% TN**	**% Nicht-TN**
Nein	26	11	15	50,0%	61,1%	44,1%
Ja	10	3	7	19,2%	16,7%	20,6%
Weiß nicht	16	4	12	30,8%	22,2%	35,3%
∑	52	18	34	100,0%	100,0%	100,0%
Wie zufrieden warst Du insgesamt mit der Gruppenarbeit?						
	Gesamt	**TN**	**Nicht-TN**	**% Gesamt**	**% TN**	**% Nicht-TN**
sehr unzufrieden	1	0	1	1,9%	0,0%	2,9%
unzufrieden	4	2	2	7,7%	11,1%	5,9%
weder zufrieden noch unzufrieden	18	9	9	34,6%	50,0%	26,5%
zufrieden	27	7	20	51,9%	38,9%	58,8%
sehr zufrieden	0	0	0	0,0%	0,0%	0,0%
keine Angabe	2	0	2	3,8%	0,0%	5,9%
∑	52	18	34	100,0%	100,0%	100,0%

Meinst Du, virtuelle Gruppenarbeit laesst sich prinzipiell sinnvoll in der universitaeren Lehre einsetzen?						
	Gesamt	**TN**	**Nicht-TN**	**% Gesamt**	**% TN**	**% Nicht-TN**
Nein	11	6	5	21,2%	33,3%	14,7%
Ja	27	9	18	51,9%	50,0%	52,9%
Weiß nicht	14	3	11	26,9%	16,7%	32,4%
∑	52	18	34	100,0%	100,0%	100,0%
***Wenn ja*, in welcher Form?**						
	Gesamt	**TN**	**Nicht-TN**	**% Gesamt**	**% TN**	**% Nicht-TN**
kompletter Ersatz	1	0	1	1,9%	0,0%	2,9%
nur Ergaenzung	29	11	18	55,8%	61,1%	52,9%
keine Angabe	22	7	15	42,3%	38,9%	44,1%
∑	52	18	34	100,0%	100,0%	100,0%
Was glaubst Du sind generell die groeßten Probleme bei *traditioneller* Gruppenarbeit (Mehrfachnennungen moeglich)?						
	Gesamt	**TN**	**Nicht-TN**	**% Gesamt**	**% TN**	**% Nicht-TN**
Koordination der Gruppentreffen	33	14	19	63,5%	77,8%	55,9%
Konflikte innerhalb der Gruppe	10	5	5	19,2%	27,8%	14,7%
Kompetenzgerangel & "Machtgehabe"	10	5	5	19,2%	27,8%	14,7%
Mangel an Vertrauen	0	0	0	0,0%	0,0%	0,0%
Kommunikations-probleme	7	1	6	13,5%	5,6%	17,6%
Hoher Zeitaufwand	23	9	14	44,2%	50,0%	41,2%
Sonstiges	1	0	1	1,9%	0,0%	2,9%
∑	84	34	50	161,5%	188,9%	147,1%

Was glaubst Du, sind generell die groeßten Probleme bei *virtueller* Gruppenarbeit (Mehrfach-nennungen moeglich)?						
	Gesamt	**TN**	**Nicht-TN**	**% Gesamt**	**% TN**	**% Nicht-TN**
Koordination der Grup-pentreffen	7	2	5	13,5%	11,1%	14,7%
Konflikte innerhalb der Gruppe	10	2	8	19,2%	11,1%	23,5%
Kompetenzgerangel & "Machtgehabe"	4	1	3	7,7%	5,6%	8,8%
Mangel an Vertrauen	8	6	2	15,4%	33,3%	5,9%
Kommunikationsprob-leme	33	15	18	63,5%	83,3%	52,9%
Hoher Zeitaufwand	19	5	14	36,5%	27,8%	41,2%
Sonstiges	5	3	2	9,6%	16,7%	5,9%
∑	86	34	52	165,4%	188,9%	152,9%

Description of tools supporting virtual teamwork

Group work sessions started out using the program Netmeeting from Microsoft[146].

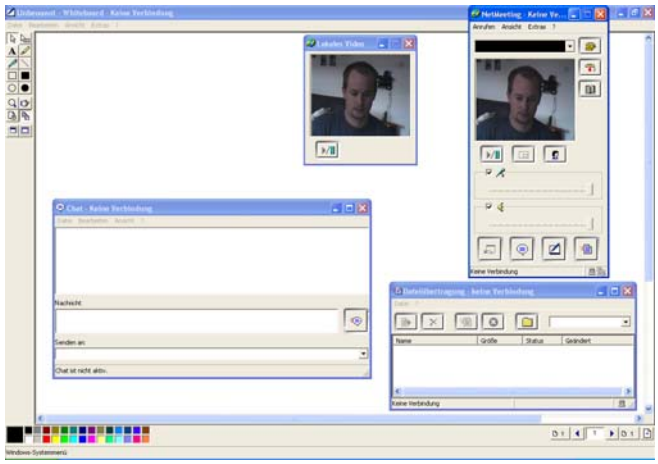

Fig. G-1: Microsoft Netmeeting (Screenshot)

