Mediated peer (to peer) learning

Ulf Blomqvist

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Abstract

Peer learning means learning from and with each other. Collaboration and co-operation in a friendly environment is, however, something that is neither easy nor obvious for students attending the university. Though, different methods and technological solutions can be implemented to facilitate and improve peer learning as well as dialogue and reflection.

The aims of this thesis were to study the implementation and use of innovative methods and technologies, and its effects on the learning process in mediated peer learning in higher education, as well as methods for facilitating peer learning through students' individual and group reflection. The aim was also to study end-user involvements in the development processes.

Dialogue sheets as a medium, i.e. a large sheet of paper with questions (about learning and reflection in this case) printed around its perimeter as support and guidance to the dialogue, have been investigated. Furthermore, the use of peer-to-peer (P2P) technology as mediator in learning has also been studied. The use of P2P technology in learning can be encapsulated in the expression *peer-to-peer learning*, hence the title "Mediated peer (to peer) learning". In addition, the evolvement of content-based services in the 3G market has also been studied, introducing a proposed general interpretation of how technology evolution affects the players in a certain market. Dialogue sheets and P2P technology are but two examples of media enhancing peer learning. Many other forms of media can of course enhance peer learning as well, but as computers and the Internet are considered to be the media into which all previous media converge, the thesis starts with the "oldest" medium, the paper, and ends with the "newest" medium, the Internet.

The conclusions of this thesis can be summarised as:

- The future of learning involves various media enhancing the learning experience. The development and evolution of these media should be the result of cooperation and interaction between learners, teachers, and the university. Failing to cooperate can cause serious problems for the universities.
- By building and maintaining an infrastructure, both analogue and digital, the learning institutions can enable flexible learning, including peer learning, utilising multiple media forms, and also support learners' individual learning styles, i.e. promote the learner-centric approach to learning, as well as increase the need for and appreciation of teachers as guides and mentors.

- By promoting various forms of mediated learning, including P2P technology solutions, teachers and universities can contribute to the defusing of P2P in the public debate, as also socially unquestionable activities then can be associated with the technology. They also foster students in respecting others' intellectual rights, and can promote alternative copyright schemes, such as creative common.

Sammanfattning

Att lära av och tillsammans med sina vänner och studiekamrater kallas *peer learning* på engelska. Det är dock inte alltid lätt eller ens självklart för universitets- och högskolestudenter att kunna samarbeta i en positiv och välkomnande miljö, såväl fysisk som mental miljö. För att underlätta för dessa studenter att verkligen kunna samarbeta och lära sig tillsammans med varandra kan man utforma olika verktyg och metoder med hjälp av olika former av media, så kallat mediebaserat lärande. Med media menas både sådana man ”kan ta på”, d v s papper, tidningar och böcker, och sådana som är elektroniska, t ex datorer och Internet.

Målen med denna avhandling har varit att studera införandet och användandet av nya metoder och teknologier för mediebaserat lärande i högre utbildning (universitets- och högskoleutbildning), samt hur dessa påverkar själva lärandet. Vidare skulle metoder för studenters reflektion studeras, både individuellt och i grupp. Speciellt skulle avhandlingen studera dessa metoders möjligheter att underlätta för att lära tillsammans. Slutligen var även ett av målen att studera slutanvändarnas (studenternas) engagemang och delaktighet i de olika utvecklingsprocesserna.

När man lär sig tillsammans med sina studiekamrater är det viktigt att kunna föra en dialog med sina kamrater och sig själv. Att föra en dialog med sig själv brukar kallas för att man reflekterar och att reflektera är en viktig del av själva lärandet.

I den här avhandlingen har ”dialogdukar” som stöd för dialog och reflektion undersökts. En dialogduk är ett stort pappersark, som har ett antal frågor tryckta längs med arkets ytterkant och som används som ett medium i en dialogövning. Frågorna längs med ytterkanten är alla vända utåt mot dem som deltar och handlade i detta fall just om att lära sig och om att reflektera.

Även användandet av peer-to-peer (P2P) teknologi som medium i lärande har studerats. Att använda P2P just i lärande skulle kunna innefattas i ett engelskt uttryck, *peer-to-peer learning*, vilket också är bakgrunden till avhandlingens titel ”Mediated peer (to peer) learning” – mediebaserade metoder för att lära tillsammans.

I tillägg har även utvecklingen av innehållsbaserade tjänster på 3G-mobil-marknaden undersökts. Detta för att se om påverkan av den tekniska utvecklingen på en mediebaserad marknad och dess aktörer även kan gälla i andra sammanhang, d v s om resultaten är så generella att de även kan

användas då man tittar på den tekniska utvecklingen inom utbildning och lärande.

Dialogdukar och P2P-teknologi är bara två exempel på mediebaserade metoder som kan förstärka lärande genom samarbete. Många andra medieformer kan naturligtvis också bidra till att lärandet förstärks, men eftersom datorn och Internet anses vara de medieformer i vilka alla tidigare medieformer konvergerar (konvergera innebär att de närmar sig varandra för att slutligen sammanfalla) så börjar denna avhandling med den ”äldsta” medieformen, pappret, och slutar med den ”nyaste” medieformen, Internet.

Resultaten i denna avhandling kan sammanfattas som:

- Framtidens lärande innefattar olika medieformer som förstärker själva lärandet – lärupplevelsen. Utvecklingen av dessa medieformer bör vara resultatet av samarbete och samverkan mellan studenter (”lärander”), lärare och högskolan eller universitetet. Om detta samarbete misslyckas så kan det innebära stora problem och utmaningar för högskolorna och universiteten.

- Genom att skapa och underhålla både traditionella och nya digitala infrastrukturer, möjliggör högskolor och universitet ett flexibelt, varierat sätt för studenter att lära sig själv och tillsammans med andra. Med infrastrukturer menas ett system av anläggningar, som utgör grund för att lärandet skall fungera. Ett flexibelt och varierat lärande får man genom att använda många olika medieformer i lärandet och genom att möjliggöra för studenterna att använda sin egen inlärningsstil, d v s man har en lärandecentrerad ansats i undervisningen. Dessutom så kan det bidra till att uppskattningen för lärarna ökar, samt att behovet av dessa lärare som guider och mentorer under utbildningens gång blir allt tydligare.

- Genom att gynna olika former av mediebaserat lärande, inklusive P2P-teknologilösningar, så kan lärare, universitet och högskolor bidra till att avdramatisera den offentliga debatten kring P2P. Detta genom att även socialt accepterade aktiviteter såsom lärande och undervisning kan kopplas samman med den tekniken. Dessutom så kan detta bidra till att man fostrar studenter i att respektera andra människors ’intellektuella rättigheter’ (upphovsrätt) och att man även kan föra fram alternativa upphovsrättsmodeller (t ex ”creative common”, som är en modell där upphovsrättsinnehavaren kan dela sitt material till andra att fritt dela i sin tur så länge man följer de krav som upphovsrättsinnehavaren har ställt, t ex att inte tjäna pengar på att dela med sig till andra).

List of included papers

Paper I - Blomqvist, U., Handberg, L. & Næve, A. (2003) "New methods for focussing on students' learning process and reflection in higher education", Proceedings of the 28th Improving University Teaching (IUT) Conference. June, 2003. Växjö, Sweden.

Paper II - Blomqvist, U., Dixner, P., Kednert, C. & Köpniwsky, J. (2003) "Solving the 3G Content Dilemma as a Prerequisite for Traffic Generation" in Cunningham, P., Cunningham, M. & Fatelnig, P. (Eds.) *Building the Knowledge Economy: Issues, Applications, Case Studies* (pp. 44 – 51), Amsterdam: IOS Press, ISBN: 1-58603-379-4 (e-Challenges e2003 Conference. October, 2003. Bologna, Italy – Awarded Best Paper)

Paper III - Blomqvist, U. & Sjödin, C. (2006) "From Peer Learning to P2P Learning – new life or obsolescence for the traditional learning institutions?" (Peer reviewed and accepted for presentation by the eChallenges 2006 Conference. October 2006. Barcelona, Spain)

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1 Introduction

There is a vast interest today in understanding how academic learning can be improved. According to Säljö (2000) this stems from the position learning holds in our society, and is closely connected to our conceptions on economic and social development and the desire to improve society's welfare. Most people are enthusiastic for the younger getting a degree that qualifies them for a demanding job, and which can endure the future developments of technology at a high level. How people learn can never be reduced to solely a question of technology or method, which, to some extent, academia and education tend to prefer.

The process of academic learning is individual and subjective. Everyone can process information, thus everyone can learn, but each and everyone learn new things in their own way (Dunn, 2001). Schools and universities, however, have been using fairly standardised methods to teach and assess learners (students), i.e. centring learning on the teacher – *teacher-centric learning*. When exemplifying learning by 'learning from reading a text'; the text generally is what *the teacher* perceive it to be; *the teacher* can decide what facts, terms or principles to be learned; and *the teacher* creates questions that will assess to what extent the learner has understood the facts, terms, or principles by reading the text (Marton & Booth, 2000). But are the learners reading the same text as the teacher? Are not learners all reading slightly different texts, in the sense that a text considered undisputable by the teacher appears differently, and have different meanings for the learners?

Over time different media and technologies have been used to enhance the learning experience for the learner. The first enhancements to take notice of are the notebook and the textbook. When these were introduced the learners did not only have to rely on what they heard the teacher say (memorise it), but could refer to their personal notes and to a textbook on the subject. Illustrative posters, natural history specimens, and correspondence courses were other early media forms. Later solutions that enhance learning have been TV, radio, video, film, optical media and computers.

From the 1950s different new technological solutions were introduced as learning media. (NE, 2006) Improved printing methods facilitated the use of images in books. Movies and TV-programs were produced for educational purposes (1960s, 1970s, and 1980s), and filmstrip slides were used together with sound tapes (1970s and 1980s) to enhance learning and teaching. Other technological solutions that have been used over the years are cassette recorders, gramophone record players and slide projectors. All these media

types, used throughout the history, are said to be converging in the computer, hence the expression multi-media computer.

Electronic solutions, such as computers and optical media (i.e. CDs and DVDs) were introduced in the 1980s and 1990s. When computers became standard equipments in learning institutions in the late 1980s, and later on in almost every student's home, a new technological solution for enhancing learning was established. Now the learner could take classes, and even courses, on the computer. The learner could for instance take part of a (self) assessment of what had been covered in the class, i.e. *interact* with the computer; an important notion to remember – we do not operate computers, we interact with them, and successful digital representations are designed to be experienced and responded to (not simply used), just as naturally as physical representations or people (Bolter & Gromala, 2003; Reeves & Nass, 2002). This method of learning on a computer is known to many as computer-based training (CBT), computer-based learning (CBL) or, earlier, computer-based instructions (CBI).

The correspondence courses, mentioned above, can be considered as extensions of the actual learning institutions. With the dawning of the Internet (or the World Wide Web that most identify as the Internet) in the early 1990s, the learning institutions were presented to a new extension possibility. Now they could start offering courses online at a distance, as well as forming totally new net universities. Conversely, the Swedish Net University (Nätuniversitetet) is not a 'new' university, but rather a Governmental Agency – Swedish Agency for Networks and Cooperation in Higher Education – connecting universities' net offers together on a single web site (Nätuniversitetet, 2006). The Swedish Net University says in its presentation that "It offers a different way to study – independent of time and place – at Swedish universities and university colleges." The main argument for studying at the Swedish Net University is not that it explicitly enhances the learning experience. Rather it enhances the learning experience implicitly, as the learner is able to "decide when, where and how to perform [his or her] studies. Flexible is a key word." (Nätuniversitetet, 2006) Another thing that is focussed on is the credits you get for a course (i.e. 20 credits for a full semester). Furthermore, the education is presented as "just as demanding as if [the learner was] inside the university. Even more so …" (Nätuniversitetet, 2006)

With the Internet (originating from the ARPANET in 1969), and the World Wide Web, an even richer formal learning environment was enabled, allowing the learner to be assessed by teachers or tutors at an instance. Even the learner's source of information was enriched, as he or she could search the Web for useful information. On the other hand, Bolter & Gromala (2003) stress that we live in a media-saturated environment, in which many forms of

technologies and media compete for our attention. Traditional media is still there, as is traditional learning. But what source is best for the learner? Or, what mix?

As an opposing opinion to the convergence theories mentioned earlier, Bolter & Gromala (2003) say that what we are witnessing is in fact a series of convergences – provisional combinations of technologies and forms. Indeed, they even argue that convergence is a myth. They use the World Wide Web to exemplify what convergence is all about – the Web combines most, if not all, popular media and media forms, and the Web has *diverged* or divided into many different (new) forms, which all have its niche audience.

To some technology or media enhanced learning is a means to compensate for the diminished time teachers and professors can spend for and with their students. To others it is a way to centre learning on the learner – *learner-centric learning* – to enable each and every learner's individual skills to be utilised in the learning process. Söderlund (2000) argues that modern thoughts about life-long learning are changing the way learning is organised in society. Furthermore he stresses that there is an increase in focus on the learners and that they themselves have to take responsibility for their continuous competence development, which is required by developments in society. In fact societal development **demands** that the learners are continuously active.

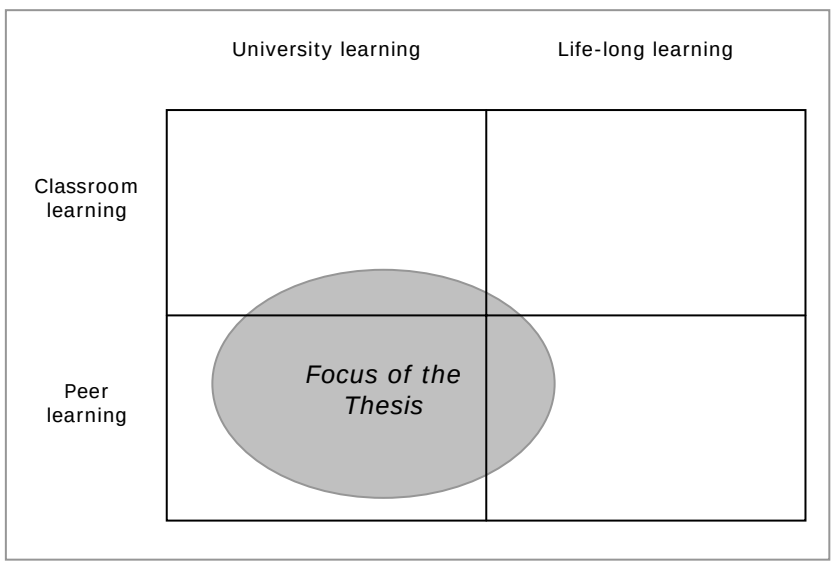

Figure 1. Focus of the thesis. Using the boxes as guidance the focus of this thesis is on peer learning in a university-learning perspective.

The focus of this thesis is on the academic learning, and especially on peer learning in the university learning context, as illustrated in Figure 1, leaving the practical learning for others to investigate. Practical learning, e.g. learning-by-doing, differs from academic learning, or theoretical learning, by the fact that some things cannot be learned just by reading. A simple example is how to throw clay using a potter's wheel; one can never learn how the clay behaves in your hands when it is too wet or when the wheel is spinning too fast just by reading, it must be experienced.

As stated earlier learning differs between each individual, and even the term learning can have different meaning. University learning is to a larger extent becoming more synonym with as well as part of life-long learning (Säljö (2000) defines learning as the possible result of all human activity, and cannot easily be connected only to institutions such as schools and universities). Classroom learning indicates university-based learning, but peer learning, which is more or less time-and-place independent, is increasingly becoming a part of classroom learning at universities, and classroom learning is on its hand becoming more and more time-and-place independent with the Net.

It is plausible that everyone who reads this thesis would agree that the term *learning* has a slightly different meaning in each of the four cases above, and for the author the interpretation of learning in the cases mentioned above is as follows:

- *University learning* – learning is to understand and interpret facts and methods, to understand the heritage of science and philosophy, and to develop as a member of society by interacting with fellow students/learners, as in a real-life setting.

- *Life-long learning* – learning is to experience, interpret and make decisions based upon facts and occurrences in the surrounding society, and to be curious, both in formal and informal settings.

- *Classroom learning* – learning is a process of encoding plus transmitting (teaching), and decoding plus storing information (learning). When the information is processed in a context, learning takes place. This process is controlled (or managed) by a teacher whose goal is to transfer or mediate knowledge so that the learner understands and knows how to use it. Structured learning is another term that can be used.

- *Peer learning* – learning is to understand how others' perception of facts and methods, and heritage of science and philosophy can be useful for and/or similar to once own experience, and to share once own perceptions with others, both in formal and informal settings.

Söderlund (2000) argues that technology (i.e. Information and Communication Technology – ICT) enhanced distance learning appears as the enabler for learners to make the transition from *university learning* to *life-long learning*, while promoting growth and welfare. Learning has evolved over time and, with the continuous introduction of new media forms and technological solutions, learning will most likely continue to evolve over time to come.

One can argue that higher-education learning (transfer of knowledge) to a large extent is mediated or rather *re*-mediated – the teacher mediates, i.e. remediates, his or her knowledge to the learner. In peer learning the process is similar. But, remediation is also valid for the media used in mediated (peer) learning. Bolter & Grusin (1999) explains remediation as the representation of one medium (used in a broad sense) in another, and argues that remediation is a defining characteristic of all new digital media. Also McLuhan (1964) point out that any new medium holds another, previous medium as 'content', i.e. it mediates another medium – remediation. Some examples to clarify this are; the content of speech is knowledge, thoughts and ideas, the content of writing is speech, the written word is the content of print, print is the content of a novel, the content of a movie is e.g. a novel (Bolter & Grusin, 1999; McLuhan 1964).

Digital media remediate their predecessors; at one extreme the older media is highlighted and represented without irony and critique, at the other there is an attempt to absorb the older media entirely, minimising the discontinuity. And in between the two extremes, two milder forms of remediation appear; the entire refashioning of the older media, but without erasing them, and emphasizing of the differences by stating that the older media are improved. (Bolter & Grusin, 1999) Translating this to learning one finds that digital media to some improve learning, to some the importance of learning is highlighted through them, to some they represent new forms of learning alongside traditional learning, and finally to the rest they are the solution that will obsolesce traditional learning.

2 Aims and methods

This chapter presents the aims of this thesis and the different methods used to conduct the research presented in the three papers at the end. To reach the goals of this research the following methods have been used; observations (Paper I), role-play approach (Paper II), and sample survey (Paper III), all together with desk-top research. The methods used are discussed further in conjunction to the delimitation argumentation.

2.1 Aims

The aims of this thesis are to:

- Study the implementation and use of innovative methods and technologies, and its effects on the learning process in mediated learning in higher education
- Study methods for facilitating peer learning through students' individual and group reflection
- Study the involvement of end-users in the development of new tools and methods for sharing, distributing and retrieving information

2.2 Quantitative methods

Quantitative methods have been seen as something definite, the only really scientific method that objectively can determine certain circumstances and conditions in society. (Holme & Solvang, 1997) Quantitative methods differ from qualitative methods in a number of aspects. Table 1 below illustrates some of these differences.

Table 1. Overview of some differences between quantitative and qualitative methods. Adapted from Gunnarsson (2002:a)

	Quantitative methods	Qualitative methods
Aim	Tries to explain – Prove	Tries to understand
Possible results	Possible results are predefined	Openness towards any possible result
Studies	What can be observed objectively	The specifically human, based on experiences
Area of interest	Studies relations/ connections (preferably causal). Searches for universal rules.	Studies unique individuals, where each individual has its own freedom of choice.
Transferability	Results can be generalized	Commonalities exist. Some results can be generalised.
Context	Views the phenomenon as context independent	Context is important

Pre-*conception* and pre-*judice* are two important pre-*conditions* in quantitative research. (Holme & Solvang, 1997) Preconception stems from the researcher's previous education, research and tacit knowledge, and can be clearly manifested when different researchers attend to, or describe, a problem (phenomenon). Prejudice is the researcher's background; e.g. upbringing, education, and other socially grounded reasons, which will affect the way the researcher attends to a problem. Gunnarsson (2002:a) on the other hand, points out that quantitative methods also have two major *advantages*; firstly, the researcher gets an objective measurement of the probability of the correctness of the results, which is not always the case with qualitative methods; secondly, if a researcher in a given situation gets to choose between a qualitative and a quantitative perspective, the latter is generally easier and less demanding.

Quantitative methods generally involve the use of special methods for selection, which implicates a simplification of the processing of the information, but it also allows the researcher to say to what extent the results are representative (Holme & Solvang, 1997). Larsson (1986) stresses that non-qualitative methods, or quantitative methods, deal with correctly finding the distribution of a characteristic, or to establish cause.

There are different quantitative methods, each with its own characteristics. The use of interviews, observations, experiments, self-administered questionnaires or analyses of sources, all have in common that structuring and planning must be done before information (data) is collected. (Holme &

Solvang, 1997) Self-administered questionnaires and interviews are most commonly used. The difference between a self-administered questionnaire and an interview lies in the collection of the information (data). When using self-administered questionnaires the researcher seldom is present when the respondents fill in their answers, but conversely is present, physically or via e.g. telephone, in an interview.

Validity and reliability

It is essential to know how well a data collection method measures what is intended (Gunnarsson, 2002:b). Or as Holme & Solvang (1997, p 163) puts it: "The question is […] whether any systematic or random errors or distortions have snuck into the creation of the research question or into the collection of the data." To describe this, the terms (measures) validity and reliability are used. (Gunnarsson, 2002:b) High validity and high reliability are prerequisites for generalizing the results to other than those participating in the study. Validity describes the relevance of what is being measured, while reliability describes the correctness and trustworthiness of the measuring and the analyzing method, i.e. quality of measuring equipment or method, quality of analysis, and quality of researcher(s) (Gunnarsson, 2002:b; Holme & Solvang, 1997).

When talking about validity one generally separates *internal* and *external validity*. Internal validity describes *credibility*, e.g. communicative validity – description of preconception, data collection, sample, and analysis process – participant control or triangulation (see further under "Role play as qualitative method" on page 11, where triangulation as a qualitative method is described). External validity describes *transferability*, i.e. description of possibility to generalise results. (Gunnarsson, 2002:b)

2.3 Qualitative methods

The term qualitative method, or qualitative model, could imply that quality takes precedence over quantity. This is of course not true, though turning the argument we find that when not all variables are quantitative the model is called qualitative (Wiedersheim-Paul & Eriksson, 1991). A qualitative method is about characterising something – how to interpret it. When talking about quality in this context, it is not referred to as valuable or good, but rather means to describe quality – to describe characteristics and nature of things and occurrences. (Larsson, 1986) Further, qualitative methods can be described as the opposite to hypothesis testing focussed on verifying and falsifying. Holme

& Solvang (1997) states qualitative methods are attempts to overstep the subject-object relationship of natural science.

There are also varying traditions when working with qualitative methods. One describes work as dealing with something radically unprejudiced – a phenomenographic (originating from phenomenology) starting point. Another describes work from within the framework of a theory for interpretation, such as psychoanalysis – i.e. hermeneutics. (Larsson, 1986) Phenomenology and hermeneutics can be said to represent a "warm" analysis method, wherein empathy is integral to the analysis. Its opposite would then be the "cold" analysis; the technical, structural analysis or repertory grid (Boeree, 1998)

Qualitative studies span over a broad spectrum of themes; foreign cultures, religious or economic pre-conceptions, how people react in certain situations. The data collected can vary: one's own immediate experiences, other's experiences – collected by; observations, interviews, letters, images, artworks, artefacts, etc. (Larsson, 1986; Boeree, 1998) Also the data collection methods can be described to have different orientations. Boeree (1998) describes three broad orientations:

1. a "past" orientation – such as collecting things that are the results of past living, like artefacts or literature
2. a "present" orientation – such as observing (or introspecting – observing one's own experiences, e.g. emotions, thoughts, ideas, perception of senses (NE, 2006)) what is happening now
3. a "future" orientation – eliciting your data, making it happen, as in an interview or a project.

Ference Marton (in Larsson, 1986) describes two perspectives on qualitative studies; first order perspective, and second order perspective. The first order perspective deals with facts, i.e. what can be observed from the outside. The second order perspective deals with how someone else is experiencing something, i.e. how something appears to someone, which is not a matter of true or false but rather what. The second order perspective is to a large extent what traditionally is being described as phenomenology.

Phenomenographic approach

The phenomenographic approach, which is related to phenomenology, instructs us to allow the phenomenon to reveal itself in its fullness. It can be 'looked' at from all perspectives, using all senses, even attending to one's personal thoughts and feelings. Phenomena are apodictic, which means they 'speak for themselves' (Boeree, 1998). Franz et al (1997) explains phenomenography (this notion is introduced by e.g. Ference Marton and Roger Säljö, etc.)

as "an area of research which focuses on identifying and describing the qualitatively different ways in which people understand phenomena in the world around them".

Phenomenography aims at describing other people's experiences of phenomena. This can involve feelings, but even 'intellectual' phenomena such as 'what is the meaning of a triangle?' In the analysis one attempt to temporarily ignore present explanations and theories on what is being analysed, in order to get to the 'source' – our un-reflected, 'pure' experience. (Larsson, 1986) This approach also means that one can choose not to describe how the phenomenon really is, but rather to describe how it appears to be.

Observations

Observation research is not a single-task effort. To employ fieldwork for gathering data is only the first step in a decision process involving a large number of options and possibilities. The choice to employ fieldwork involves a commitment to get close to the subject being observed in its natural setting, to be factual and descriptive in reporting what is observed, and to find out the points of view of participants in the domain observed. Once these fundamental commitments have been made, it is necessary to make additional decisions about which particular observation approach is appropriate for the research situation at hand (Genzuk, 2003). Holme & Solvang (1997) summarises observations as to see, listen and ask questions to get a hold of what is happening.