146 Information and download under [Microsoft 03WWW].

This program was regarded as insufficient due to the fact that only two way communication conferencing was possible. The software was changed to "iVisit"[147]

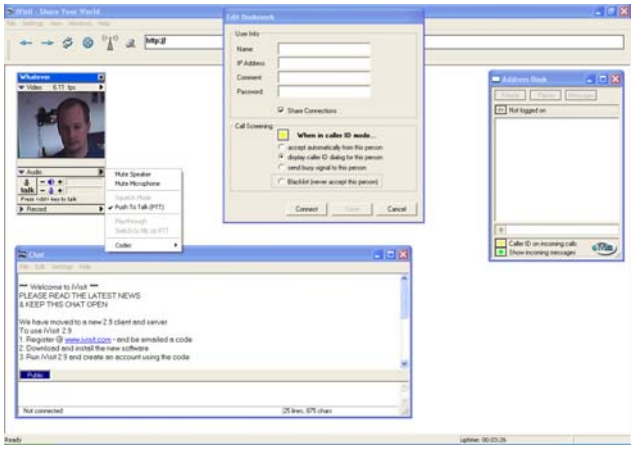

Fig. G-2: iVisit desktop (Screenshot)

For briefings and introduction purposes to the software the students always had a contact person in the prepared rooms of the university. The students who participated in the experiment from their homes were allowed to use the software of their choice. After experimenting with Microsoft Netmeeting they switched to "Yahoo Messenger"[148] These students were allowed to use the software of their choice in order to ease installation and to make use of familiarity aspects.

Fig. G-3: Yahoo Messenger (Screenshot)

147 Information and download under [iVisit 03WWW].

148 Information and download under [Yahoo 03WWW].

H. Check List for successful virtual communication

Description of availability standards:
These standards regulate at which times the communication partners are reachable and how fast they will react to messages (see [Senst 01, 43f.], [Haywood 98, 19ff.]).

Combined use of synchronous and asynchronous communication media:
A synchronous messenger-software, which indicates who is online, extremely accelerates information exchange. However, asynchronous media are also necessary to overcome times of non-accessibility (see [Senst 01, 43f.], [Haywood 98, 25ff.]).

Combined use of push and pull media:
The advantages of the combined implementation of synchronous and asynchronous media is similar to the advantages of implementing push and pull media in order to increase effectiveness of communication (see [Senst 01, 49], [Haywood 98, 33ff.]).

Prioritization of messages:
This enables the receiver to select the sequence in which the documents are worked on according to importance (see [Haywood 98, 30ff.]).

Emphasizing the message according to content:
If possible, messages should always be sent in the HTML format. This enables emphasizing via well-known means such as printing bold or in italics. In pure text messages emphasizing is enabled through accenting in form of *asterisks* (see [Senst 01, 44f.], [Haywood 98, 30ff.]).

Enable reference to context:
The context to which a message refers should immediately be evident. This can be enabled e.g. by (partly) integrating the preceding discussion process. Within this context it is also stressed to use the "subject-line" of an e-mail in a meaningful way (see [Senst 01, 44f.], [Haywood 98, S. 24f.]).

Avoid „screaming" in virtual rooms:
Writing in CAPITALIZATION is considered as "screaming". Especially when punctuation marks are used excessively (!!!???). This is to be avoided. Contents are to be emphasized in the above mentioned manners (see [Konradt/Hertel 02, 84]).

Avoid irony:
It is difficult for a virtual communication partner to understand written irony. Misunderstandings can be avoided by consequently keeping away from irony.

Use of emoticons:
Emoticons can partially compensate the missing social presence within virtual communication. They are implemented in order to express feelings in text based communication forms. According to [Konradt/Hertel 02, 85]and [Rosenbaum 01] the most important emoticons are

:-) = smile/happiness

:-(= sadness/disappointment

;-) = wink

Use of acronyms:
Specific abbreviations and acronyms save time and support an increased social presence. Similar to emoticons, these acronyms give communication a „personal note". Of course the communication partner must know about the meaning of these acronyms (see [Konradt/Hertel 02, 85]). Examples for commonly used acronyms are:

BRB = Be Right Back

CU = See You

LOL = Laughing Out Loud

(see [Konradt/Hertel 02], [Rosenbaum 01])

Define access:
Who has access to messages, documents and other information must be defined in order to exclude inappropriate use (see [Senst 01], [Haywood 98]).

Encoding of confidential messages:
In addition to defining access rights, confidential or sensitive messages are to be encoded/encrypted.

Do not forget you are communicating with humans:
In virtual communication one should never forget that this communication is with humans. All behavioural rules which apply to traditional face to face communication also apply to virtual rooms (see [Albion 03^{WWW}]).

I. Contents of the CD-ROM

- Dissertation (PDF)
- Transcriptions of interviews to the according studies:
  - Identification of the key factors of the traditional case method
  - Evaluation of the automated case method
  - Alumni requirements concerning learning scenarios
  - Student requirements concerning virtual learning
  - Success and hindering factors of traditional and virtual communication
  - Evaluation of virtual group work in a university setting