Participatory observation generally means that the researcher needs to conduct fieldwork, which can appear as having an unstructured nature at a first glance. Shaffir, Stebbins and Turowetz (1980, in Boeree, 1998) describes field studies as different from controlled studies, such as surveys and experiments, in the way that the latter prejudge the nature of the problem, use rigid data-gathering devices and hypotheses based upon "a-priori beliefs or hunches concerning the research setting and its participants".

Observations, as well as various quantitative methods, have historically been used in ethnography. Ethnography have been characterised by the aim of describing societies; cultures as systems with regulations and codes, which logics can be described as entireties. The preferred data collection method has been participatory observations. (Larsson, 1986)

The first and most fundamental distinction among observation strategies concerns the extent to which the observer is also a participant. This is not just a simple choice between participation and non-participation. The extent of participation varies from complete immersion as full participant to complete separation, taking on a role as spectator. (Genzuk, 2003) Participatory

observation is a field strategy that simultaneously combines document analysis, interviewing of respondents and informants, direct participation and observation, and introspection.

Experiencing an environment as an insider is what necessitates the participant part of participatory observation. (Genzuk, 2003) Participatory observation is following "natural" life, without unnecessary interference. (Larsson, 1986) Boeree (1998) describes participatory observations as a "warmer" form of structural analysis, i.e. to understand the experiences of others, by putting ourselves in their place. Participatory observation is immersing oneself in an alien way of life in order to gain knowledge of that way of life. Genzuk (2003) states that the challenge is to combine participation and observation so as to become capable of understanding the experience as an insider while describing the experience for outsiders.

There are some problems connected with participatory observation that are not different from problems with experimental research. We look for validity, i.e. the accuracy of our description, and reliability, i.e. the ability for other observers to replicate our description. (Boeree, 1998)

Role play as qualitative method

The 'role-play' approach (see Figure 2) to studying different scenarios was designed and initially used at the Royal Institute of Technology, and is of value when observing divergent views of different parties in a study. The method can best be described as a combination of analysing past events, observations, introspections, interviews and phenomenographic elements.

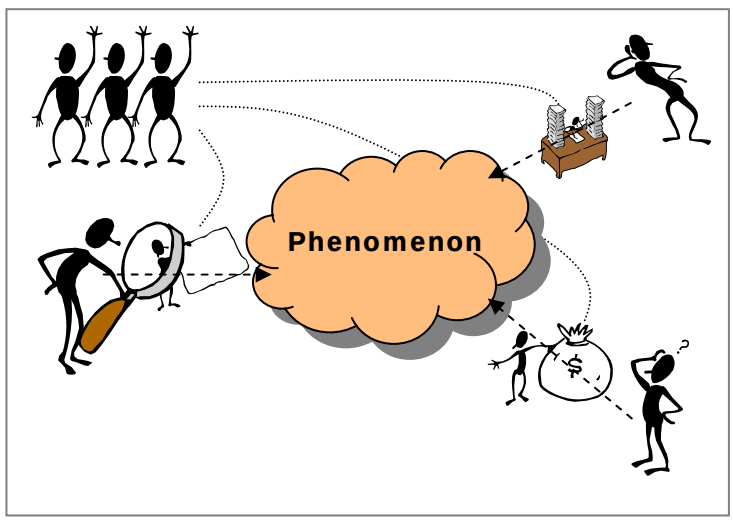

Figure 2 Role-play approach to studying a phenomenon – Each researcher takes on a role known to be part of the phenomenon in order to study it.

Similar to the role-play approach is triangulation (see Figure 3), which in research terms was described by Denzin back in 1978 as a researcher using different sets of data, different types of analyses, different researchers, and/or different theoretical perspectives to study one particular phenomenon (in Chenail, 1997). The different points of view are then studied so as to situate the phenomenon and locate it for the researcher and reader alike. At the same time, a careful reflection of what the researcher use as the particular points of view to triangulate the phenomenon reveals as much about the 'location' of the researchers as it does about the phenomenon.

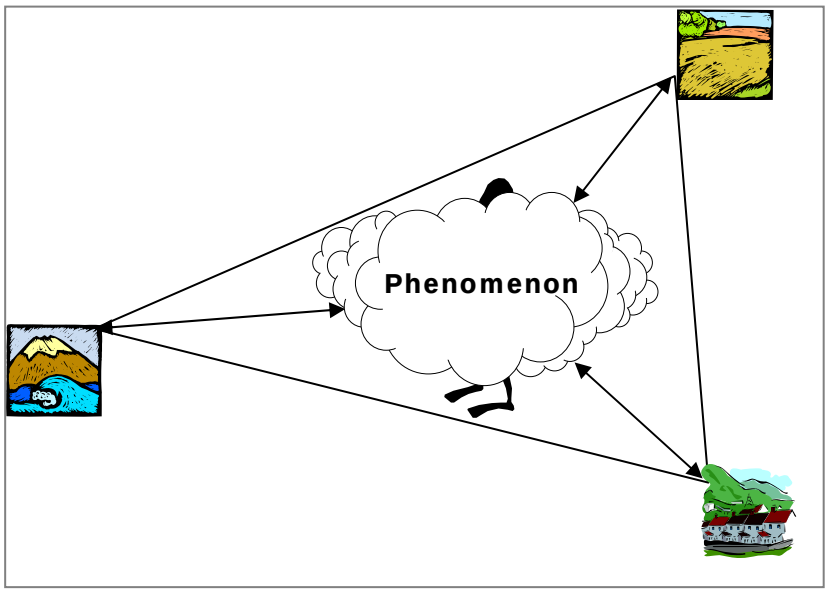

Figure 3 Triangulation approach to studying a phenomenon – Different points of view are used to locate the phenomenon to the researcher

The role-play approach as an investigation method has been used in various contexts, e.g. teaching research ethics (Strohmetz & Skleder, 1992), geoscience education (Teed, 2006), though it needs further development. Methods depending on subjective interpretations are always coupled with a risk for bias. In the role-play approach there is a risk that a researcher identifies him or herself too closely with the position nearest to him or herself as a person, which in the Business-to-Consumer case is most likely to be the position of the curious consumer. The risk also means that the researcher or researchers risk underestimating the underlying differences of opinions.

The object of triangulation, as within sailing, is to give a location in relation to some other points, to locate the meaning of some other phenomenon 'out there' (Chenail, 1997). In doing so, it is easy to forget that the researcher always is part of the equation too. If the researcher looses him or herself in the study, he or she risks loosing the study.

Concluding, one of the most outstanding problems with participatory observation is ethics. Are we, or are we not participating in activities that are illegal, or that we consider immoral or unethical? (Boeree, 1998)

2.4 Choice of Methods and Delimitations

This thesis is built on three separate studies, each with slightly different investigation methods, and which together, in a sense, achieves a triangulation on the subject of the thesis.

The findings are based on studies carried out in Sweden, mainly in Stockholm. Students at the Master's Programme in Media Technology at the Royal Institute of Technology (KTH) participated in the dialogue sheet exercises discussed in Paper I. Furthermore they contributed to the findings by actively taking part in the ULM (Unified Language Modelling) exercises (see Paper I on page 79 for more information) and gave feedback by answering a questionnaire with open ended questions. Though dialogue sheets since have been used at various locations, such as the University College of Gjøvik in Norway, Cass Business School of London in the U.K., and Uppsala University in Sweden, to mention a few, these sites have not been studied in this thesis. Furthermore, more students from other Master's and Bachelor's programmes at KTH (e.g. Computer Science, Engineering Teacher, Business Management, and Physics) have participated in dialogue sheet session; however, they have not been studied, and thus are not included in the findings.

In Paper I a mix of *phenomenography* – using the second order perspective of qualitative research as described in chapter 2.3 "Qualitative methods" – *observations* – to some extent this was participatory observation, though the participation was reduced to being in the same room as the real participants, those who were observed – and *questionnaires* with open-ended questions, was selected as the investigation method. Phenomenography is least salient (i.e. more like implicit) in the study, whereas observations are most salient. The questionnaires were used to capture and verify the results captured in the observations. The analysis and conclusions in the paper were then based on the results of all methods used.

The aforementioned ethical issues are very important when working with participatory observations. Boeree (1998) posed the question: "Are we, or are

we not participating in activities that are illegal, or that we consider immoral or unethical?" This ethical aspect was prominent when using the role-play approach in Paper II. As the aim of the study in Paper II was to study the divergent views of the different parties involved, the co-authors of Paper II each took on one of the "roles" of *'the consumer'*, *'the content owner'*, and *'the network operator'*. To fully identify with the consumer the researcher had to engage in, then absolutely legal, but perhaps unethical activities, such as sharing copyright protected material using file-sharing services.

The role play method can also be viewed as a peer learning method. The researchers learn from and with each other when acting in the role play research. By this collaboration and cooperation they are able to reach a higher level of understanding of the different roles or parties studied.

Using the role-play approach in a study enables the investigator to identify with those observed, but at the same time the method provides no certainty that the investigator focuses on the "right" aspects of the ones who are investigated. There is always a risk of being biased when conducting participatory research and the researcher should always bear in mind the prejudice and preconceptions identified before the observatory study commenced, as well as the preconditions of the study. Furthermore, when using the role-play approach it is not possible to grasp all aspects of the role the investigator takes on, as these kinds of roles are often generalised, and perhaps stereotypes. Also, the study in Paper II is limited to the companies visited and investigated, and does not cover the "whole" of the roles as 'content provider' and 'network operator'. Adding to that, 'the consumer' as a role risks being largely biased by the investigators own perception of him or herself as a consumer.

In Paper III self-administered questionnaires were used in order to reach a fairly large student group in a short period in time. Mitchell & Jolley (2001) state the main advantage with using questionnaires is the ability to reach a reasonably large population whilst requiring a relatively limited effort. On the other hand, there are also disadvantages with self-administered questionnaires, such as questions being misinterpreted, thus producing misleading results; or the questionnaire survey suffers from a low return rate, implying that there is a risk that the individuals that complete the questionnaire may not be representative to the population investigated. If these problems occur they could result in the survey findings reflecting a biased sample.

The students answering the questionnaires used as sampling method in Paper III were all residing in Halmstad, both the high school students and the university students. Making a cross-sample with students at various locations might have produced slightly different results, though the major findings in Paper III are deemed as general. Also, all the results from the questionnaire were cross-matched with available statistics from Sweden and the U.S.A.

3 Related research

In this chapter some research results *related* to the area of this thesis are presented. Directly matching previous research is lacking. One reason being the fact that many researchers focus on technology enhanced distance learning from a teacher and assessment perspective. Recent technological developments, such as peer-to-peer (P2P), have just begun to appear in research results, but then mainly focussing on the commercial use and on corporate-based knowledge management.

Utbult (1995) describes the time and place independence of distance education (mediated learning) by using three separate metaphors: Correspondence course on the computer; The extended classroom; and The living book. These are in fact frequent arguments for why technology enhancement is introduced in higher education, i.e. the ability to extend the classroom, reaching more learners by utilising a correspondence like setting with course material only available electronically. More so, this is an indication that the focus of technology enhancement have not, at least initially, been put on learner interaction *through* a medium, but rather teacher-learner interaction, and possibly physical learner interaction.

The Internet is identified by Utbult (1995) as a knowledge infrastructure, reaching the learner everywhere, even at home. This is confirmed by Andersson (2005) in his thesis on Ubiquitous Knowledge. He states that the impact of the Internet across various sections of society is becoming more evident as we speak. Furthermore, he describes the importance that the World Wide Web (WWW) has for learners seeking knowledge.

Oliver & Omari (1998) present studies on students learning behaviour in a classroom-based setting of a WWW learning environment, aiming to encourage cooperation, reflection, and articulation among the students. The research presented by Oliver & Omari (1998) does not, however, show results nor thoughts on computer or Internet mediated human interaction, i.e. discussion or dialogue between two (or more) whose presence (or sense thereof) is mediated to one another (Enlund, 2000; Knudsen, 2000; Sponberg, Knudsen & Handberg, 2001; Knudsen, 2001).

Ewing et al (1999) describes the focus of the STARS project in the United Kingdom, which outcomes were presented back in 1997. The focus of the study was on the effective role of technology in teaching and learning in the context of utilising the WWW within a classroom based collaborative learning

task. Their major concerns were described as the integration of the learning event into an ongoing collaborative learning environment, how to structure the learning task in a medium which was largely unfamiliar to both teachers and students, to determine the most appropriate levels of control and flexibility to encourage independent learning, and the importance of an appropriate model of learning. Although they refer to the, then, recent changes in the use of computer based learning environments, i.e. the shift from electronically presenting information, to providing support for the learner in constructing knowledge and deriving meaning, the project showed that technology enhanced learning was still not fully a question of focussing on the learner, but rather maintaining the centring on the teacher and the need to control and assess the learners.

Lidstone & Lucas (1998) speak about mediated collaboration and reflective collaboration as two patterns of interaction. In mediated collaboration the interaction is dependent on a software program initiating and/or sustaining discussion, i.e. discussion between two (or more) *physically present* individuals. In the latter interaction pattern the program is not as involved; once it initiates discussion, it plays little or no further part in the discussion. Still the media is merely seen upon as an enabler. The idea of mediated collaboration where the collaborators are separated in place, and even in time, is not explored.

Ewing et al (1997) put forward the constructivist approach to learning, i.e. personally constructed learning through representations, which are internal mental actions of the learner. This also implies that thinking is the learner's internal representations of external events, and that such representations are influenced by internal factors of the learner's previous experiences as well as the learning environment. Learning proceeds towards conceptualisation and understanding through the learner's reflection and developing success in abstraction.

Ewing et al (1999) especially notice three aspects of the future of learning and hypermedia. Firstly, the increased recognition that proper and effective use of learning through actively constructing knowledge would lead to predetermined learning outcomes at a greater level of generality. Secondly, the moving away, in constructivist led learning, from pre-established decision taking, to the point where the learning task begins, and thirdly, the shift of decision taking, from being taken by the teacher to being taken by the learner.

Diaz (1999) puts forward life-long learners in the context of adult learning theory and web technology by stressing the shift in adult learning theory from a teaching environment to a learning environment, wherein students can become life-long learners by being enabled to locate the resources necessary to continue learning. He also discusses the notion of adult learners being autonomous, preferring self-directed study, and that they thus should respond

well to distance education via the WWW. But, although Diaz speaks about the Web as a facilitator of self-directed and practice-centred learning, he also speaks about the needs of the learner including a communication between the teacher and the learner, not between learners. On the other hand, Diaz (1999) also raises the problem of the learner interacting more with the technology, rather than learning. Solving this problem, the Web, in the learning context, becomes transparent, i.e. the medium, the technology, is not in the attention of the receiver. This is elaborated by Bolter & Grusin (1999) in "Remediation: understanding new media", where they introduce the notion of transparency. Also Enlund (2000) discusses this subject.

Söderlund (2000) points out that an important supporting structure for learners is the social interaction with other learners, in which they are able to form and give expression for their thoughts, exchange ideas and share these with others, and jointly reflect on various phenomena. This in turn establishes a ground for processes within the individual learner, and deepens the understanding of the learning process. In their learning processes, learners use different resources that are only partly created or offered by the teacher. Learners also use resources available in their close environment, at work or at home. To this one can add the ever increasing use of computers and different communication technologies as yet other learning resources.

Söderlund (2000) concludes that learning is happening within different contexts, where learning institutions are but one example of such a context. In this perspective it is fair to say that learning is not only a cognitive phenomenon, but also social, cultural and sensual. The cognitive learning processes are considered as part of the context in which learning occurs. The learner is an active person using mental tools, e.g. concepts, and artefacts as well as the resources provided by their social interaction with others.

Höglund & Karlsson (1998) identify the natural relationship students have with computers. The technology is not exciting in the sense of being revolutionising, it is considered as a natural means for retrieving information, writing, and communicating with people around the world. They declare that the computer and the Internet only mean a paradigm shift for those who have experienced the change during their professional carrier, not for the students.

Ratti et al (2004) stress the fact that information is growing at an alarming rate as well as it exists in various formats and locations. In order to create and manage open, personal knowledge spaces they have identified that there is a need for a variety of tools to access and navigate the information. One solution present by Ratti et al (2004) involves an environment that allows the user to manage information collections and attach documents to them (nodes or islands of information) as well as share them. To gain access to this information in an ad hoc fashion they put forward P2P as the most appropriate

architecture, where nodes that hold resources in a distributed fashion can connect to other nodes to allow access to their own resources and seek information from others. An important question identified when implementing P2P architectures is how to harness copyright violations to ensure proper use and to ensure that privacy and access is properly managed. (Ratti et al, 2004) This has become even more important over the years as P2P networks have attracted a lot of criticism and mistrust due copyright violations and thus a consequent reluctance of the commercial and educational world to work with them.

Popova & Popov (2004) focus their research on how to make the transition from hands-on experience to eLearning. Their focus stems from the fact that the demand for online courses is growing as remote learning is extending, and even slowly substituting traditional learning methods. The objective for higher education to embrace this trend is at least twofold: the aim to provide more flexible learning methods for the learners, and the ability to reach a larger audience. The key issue is how to make the experiential part of learning equivalent in the mediated environment. Though they present solutions to make this transition, and the benefits of cooperation and collaboration, the focus is still on a teacher-learner environment, where teachers asses the learners in order to provide them with a formal accreditation.

Holtham & Courtney (2005) describe different modes of curriculum design and learning delivery at various universities around Europe and Australia. Their findings show that a mixed learning delivery with both technology enhanced settings, e.g. ICT-mediated learning, and traditional attendance-learning settings is frequently used; all focussing on an increased customisation. Furthermore they show that each institution's educational innovations enable them to pursue their institutions pedagogic policy, e.g. case-based, problem-based, project-based, or practice-based learning policy. Thus it is plausible to argue that developments driven by the learning institutions fulfil their needs and aims primarily from a teaching point of view, and only secondly from a learning point of view. However, it is fair to say that the policies mentioned are very much focussing on the learner, and the learning settings.

Tembe (2003) puts forward the benefits of eLearning being the combination of different media types, which stimulates the whole brain and is preferred over plain text books. Furthermore, eLearning makes learning more effective. But, she also asks herself whether we are aware of the different characteristics of each media type combined? And, whether we are able to utilise these characteristics in the learning situation? Rhetorically one can ask whether the possibility to create technology or media-enhanced learning really is a question of what new technology or new media can offer, or whether it is

a question of better learning how to utilise the separate old media types comprising eLearning?

Tembe (2003) also states that to better maximise the use of new media technology in learning, to move beyond our old pre-conceptions and experiences with regards to media and technology, it is essential that we look upon, and reflect on, the mere expression of matters and what learning opportunities they can offer.

Hernwall (2003) argues that when using media (or technological artefacts) the human conditions, both perceived and real, transcend into what technology renders possible. The constructive and intentional human being develops his or her abilities and competencies in harmony with his or her immediate culture and surroundings. Furthermore, he states that technology is not hindering us as humans, but rather the human conditions become different through the use of the various tools we have created. With the new, digital technology it is possible for every user to become a producer, for every recipient to become a sender, for every sender to copy and store material with maintained quality, just as if it was the original.

Johansson (2003) stresses that the conditions for socialisation and learning change with the introduction of new media technology. Learning and education can also be affected as students and teachers become dependent on the technology.

4 Setting the stage – some concepts in learning and mediation

This chapter will introduce some pedagogic ideas related to dialogue, and present media enhanced dialogue through the use of dialogue sheets. Furthermore, it presents a theoretical model of mediating artefacts. This chapter will also exemplify communication media by telephony, and introduce the use of new digital communication media in peer communication.

In Paper I the concepts of dialogue and reflection are introduced. Communication is the ground for dialogue, and one basis for the dialogue within. The dialogue within is often referred to as reflection. In Paper II, communication is in focus when investigating the new 3G mobile telephony as well as the dilemma of what comes first, content or users. In Paper III peer communication is introduced in the context of peer and P2P learning. Dialogue is the ground for peer communication, while P2P is a tautology that is accepted as a term in digital communication. This chapter discusses dialogue, a theoretical model of mediating artefacts, communication technologies, and peer communication technologies (especially P2P).

4.1 Dialogue and learning

Dialogue comes from the Greek words *dia* (through) and *logos* (word). According to Drugge & Hansson (2000) the term dialogue is positive, meaning that free and independent people openly present thoughts and opinions. Dialogue is one of the keystones in the development of philosophical and ethical thinking, which can be traced back to Socrates and Plato, according to whom dialogue is the very means by which knowledge develops; the free-flowing of meaning through a group allowing them to discover insights not attainable individually. (Göranzon & Florin, 1991; Senge, 1990) Janik (1991) argues that dialogue has re-emerged through an effort to set new technology, especially information technology, into some sort of proper perspective. This is surprising, he continues, "for the earlier philosophy of dialogue was principally religious in orientation and highly sceptical, when not outright hostile, to science and technology" (p 13). This is also supported by Senge (1990), who say that the practice of dialogue has been preserved in many primitive cultures, but almost completely lost to modern society. The re-

emergence and re-discovery of dialogue in modern society is focussed on putting dialogue into a contemporary context.

Dialogue is the medium of transformation. In dialogue differences can appear and be played off against one another, both within the individual and between people. Inner reflection, a 'dialogue with things' is essential for knowledge. Only those who reflect on their experiences develop competence. An unreflecting, habitual action does not transcend or transform what have once been learned. Knowledge grows through a rhythmic exchange between participation and distance, between action and reflection. (Florin et al, 1991) Also Söderlund (2000) states an important aspect of learning is reflection. Both the internal, personal reflection and the reflection made together with other learners. Learning can be looked upon as a meaningful change process (transformation process) in which the learner's understandings and interpretations of the surrounding world is altered, and in which the learner's competence and readiness for unexpected events in the surrounding world is increased.

Generally dialogue appears as a condition for learning that means a development above and beyond normal or tradition. Dialogue is essential for learning with an ambition to form a practical theory that can be used for developing groups and organisations, thus it is important for collective learning. (Drugge & Hansson, 2000) In fact Senge (1990) argues that team learning *starts* with dialogue, and involves learning how to recognise undermining patterns of interaction in order to have them surfaced and used positively to accelerate learning. Other important components in a learning dialogue are honesty, openness, respect and stability. Yet other indicators are that everyone have the time to listen, dares to ask questions, exceeds boundaries, mediates experiences, obtains insight, admits failures, and reflects. (Drugge & Hansson, 2000) In part the essence of dialogue is captured by Sällström (1991, p 28) when he says that "In dialogue, language is not used to lay down truths, but to guide one towards a better understanding."

Senge (1990) argues that Heisenberg's conversations with Pauli, Einstein, Bohr, and other important figures of modern physics, "illustrate the staggering potential of collaborative learning – that collectively, we can be more insightful, more intelligent than we can possibly be individually. The IQ of the team can, potentially, be much greater than the IQ of the individuals" (p 239)

Dialogue pedagogy, contrary to mediating pedagogy, involves a form of teaching that implies individual adaptation. Drugge & Hansson (2000) raise the distinction between communication and dialogue on a *content level* and communication on a *meta-level.* On the content level dialogue creates an understanding of the verbal message, based on semantic laws. On the meta-level the

message is equal to the senders intentions, mainly mediated through non-verbal communication, outside traditional logic.

It is a misconception to believe that inner thoughts and values are affected by information, instructions, rules or even orders. Drugge & Hansson (2000) argue that media overflow hardly creates dialogue. Rather it creates a problem of selection for information-fatigued citizens. Furthermore they believe that individuals should be handed tools to acquire the insight of what is important to learn.

Pihlajamäki (in Drugge & Hansson, 2000, p 180) says: "In the massive information flow that will come over us, the listener must take the initiative and become the one who is active, critical and knows how to set boundaries." Drugge & Hansson (2000) argue that man can live isolated for a long time, but foremost she is a social being with needs to exchange ideas and emotions with others. Linguistic or verbal communication is a powerful means to coordinate people in structured activities and settings, such as family, sports teams, orchestras or work teams. Dialogue is an essential, yet insufficient, component for learning through concrete experience. A good dialogue is the basis for fruitful teamwork. Dialogue, thus, is the hub around which human social support and needs are revolving.

4.2 The tetrad model

In "The Global Village", McLuhan & Powers (1989) present a model, originating from their discussions in the late 1970s, which tries to explain and criticise technological and societal development.[1] They state that simultaneous interplay cannot be reduced to linear, or sequential, representation in much the same way a synchronic chord of music cannot be experienced as a diachronic tune.

The model comprise four phases, or states, all together manifesting the cultural life of an artefact in advance by showing how a total saturated use would produce a reversal of the original intent. To represent mental attention and inattention McLuhan & Powers (1989) introduce ground and figure, where ground represents inattention and figure attention. The full maturity of the Tetrad reveals the metaphoric structure of the artefact as having two

[1] It is important to bear in mind that McLuhan & Powers (1989) based their model on the technology and society of the late 1970s, thus their focus were on the computer rather than on IT (or ICT) as a whole. IT in its turn holds the notion of video-related technologies, which was another focus of McLuhan & Powers. Since Marshal McLuhan died in 1980, this could be regarded as his last actual contribution to the media debate, nine years after his death.

figures and two grounds (Figure 4, below), i.e. two states of attention and two states of inattention. These are dynamically and analogically related to each other. Furthermore, the *figure* can *represent* the *present*, and the *ground* can *represent* both the *past and* the *future*. This allows us, through comprehensive awareness, to see the past, the present, and the future at the same time. This is actually one of the main strengths with the model; it enables us to recognise the four-fold process pattern of transformation before it is completed. It also enables us to predict and, if desired, prevent the future.

According to McLuhan & Powers (1989) every human artefact is a medium of communication, whose message may be said to be the totality of the satisfactions and dissatisfactions it engenders. This reveals, "at the speed of light" (p 8), simultaneous process patterns. But, to arrive at the process pattern that represents the cultural developments described, it is necessary to pose four questions:

1. What does the artefact enlarge or enhance?
2. What does it erode or obsolesce?
3. What does it retrieve that earlier had been obsolesced?
4. What does it reverse or flip into when pushed to the limits of its potential (chiasmus)?

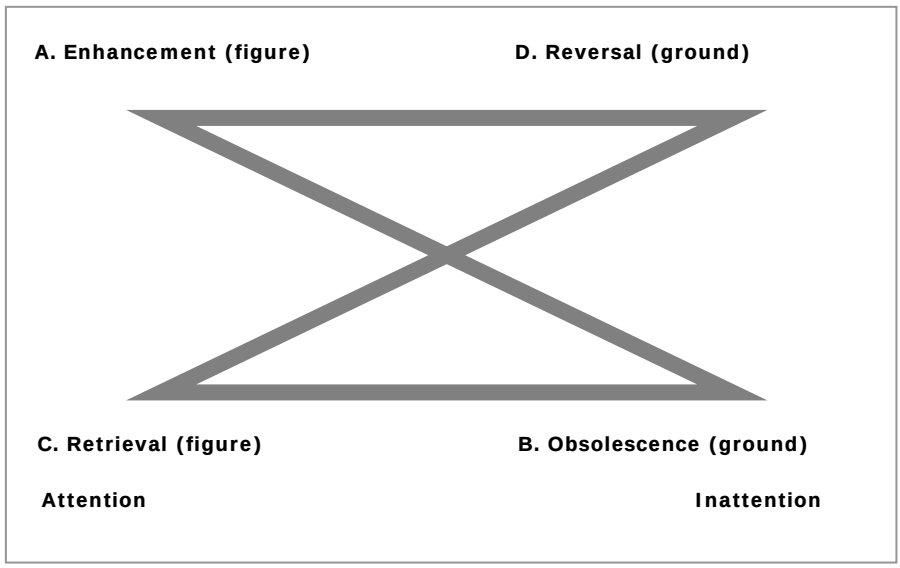

Figure 4. The tetrad model, adapted from McLuhan & Powers (1989)

The Tetrad model can then be argued to amplify the potential equilibrium of the relations being explored; it obsolesces simile, metonymy, and connected logic; it retrieves understanding, or meaning, by virtue of replay in another mode; and it reverses into allegory or parallelism. Concluding, the four states of the model (as illustrated in Figure 4 above) are:

A) Enhancement

B) Obsolescence

C) Retrieval

D) Reversal

Visual space is a side effect of the uniform, continuous, and fragmented character of the phonetic alphabet. (McLuhan & Powers, 1989) Cash money and the compass, which were leading technologies in the 15th century, illustrate an early transformation of visual space archetypes to the acoustic, from the tangible to the intangible, from hardware dominance to software dominance – analogous to the present role of ICT or IT. McLuhan & Powers (1989) saw the shift from visual space to acoustic space technologies in society as an accelerating phenomenon.

Examples of how the tetrad model is used are illustrated in Table 2 below:

Table 2. Examples of artefacts described using the Tetrad Model (McLuhan & Powers, 1989)

The phenomenon (human artefact)	A. increases or enables	B. obsolesces	C. retrieves	D. reverses into
Cash money	speeds transactions	obsolesces *barter*	retrieves conspicuous – bragging, luxury – consumption	and reverses into ***credit*** or non-money
Credit	enhances inflation, through indebtedness	obsolesces sole ownership, encourages rent-all	retrieves cashless society, brings back *barter* and do-it-yourself	and, finally, flips into bankruptcy

What the examples above tell us is that **cash money** has moved *barter* from attention into inattention, and reversed into **credit,** which in its turn has pushed *barter* back into attention, and reversed into financial problems.

This approach to human artefacts – as parts of society, in contrast to merely being tools, or physical representations of the human intellect – is also

found in the 'Media equation' by Reeves & Nass (1996). They state that media is, generally, firstly considered as a tool for man, pieces of hardware, and not 'dramatis personae' in social life.

Like all other tools, the apparent is that media support people accomplishing tasks (enhancement or enlargement), retrieving new information, or entertaining themselves. People do not have social relationships with tools. This is an explanation why it is hard to look upon tools as possible allegories, or threats, to society. Furthermore, this view of media as a tool is wrong, and that people treat computers and new media like real people. (Reeves & Nass, 1996) Bolter and Gromala (1999) also support this view. They maintain that we do not operate computers (i.e. we do not use them as tools or machines), we interact with them. More so, they in fact state that digital artefacts are *designed to be experienced*, not simply used.

4.3 Dialogue sheets

In order to develop activities that are effective, both work wise and financially, more and more focus is today put the personal development, well-being and balance in life of those who participate in the activities. The open dialogue offers itself as a tool and methodology where this can be focussed. To enable an open and non-ambiguous dialogue there are some principles for what the dialogue should be all about: (Trollestad, Larsson & Schou, 2000)

- To listen more than to speak
- To formulate one's personal ideas and meanings in a clear way
- To explore and invite
- To try to understand and to put oneself in other's understanding
- To be present

The dialogue also allows for the individual learner to express doubts, search for more information, oppose or approve, but also to change their opinion without loosing face. New understanding is achieved by individual conquests, rather than having pre-formulated opinions stuffed down their throats or sprinkled over them as broadcast messages in an auditorium. (Trollestad, Larsson & Schou, 2000)

A dialogue sheet can be considered as a pedagogical tool for reflection on a subject. Generally the creation of a dialogue sheet is an iterative process where a reference group tests the proposed sheet before final completion. (Trollestad, Larsson & Schou, 2000) The dialogue sheet is a method in which a group engages in dialogue over some questions on a specific subject. Each group member around the dialogue sheet takes ownership over the question(s) closest to him or her. He or she also functions as a "moderator" during the dialogue to assist everyone in following the principles stated above. Holtham & Courtney (2005) describe the dialogue sheet as "[…] poster-sized to allow use by teams or individuals. They resemble a board game and deploy [a number of] questions around the perimeter to prompt reflection and the recording of understanding achieved." See also Figure 55 below.

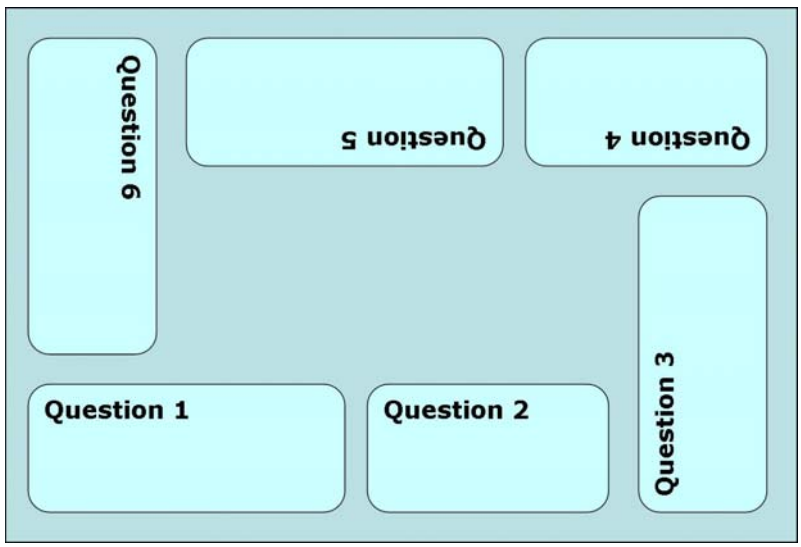

Figure 5. Schematic illustration of the dialogue sheet. The center area can either be used for general descriptive texts or as a "free area" where general or specific notes can be taken.

The dialogue sheet described here should not be mixed up with other notions of "the dialogue sheet", e.g. U.N. (2006), and Danielsson (2006), where the dialogue sheet is synonym with a questionnaire with open ended questions, either to be filled in individually or in pairs.

4.4 Communication media

Communication is, as mentioned earlier, the ground for dialogue. Various communication solutions can be utilised to mediate the dialogue, as well as to mediate learning. In this section, telephone systems as communication media are introduced. Telephone systems have over time been driving forces in the development of communication in various contexts, and are important as a point of reference when looking at learning media.

The telephone

The telephone was invented by Alexander Graham Bell in 1876, by accident one could say. On 10 March that year, professor Bell had spattered his trousers with acid, and his assistant, Mr. Watson, heard his cry for help over Bell's experimental audio-telegraph. Bell's original notion for the telephone, an idea promoted for a couple of years, was that it would become a mass medium. This notion, put into practice in late 19th century in Hungary, might be considered as a spiritual ancestor of the modern telephone-accessed computer data services, such as CompuServe. The principle behind the Hungarian utilisation of the early telephone is not too far from computer "bulletin-board systems" or BBS's, arriving in the late 1970's. Eventually the telephone became a machine through which people could interact with other people. (Sterling, 1992)

The telephone came to Sweden already in 1877 and quickly became widely spread. Lars Magnus Ericsson (the original founder of the Ericsson Company) began producing telephones and telephone switches. Several private initiatives were started to build telephone networks and to drive customers. In the early 20th century these small and independent networks were bought by the government to form a unified, national telephone network. Between 1924 and 1972 all stations were automated utilising mechanical switches, which later on during the 20th century all were replaced with computer based switches. (Tekniska Muséet, 2006:a)

During the 1980's the break-through came for mobile telephony (or cellular telephony). Before then, virtually nobody really believed that the technology would ever be of any importance at all, but mobile phones have since the 1980's spread all around the world. (Tekniska Muséet, 2006:b)

Mobile telephony

Looking back on the history of mobile phones we find that speaking on the phone (i.e. exchanging information), independently of time and place, was a

dream, among others manifested by articles like 'Hello! We will come by car and will be there in 15 minutes…' presented in 'Vetenskapen och Livet' (Science and Life) in 1920. (Tekniska Muséet, 2001:a)

In the 1920's police cars in Chicago were directed via radio communication. These 'radio cars' were first used in Sweden in Gothenburg in 1935. In 1946 the American Telephone and Telegraph Company (AT&T) was permitted to build and maintain the world's first mobile phone network in St. Louis, and by the end of the 1940's there were a few thousand subscribers in 25 cities in the U.S.A. The Bell Labs invention of the transistor in 1947 would have great importance for the evolution of the mobile phone 20 years later. (Tekniska Muséet, 2001:a)

Given the limited ranges of the early MTA (Mobile Telephone System A) and MTB (Mobile Telephone System B) car phone systems a proposal for a national system was worked out between 1964 and 1967. The resulting proposal constituted important groundwork for the future NMT (Nordic Mobile Telephony) system. The NMT system became reality in 1981 as a result of collaboration between the Nordic countries, which began in 1969. In 1982, 70% of all mobile phones sold in the world were sold in the Nordic countries. (Tekniska Muséet, 2001:a)

Ericsson became an important player on the telephone market, and by 1988 they had a 35% market share in America. Also the spreading of the NMT system in Europe paved the way for a more widespread collaboration in Europe, and in 1982 the Groupe Spéciale Mobile (GSM) was formed in Vienna. Based on an evaluation in Paris in 1986 a decision was made to go for the Nordic countries' solution as a European standard, and from 1988 the abbreviation GSM would stand for Global System for Mobile Communication. (Tekniska Muséet, 2001:a)

The number of mobile phone subscriptions in 2004 (see Table 3) exceed the number of inhabitants in Sweden (totalling just over 9 millions at the end of 2004, and just over 7.3 million aged 16 yrs or older; SCB, 2006:a), and since not everyone can get a subscription (due to being under age, or having record for non-payment of debt), it is obvious that many people have more than one mobile phone subscription. One explanation is the generous offers by the network providers; "giving" away the mobile phone in exchange for commitment to that network provider for 12 to 24 months, thus some 'buy' more than one phone and subscription. Another explanation is that many companies provide their employees with a mobile phone and a subscription while as they keep their private subscriptions. According to SCB (2006:a) the mobile phone penetration in Sweden was 96%; or app. 6.25 million between the ages of 16 and 74 years had a mobile phone at the end of 2005.

Table 3. Number of mobile phone subscribers in Sweden 1956 to 2004. (Tekniska Muséet, 2001:b; SIKA, 2005)

Year	Number of subscribers in Sweden	Forecasts for number of subscribers (made in year)
1956	26	
1960	137	
1964	125	
1968	257	
1972	1,126	
1976	9,788	
1980	20,327	
1984	57,695	
1988	228,700	
1992	642,000	45,000 (1981)
1994*	423,000*	25,000 (1990)*
1996	2,492,000	
2000	6,340,000	
2004	9,775,000**	

**** = Only GSM subscribers; ** = subscriptions data from SIKA (2005), whereof 322,000 3G subscriptions.***

In 1997 several mobile telephone system manufacturers joined forces to develop an open, wireless communications standard for the third generation networks, known as 3G. The third generation mobile communication systems allow mobile Internet, multimedia, video, and other applications that require a large capacity, to be incorporated into the mobile phones. The same year the mobile phone really became an everyday possession, a tool for keeping in touch with colleagues, business contacts, friends, family, etc. Mothers in the park and kids on the playground and in schools started to use mobile phones. In 2000, 80% of young people in Sweden, aged 15-24 yrs, had their own mobile phone, and the share in other countries is increasing rapidly. To young

people mobile phones are not just a tool for communication; it is a part of their identity, perhaps to such an extent that their mobile phone number is more important than their social security number. (Tekniska Muséet, 2001:a)

With the third generation of mobile communication systems a new problem occurs – the content dilemma – which is somewhat like the question of "what comes first, the hen or the egg". Given the large number of mobile phone subscribers (see Table 3 on page 29) it would have been natural to ask the subscribers what content[2] they desire, and to investigate together with them how they use their mobile phones, but the whole content issue is mostly argued between content providers and network operators (see further in Paper II).

"New" telephone technologies

Voice over Internet Protocol (VoIP), is one of the "new" telephone technologies. VoIP, or IP-telephony, allows you to make telephone calls using a broadband Internet connection instead of a regular (or analog) phone line. Some services using VoIP may only allow calling other people using the same service, while others may allow calling anyone who has a telephone number – including local, long distance, mobile, and international numbers. Also, while some services only work over a computer or a special VoIP phone, other services allow the use of a traditional phone through an adaptor. (FCC, 2006)

Skype is an example of a VoIP service that originally only worked over a computer. Skype is mainly a software program for making calls over the Internet to anyone else who also has the Skype software installed, and it works with most computers. On its web site the company Skype (2006) claims that "The calls have excellent sound quality and are highly secure with end-to-end encryption. You don't even need to configure your firewall or router or any other networking gear. It just, you know… works." This is of course excellent, but only if you only want to make calls using your computer. However, new services have been released allowing calls to landlines, as well as being called from landlines.

4G stands for the fourth generation of mobile telephony. Rouffet et al (2005) present the different drivers for the second (2G), third (3G) and fourth generation (4G). In 2G voice was the driver, while video and TV are the drivers of 3G. In 4G high data-speeds will be the driver, together with service and application ubiquity, and a high degree of personalisation and synchronisation between various user appliances.

[2] Here content is used in a broad sense, also including functionality.

Today data rates of up to 100 Mbps (mega-bits per second) are the goals for 4G with three separate development paths "competing" on the road to getting there. One is 3G-centric, in which 3G is pushed to its limits before a new technological solution is implemented. Another is based on radio LAN, and the third is comprised by a development of IEEE standards 802.16e and 802.20. (Rouffet et al, 2005)

4.5 Digital technology – ICT

Digital technology, i.e. information and communication technologies, is widely used as an enabler for enhancing the learning experience. In order to better present the connection between learning and some of the forms of mediated learning presented in this thesis, some technological innovations and solutions are presented in this section.

The computer and the Internet

In 1949 there were three or four computers in the world, depending on what definition of a computer is used. The names of the computers sounded like villains in a comic book: ENIAC, EDSAC, BINAC. All computers were used almost exclusively to do complex calculations for military and civilian scientists and engineers. Howard Aiken, a pioneer in computers, said that the world would only ever need five or six computers like ENIAC. (Bolter & Gromala, 2003)

In 1954 the US economy is spending, annually, $10 million on computer hardware. The machines are now used also for large-scale bureaucratic tabulations and business data processing. (Bolter & Gromala, 2003)

In 1962 there are 10,959 computers in the world according to James W. Cortada (in Bolter & Gromala, 2003). The following decade allowed some lucky programmers at MIT (Massachusetts Institute of Technology) and elsewhere to input programmes "interactively" on the first time-shared computer. (Bolter & Gromala, 2003)

On 29 October 1969, the Internet came to life when it uttered its first word "Lo". The Internet was originally known as the ARPANET (Advanced Research Projects Agency wide-area NETwork, sorting under the Defence Department in the U.S.A.). (Kleinrock, 2004)

In 1979 the number of PCs in the U.S.A. alone, exceeds 500,000; two college dropouts are building and marketing a microcomputer they call the Apple; the networking of universities and corporate research centres utilising the ARPANET continues. College students at two US universities are devising

a protocol called Usenet to allow people to subscribe and contribute messages to newsgroups. (Bolter & Gromala, 2003)

In 1989 there are almost 14 million computers in American homes. Now eight years old the IBM PC has established the word processor and the spreadsheet as indispensable business tools. For millions of business users, the computer is unquestionably a medium for words and numbers. (Bolter & Gromala, 2003)

In 1993 Microsoft, with its Windows operating system, ensures the success of the graphical interface that Xerox and Apple pioneered. The World Wide Web becomes a medium of visual design that will soon rival magazines and books. (Bolter & Gromala, 2003)

The use and implementation of computers and access to the Internet from home has developed rapidly over the years. In 2005, Sweden was second to Iceland in a European comparison on the use of the Internet. (SCB, 2006:b) 40% use broadband connections (i.e. ADSL – Asymmetric Digital Subscriber Line, SDSL – Symmetric Digital Subscriber Line, Cable, LAN – Local Area Network, or 3G – third generation mobile telephone system, also known as UMTS – Universal Mobile Telecommunications System). The most common place to use a computer (and to access the Internet) is at home; in school more women than men use computers. The total number of people aged 16 to 74 years with home computers and home Internet access in Sweden between 2003 and 2005 is shown in Table 4 below.

Table 4. Home PCs and Home Internet Access in Sweden 2003-2005 (SCB, 2006)

Year	Number of home-PCs in the ages 16-74 yrs	% of population	Number with Internet Accesses at home in the ages 16-74 yrs	% of population
2003	5.126.447	80	4.658.967	73
2004	5.469.354	84	5.087.188	79
2005	5.469.003	84	5.077.025	78

Neither the telephone nor the telegraph can simultaneously reach a large number of people, the postal system charges a fee for mass mailings, the newspaper reaches many but has cost associated with it, the printing press is expensive, television reaches practically all but is still a one-way broadcast medium. The Internet, however, removes these impediments to reaching millions of users. (Kleinrock, 2004)

Peer communication solutions

There are many forms of peer communication solutions. Many are using a client-server system set-up, where a central server handles all the logic (all the "calculations"). Today the most popular implementation of peer communication is P2P, which is often associated with file sharing. However, P2P is also used for peer-to-peer conversations, and one of the earliest implementations of such a conversation system is the IRC or Internet Relay Chat. Engen (2000) expresses it as follows: "In the beginning there was IRC. Only IRC. One network, that's it. […] IRC-operators had a lot of powers [sic!], and things were small enough that one could semi-know things about channel ownership."

In fact IRC to a large extent grew up alongside the World Wide Web, though there are examples of earlier set-ups of IRC networks, e.g. in Oulu in Finland in 1988 where an early version of an IRC, the 'OuluBox' (a Public Access BBS) with 'rmsg' (a person-to-person communication program, implemented by Jyrki Kuoppala at the Helsinki University of Technology) was created (Oikarinen, 2000). Jarkko Oikarinen is considered the father of the original IRC-software, the 'IRC', which was preceded by the 'MUT' (Multi-User Talk, a program written by Jukka Pihl at the University of Oulu) combined with OuluBox. The IRC was soon to become a pure chat program, without any BBS functionality, and was well spread in Finland. The first real IRC server (which is still running) was tolsun.oulu.fi.

As personal computers became more widely used the interest of connecting them to each other increased. Initially computers were connected together through LANs (local area networks) to central servers, as these central servers were much more powerful than the individual computers. Any large data processing took place on these servers. Since then, computers have become much more powerful, and they are now able to handle data processing locally rather than depending on central servers to do it. This is the reason why computer-to-computer collaboration or peer-to-peer (P2P) computing is feasible when individual computers bypass central servers to connect directly with each other. (Farago-Walker, 2003) P2P networks are characterized by direct access between peer computers, rather than through a centralised server. P2P as an expression generally refers to applications that take advantage of resources (storage, cycles, content, human presence) available at the edges of the Internet. (Blomqvist et al, 2005)

Farago-Walker (2003) describes three distinct P2P computing models: 1. Multiple peer relationships; 2. Distributed peer relationships; and 3. Collaborative peer relationships. (see Figures 6-9 below)

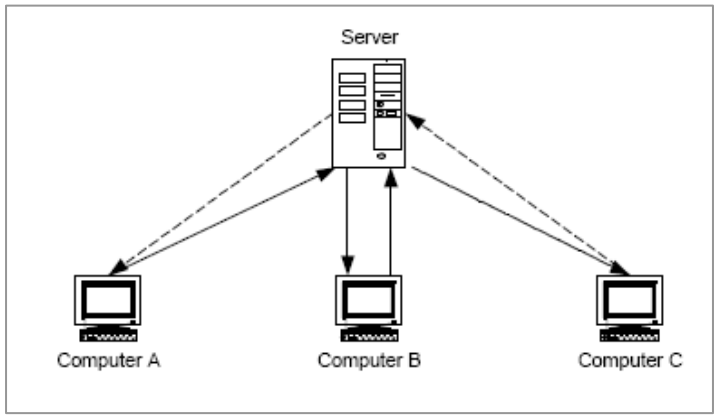

Figure 6. Multiple peer relationships, example: Napster (Farago-Walker, 2003)

In multiple peer relationships computers are connected to each other through servers. Files can be shared and collected from anyone else on that same network, but one key problem is that this can lead to major breeches in security and also cause intellectual property problems. (Farago-Walker, 2003) Examples of services structured as multiple peer relationship are Napster and KaZaA.

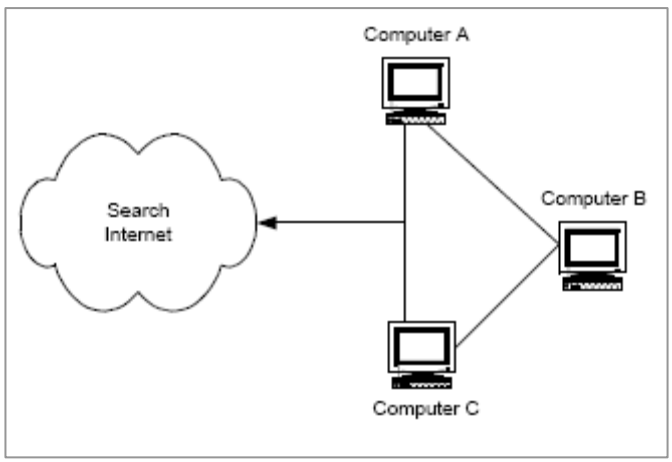

Figure 7. Distributed peer relationship, example: Infrasearch (Farago-Walker, 2003)

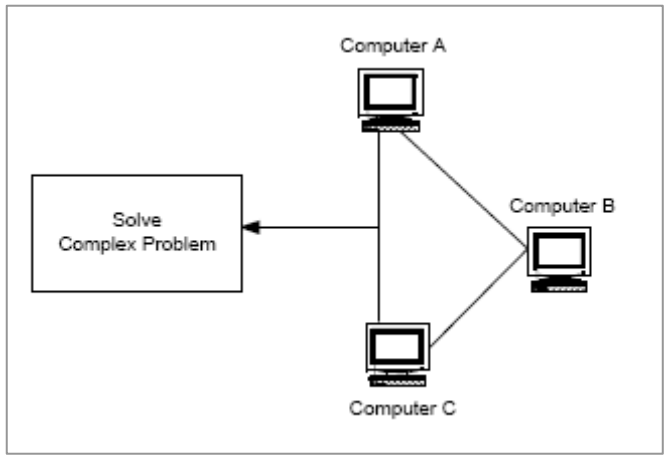

Figure 8. Distributed peer relationship, example: Entropia (Farago-Walker, 2003)

In a distributed peer relationship a group of computers are connected together to combine their computing and processing abilities to search the Internet or to solve very complex problems requiring massive process capacity. (Farago-Walker, 2003) Examples of services structured as distributed peer relationship are Infrasearch and Entropia.

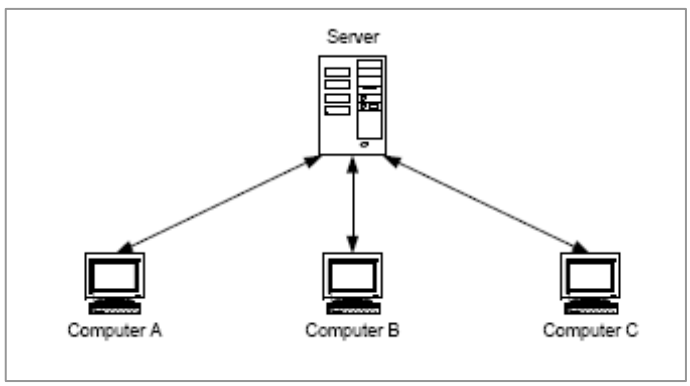

Figure 9. Collaborative peer relationship, example: P2P learning (Farago-Walker, 2003)

A collaborative peer relationship is based on a small group of people agreeing to collaborate through a common interface, such as on-line gaming, chat rooms, instant messaging, or an e-learning environment. (Farago-Walker,

2003) Examples of services based on collaborative peer relationship are Jeopardy (by Sony), Chat Here, and HorizonLive.

Focussing on the distributed peer relationship, Blomqvist et al (2005) state that P2P comprise structured overlays that allow applications to locate any object (content) in a small number of network hops. Also, these systems can be scalable, fault-tolerant, and provide effective load-balancing, but they are not "secure" in the sense that they can withstand an adversary. A comparison between P2P and client-server based systems is presented in Table 5 below.

Table 5. A comparison of P2P and client-server based systems, adapted from Blomqvist et al (2005)

	Client-server		**Peer-to-peer**
	Session-based	***Web based***	
Connection between "peers"	Tight	Loose	Very loose
Communication characteristics	Asymmetric	Asymmetric	Symmetric
Number of clients	Moderate (thousands)	High (millions)	High (millions)
Number of servers	Few (tens)	Many (hundreds of thousands)	None (zero)

Closely related to IRC and P2P-based chats (e.g. instant messaging) is the web chat. When talking about web chats one generally separates them into chat rooms and discussion forums, where the latter are typically single-topical exercising one-to-many communication through a web-site interface, and where the former are enabling both one-to-many and one-to-one conversations. Also, chat rooms can sometimes be moderated. Discussion forums differ from mailing lists by requiring the subscriber to actively go to a web site, whereas mailing lists automatically deliver new messages to the subscriber.

5 Summary of included papers

In this chapter the major results and findings of the included papers are summarised.

5.1 Paper I: New Methods for Focussing on Students' Learning Process and Reflection in Higher Education

This paper focuses on students' lack of ability to reflect on their learning. The lack of proper tools and methods for reflective thinking is put forwards as part of the reason together with the educational system itself, as well as the learning institutions.

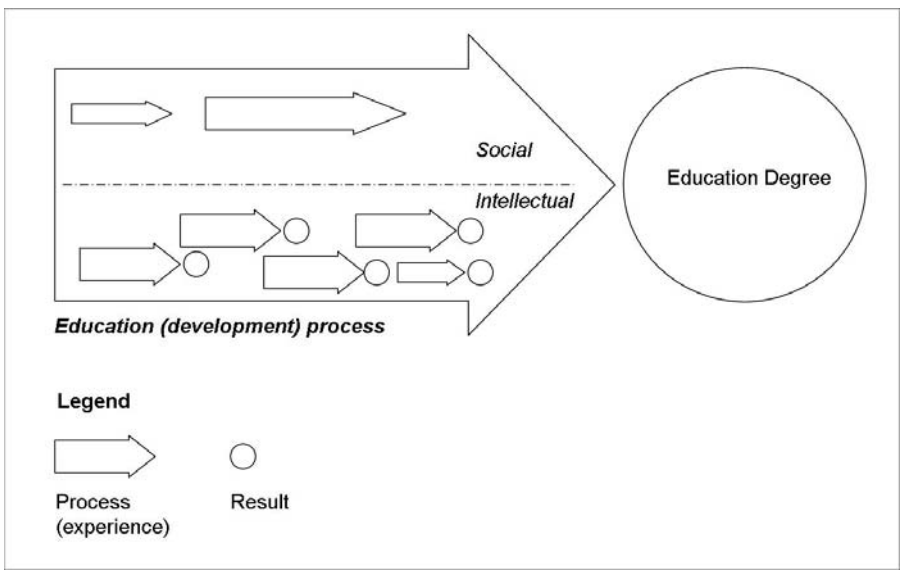

Figure 10. The University learning process – processes leads to results e.g. passed courses. Informal and formal processes give experiences.

In Figure 10 above, which is also found in Paper I on page 74, the learners' social and intellectual development in higher education are illustrated. Both sides, i.e. both the formal and informal learning form part of the

learners' degree. However, only the intellectual development is assessed, hence the rings in the figure. In fact the degree is often seen upon as the sum of all results (all rings), while the processes tend to be missed or even neglected.

Teaching normally takes place during classes, whereas learning is either synchronous or asynchronous to teaching. Learning can also be an outcome of facilitation (i.e. methods or tools provided for the students learning) or of students' own initiative (i.e. peer learning). This stresses the need for activities around community building, together with the creation of suitable learning spaces, as well as proper tools and methods. Students need to be able to better handle various kinds of information, and information sources. Knowledge of how to produce information for different kinds of target groups, and subject areas, can contribute to a better awareness of information handling and retrieval. Hence, the students need to fill their responsibility gap illustrated in Figure 11 below (also found in Paper I on page 75). The learner's ability to take responsibility for their own learning is supposed to increase during their formal training from pre-school to the time they come to the university, but generally, the increase has not been as strong as the universities expect it to have been.

The paper presents results of research and development of academic education, in the area of:

- Reflection as support to learning and self-coaching
- Reflection and documentation in portfolios as part of assessment by teachers
- Reflection and documentation of processes to support distance education
- Learning communities as support for fulfilling society's competence needs

However, the approach in the paper is directed towards the learners' attitudes towards higher education, and methods to help them improving these attitudes.

The paper presents the dialogue sheets as a method for creating good dialogue within a group of 4-6 people. The word dialogue is used to emphasise the intended conversation, rather than argumentations and debates. In a dialogue all ideas are listened to and respected. This is also the basis for team-work and for being a member of a learning community.

The dialogue sheet method utilises the benefits of the dialogue when there is a need to constructively discuss important matters, such as learning, a new organisation, human values, etc. It is also a base for learners formulating questions of their own, rather than just answering others' questions, as well as an enabler of critical thinking and reflection. One important effect is that **all** members participate in the conversation, everyone writes down important

issues, and they are all encouraged to write additional comments, questions and other related information on the sheet.

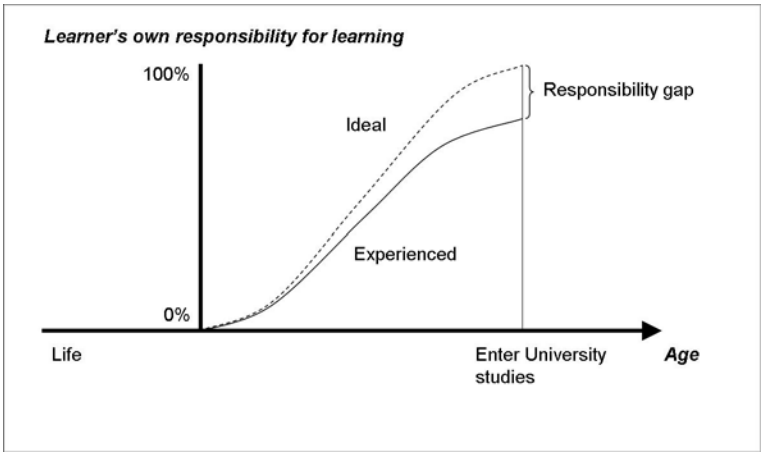

Figure 11. The responsibility gap

The paper also introduces conceptual modelling as a tool that can support student learning. The purpose of conceptual modelling is to help people disregard irrelevant structures by building relationships between idealised concepts that focus what is essential.

The research process was a mix between observing and participating in the sessions, and interviewing participants. Further, similar settings were used to pre-test the tools and methods, later on used with the students. And finally, questionnaires with open ended questions were used to learn what students thought of the tools and methods presented to them.

The study reveals that the view on learning and reflection presented to the students are not what they expect from a university, in a positive sense. The students are not used to the kinds of exercises that focus on reflection and the learning process. However, most students were eager to participate and complete the tasks ahead of them in the different sessions, which might be the result of students "doing what they are told". Their inclination to learn might also have been an important factor.

When working with the questions about thinking, learning and reflection presented to them on the dialogue sheets, many students were struck with an insight that it is important to stop and think about what they are doing; why they have chosen to study at the university; and that they will benefit from starting to reflect more on what they learn. When teachers tried the dialogue sheets for themselves, some found it strange to talk about how and why

students learn, instead of what, but then again some felt the opposite. The students found the dialogue sheet session useful for starting to find a balance between plain learning and reflection, i.e. for starting to reflect upon what and how they learn.

The study showed that actions cannot be singled out, thus it is important that the dialogue sheet method is not introduced solely, but rather as a part of a package of activities, using different tools and methods. Further, not all recipients will find this method useful or may not understand the meta-perspective on the activity. This stresses the importance of not taking a teacher-centric approach to these activities, but rather a learner-centric.

The social actions are depending on the forming of learning communities, which depend on trust between students, and for which the students' organisations and freshmen activities are important.

Introducing new methods for reflection and learning process focussing will help students find themselves in life, and why they have chosen to study at the university. The expected outcomes for the future are students being confident in their purpose of attending academic studies, and that dialogue sheets and other supportive activities are helping to pinpoint that purpose. Furthermore, there is an expectance that peer learning will increase, together with a general improvement of attitudes towards learning. The new methods and tools have helped students obtaining a greater self-awareness of what and how they learn, and shifting focus from examination to the learning process. In addition, the students have become more interested in sharing experiences from different learning situations, and more willing to learn from each other.

5.2 Paper II: Solving the 3G Content Dilemma as a Prerequisite for Traffic Generation

This paper studies the current relationships and attitudes between major players in 3G: network operators, content owners, and consumers. It also summarises the results of "role-play" tests for investigating opportunities for compromise in various delivery scenarios.

The paper starts by establishing that experience suggests that new "killer applications" will be:

1. hard to predict in advance, and
2. the result of interactions between consumers, available technology and available content.

Table 6. Summary of views in different important 3G-related questions

	Operators	Content owners	Consumers
What is the real opportunity?	We offer a new channel to the consumers, for which content owners should be willing to pay just for the opportunity to participate.	As a media company we do not need a new delivery channel as much as the operators need our publicly well-known content.	It does not matter what they offer if I cannot see how I can benefit from paying for it, unless it is free as on the Internet, but I can appreciate the value of higher transmission speeds.
How should the system work?	We need to keep consumers within our network in order to defend tariffs (e.g. SMS) and maximise revenue.	Consumer can do whatever they like as long as we do not face a new Napster problem where our content is not protected.	If it makes it easier for me to access the Internet and my e-mail, I am willing to "get on the bandwagon".
Who should do the billing?	It will be simpler and more beneficial for the consumers to get one bill for every-thing, thus everything should be billed by the operators	Operators could take care of the billing, but at the same time, there is a risk consumers perceive it as very expensive if everything is on the same bill.	I prefer one bill, but I only have a certain available wallet-size for entertainment, mobile phone calls etc. per month.

The paper presents the parties in 3G, stating that the operator has two main responsibilities: to build and maintain an infrastructure enabling mobile phone services, and to supply the infrastructure with services. Consumers, possibly the most important party in the 3G market, are by definition the potential users to most future 3G services. Content owners/providers constitute both producers of copyrighted material and mediators of such material. The consumers' access to familiar and recognisable content provided by the content owners is essential to generate traffic in the 3G networks. Traditional media companies are not dependent on the mobile media solutions, but are at the same time likely to become the largest providers of media content.

The paper identifies a serious gap of understanding between operators and content providers (see examples in Table 6, which can also be found in Paper II on page 94). Content owners prefer event-related solutions, while

operators prefer solutions related to quantity of data, which is possibly devastating to the transfer of certain types of media content.

The paper reveals that content owners demand an extensive application of DRM techniques, both for identification of usage as well as for controlling what consumers can and cannot do. Operators maintain that the important initial goal is to stimulate traffic, and to introduce DRM at a slower rate. If the parties fail to agree to implement DRM techniques according to the content owners' wishes, then they might be reluctant to participate in the networks and services of 3G telephony. There seem to be an apparent inability to distinguish between the controlling and monitoring functions of DRM systems. Should the aim be to allow consumers to experiment and develop services using DRM to track preferences, or should this be strictly limited from the start?

The study also shows that operators and content owners have very different views on "who is helping whom" in the development process, or rather "who is paying whom to participate". Content owners' standpoint is that the operators have the responsibility to pay for access to their content, while the operators believe that content owners ought to pay for access to the networks. Also there is a lack of common standards for delivering content packages to new mobile networks.

Consumers are impatient on knowing whether the new networks and terminals, and the services associated with them, can combine previously separated delivery channels, or if the content owners and operators primary goal is to make more money out of old media and existing services just by "re-purposing" the old material and content.

The study identified five main problems:

- Different payment models towards the consumers, users, are one problem
- The interest for implementing DRM systems differs between the parties.
- Both content owners and network operators argue that their contributions are undervalued
- Most content owners do not recognise the operators' positive attitude towards the development of 3G services
- The operators lack common standards, which hinders the development of well-used services

Broader bandwidth and better devices will enable the users to experience better outlets for their creativity, and to develop applications of their own. It could well be that future well-used services are the results of consumers' desires to satisfy needs yet unknown. The development of mobile networks has historically been technology oriented, which is comparable to a

Manufacture-active paradigm, but when involving the users early in the development process the business is moving towards a Consumer-active paradigm. User-innovators can also act as entrepreneurs, selling and spreading their ideas aside from the large enterprises, forming a Lead-user model for business development.

Competition will be based on the spectrum of delivered services rather than simply on pricing, and the most responsive and flexible operators and content owners will be the most profitable ones.

The study presents two main conclusions. The first is that advances offered by the next generation of mobile services will not be realised unless the differences between the parties can be resolved, reaching compromises and overcoming cooperation issues. Secondly, if the parties can solve the above problems, then there is a real potential for the mobile terminal to become an integrated entertainment device. What is certain is that all parties are facing a very uncertain future.

5.3 Paper III: From Peer Learning to P2P Learning – new life or obsolescence for the traditional learning institutions?

The paper states that the Internet has reached a high social acceptance (compare with Table 7 below, also in Paper III on page 105). 75% of US students use the Internet as a communication tool in group projects, and 29% report using instant messaging (IM) for this purpose. 60% of online teens in the US use IM when doing their home assignments.

The paper also shows that there is a growing interest for academic use of file sharing programmes, though statistics seem to be lacking. In the USA a project has been launched to facilitate legitimate file-sharing among individuals and educational institutions using P2P file sharing technology.

75% of American teenagers use IM. Internet users in college are twice as likely to use IM on any given day compared to the average internet user. In Sweden about 25% of all Internet users use some kind of instant-messaging service regularly.

Table 7. The five proofs of Internet's high potential to improve learning according to Weller (2002)

Social acceptance	Internet penetration in society is higher than most other learning technologies. It is a medium that people are familiar with, and use to manage every-day tasks. It is known that information on almost everything can be retrieved from the Internet.
Educator proximity	Internet is cheaper than other learning technologies. It enables closer relationship between the learner and the teacher, and it facilitates (teacher) control of the learning process.
Generic Interface	The Internet interface is familiar and similar for all web sites. Other technologies almost always have unique and different interfaces, hence learning the interface can become the actual task.
Interactivity and personalisation	Interactivity separates the Internet from most traditional media. Internet enables communication, as compared to other media's mere information delivery.
Sustaining and Disruptive technology	Internet is a disruptive technology as it is capable of altering organisations, completely transforming their nature and profile. As the Internet is not a short-term trend, it is also a sustaining technology.

84% of the American Internet users belong to some kind of online community; the main reason being communicating and retrieving specific information. In Sweden 71% of the teenagers are members of the most popular (Swedish) web community, Lunarstorm.

Nearly 80% of American college students state that the Internet has had a positive impact on their academic work, in fact 94% claim having used the Internet for school research, and 71% state having used it as a major source of information in their most recent school project.

IM, file sharing, and web communities are to a larger extent used by the younger high-school students (The survey revealed that IM is primarily used for chats and discussions on home and group assignments, but also for sharing files between each other. Moreover it is used for receiving information and tips on useful readings. File sharing is often used as a source for media content, as well as a source of inspiration when working on school projects in media courses, e.g. creating animations, and sound editing, but also for accessing recordings of lectures. Web communities are mostly referred to as the communities provided by the learning institutions, and are then principally used as common workspaces where files and such can be shared.

Table 8 below, which is correspondent to Table 2 in the paper on page 108), while mailing lists are more popular among university students. Moderate users of IM are to higher degree university students. Also, file sharing and mailing lists are to a larger extent used academically by university students.

The survey revealed that IM is primarily used for chats and discussions on home and group assignments, but also for sharing files between each other. Moreover it is used for receiving information and tips on useful readings. File sharing is often used as a source for media content, as well as a source of inspiration when working on school projects in media courses, e.g. creating animations, and sound editing, but also for accessing recordings of lectures. Web communities are mostly referred to as the communities provided by the learning institutions, and are then principally used as common workspaces where files and such can be shared.

Table 8. Some results on students' use of P2P and Internet technologies for leisure and academic work. (High school: n = 54; University: n = 350)

	Instant messaging		*File sharing*		*Web communities*		*Mailing lists*	
	High school	University	High school	University	High school	University	High school	University
A. More often than weekly	74%	61%	42%	25%	39%	13%	11%	14%
B. At least monthly	91%	81%	76%	56%	73%	36%	65%	70%
C. Thereof at least several times academically	51%	40%	7%	13%	14%	9%	18%	21%
D. At least monthly privately and at least on several occasions academically (all respondents)	46%	35%	5%	7%	10%	3%	12%	15%
E. Never academically (all respondents)	25%	49%	79%	80%	62%	86%	74%	60%

The difference between the two groups, with regards to the academic use of web communities, is significant, whilst being close to none for the academic use of IM, file sharing and mailing lists. High school students in the survey are

three times more likely to use web communities academically than university students. For private use the ratio is about the same. This can be explained by the fact that web communities are considered as a newer technological solution than e.g. mailing lists, but also by its varying definitions.

The technology most used for academic purposes is IM, with almost half of the high-school students and a little more than one out of three university students having used it several times in their schoolwork. File sharing, and mailing lists have never been used academically by almost two thirds or more of the respondents in the survey. The same goes for web communities, though universities provide infrastructure for such, where learners and teachers can interact and share knowledge. However, these solutions might not be considered as communities such as Wikiversity.

Table 9. Learning-related process patterns, based on the Tetrad Model by McLuhan & Powers (1989)

The phenomenon (human artefact)	A. increases or enables	B. obsolesces	C. retrieves	D. reverses into
Classroom teaching	the reach of teaching, or knowledge transfer	*apprenticeship, i.e. peer learning*	*university* or structured, and controlled, learning	academic society, when pushed to the limit
Academic Society	focussed technology R&D	trial-and-error	technology enhanced mass media, e.g. *WWW* and Internet	one-to-many, and many-to-many, or P2P, communication
Web-based learning	mass teaching	classroom teaching and possibly *university*	*knowledge brokers*, i.e. super (one-to-many) teachers	*ubiquitous learning*
P2P technology	*ubiquitous learning*	*knowledge brokers*	*apprenticeship, i.e. peer learning*	feudal society

In an attempt to look at the evolution of learning, from plain peer learning to digitally enhanced P2P learning, using the Tetrad model by McLuhan &

Powers (1989), the paper shows that the development is not moving in the direction possibly preferred by decision-makers. Consequences of human interaction with these artefacts can be much more dramatic than one would expect; a few process patterns are presented in Table 9 (also found in Paper III on page 111).

A prerequisite for using different Internet applications for academic work is the extent to what it is used privately, i.e. the level of social acceptance. Private use of a certain application or technology does not guarantee that it is used academically. E.g. file sharing is yet to be fully socially accepted. Partly this is due to the tainted reputation P2P has got as a result of the entertainment industry's rhetoric in media. Initially they argued that "P2P is illegal" – which is very far from the truth – and later that "all file sharing is illegal" – which also is not true as it is completely acceptable to share copyright protected material if all copyright holders consent, or if the material is free, i.e. no copyright protection or when creative common is used as a copyright scheme.

The introduction of P2P technologies in learning is changing the way learners share information. It also changes the way that learners collaborate, and how they learn. Learners do not have to be in a classroom to learn, which has lead to the shift of focus from the teacher to the learner. The learner retrieves, pulls, the information, and the teacher's information push is obsolesced. But, learning also involves trust, specifically trust for the other party, the information provider, and trust for the quality of the learning process. More so, learning involves being open to the ideas of others, and this openness also requires trust.

The study reveals that the Internet used as a learning medium in higher education is highly dependant on teachers' interest in the technology. The same goes for peer learning. It is the teachers' responsibility to help learners become more open to new ideas, to model the kinds of disclosure and risk-taking that are needed.

When comparing IM and file sharing, some new perspectives on technology enhanced learning emerge. Both technologies are used extensively in the private domain. Both technologies have several positive qualities, and are suitable to use as media for academic work. However, today the academic use is lagging behind the private use. 64% in the survey reported using IM academically as well as for leisure, compared to 35% for file sharing. This can be explained by the fact that IM is, to a larger extent than file sharing services, a communication medium. However, IM is also used more and more for file sharing. IM's reputation can degenerate if the latest file sharing trends become more widespread, resulting in actors such as Microsoft imposing their DRM solutions on the messaging services. Another conclusion is that a technology

needs to attain social acceptance to be used extensively and in various contexts. The somewhat older population investigated at the university do not use the latest technologies to the same extent as the high school students.

The development from peer learning to P2P learning is lined with artefacts being obsolesced and retrieved. P2P learning also involves an uncomfortable paradigm shift, with somewhat unpredictable outcomes. Furthermore, it involves a change in how people deal with knowledge and information.

The paper states that although P2P brings (tremendous) power to the user, creating a user-centric society, the risk of reversal into a feudal society can be supported by looking at the hierarchical structures that today's file-sharing services are creating.

Several of the human artefacts of today will reverse either into a desirable or a non-desirable state (phase). However, that reversal can be prevented if technology is embraced and used to its advantage. Today's learning institutions have the opportunity to prevent the forthcoming reversal by embracing it and carefully implementing it. Only then will it reach its full potential.

As closing conclusions the paper states that universities and high schools embracing the new technologies will have advantages such as: highly engaged and networking students, more widely spread knowledge (information), better competitiveness, increased accessibility and availability, and an increased take up area with the use of distance-spanning technologies. Some of the disadvantages put forward in the paper are: teachers relying too much on technology – diminishing their own importance in the learning process; even less contact between students, teachers and professors; learning outcome more and more uncontrollable; malfunctioning technology creates dissatisfaction and bad will; less knowledgeable students – copying becomes widespread; and lost cultural and traditional values of education.

6 Discussion and conclusions

Looking at the telecom business, especially the 3G business described in Paper II, experience suggests that new "killer applications" will be hard to predict in advance, as well as the result of interaction between consumers, available technology and available content. Now, can this insight be translated (transformed) into learning in higher education?

> New "killer applications" in learning will be hard to predict in advance, as well as the result of interaction between learners, universities and teachers.

It appears to be possible to make this translation (though with a little twist). Taking this "translation game" further; the 3G operator would correspond to the learning institution, the user/consumer to the learner/student, and the content owner/provider to the teacher/knowledge provider. Given this "translated" definition, then the description of the different players in Paper II would read:

> The learning institution has two main responsibilities: to build and maintain an infrastructure enabling flexible learning and education and to supply the infrastructure with courses and knowledge services. The student group is the most important party in the flexible-learning market. Teachers and knowledge providers constitute both those who produce knowledge information, and those who own and mediate such information.

This could be a valid description. So, if there are cooperation issues in the 3G market, would there then be such cooperation issues in education? Translating the table found in Paper II (see page 94), exemplifying some of the views, gives us some ideas (see Table 10 below).

Table 10. "Summary of views" transformed into a learning context.

	Learning institutions	**Teachers**	**Learners/ students**
What is the real opportunity?	We offer new channels to the students, for which teachers should be willing to contribute just for the opportunity to participate.	Our profession does not need a new channel as much as the universities need our publicly well-known knowledge.	It does not matter what they offer if I cannot see how I can benefit from it, unless it is easily accessible as on the Internet, but I can appreciate the value of time & place independence.
How should the system work?	We need to keep students within our network in order to maximise revenue or governmental contribution[3].	Students can do whatever they like as long as our profession and the respect for our knowledge are not compromised.	If it makes it easier for me to get a degree and learn in my own style, I am willing to "get on the bandwagon".
Who should provide the knowledge?	It will be simpler and more beneficial for the students to get all knowledge from one university, thus everything should be kept within the university	Universities could take care of all knowledge distribution, but at the same time, there is a risk students perceive it as inflexible and protective if everything is kept within the university.	I prefer one university, but I only have a certain level of tolerance for limitations if I want specific knowledge.

6.1 The "real opportunity"?

- Teachers should contribute to the continuous development of methods for supporting student reflection and peer learning, such as the dialogue sheet, firstly by allowing time for reflection and peer learning in the class-room, e.g. allowing dialogue sheet sessions, and secondly by continuously

[3] Higher education in Sweden is financed by governmental contributions. A decline in student enrollment and students failing courses results in lower governmental contributions.

contributing to questions that could (and should) be asked when reflecting, e.g. by improving and "re-visiting" dialogue sheet questions during the courses. Teachers should, however, not claim that they alone can make students reflect and focus on what and how they learn. Universities should provide one or more solutions or methods, such as the dialogue sheets, as a first corner-stone in the "life-long learning construction".

- Teachers should contribute their material and knowledge to peer learning solutions, e.g. to P2P (learning) networks. This would also contribute to an improved reputation of peer learning and P2P in general and an increased source of qualitative learning material in the P2P networks in particular. The next generation students, the students of tomorrow, are increasingly familiar with P2P in its various forms, e.g. instant messaging and file sharing, as well as with other forms of technology support. Also, the universities should be encouraged to provide their own P2P file sharing service dedicated for learning material.

Holtham & Courtney (2005) describe, among other things, the invention of the dialogue sheet as a tool for reflection in higher education, as an enabler for the university to pursue a distinct and discrete path to achieving an institution's pedagogy policy. This would, according to Holtham & Courtney (2005), to some extent be an argument that dialogue sheets will only work in a certain context, such as a problem-based context, but as Trollestad, Larsson & Schou (2000) show the contexts can vary. Furthermore, it is the author's experience that when working with values or reflection on meaning, the dialogue sheets are very useful. It is not primarily the context, nor the content, that constitutes the good method, it is the method itself. Trollestad, Larsson & Schou (2000) emphasize that the method is based on communication between people, and that an open and non-ambiguous dialogue is developed. This basis cannot be reduced to conversation or meeting technique, but rather an attitude and a humanistic approach in which mutual respect dominates the actual meeting. This is also confirmed by Söderlund (2000) who states that an important supporting structure for learners is the social interaction with other learners, to be able to form and give expression for one's thoughts, exchange ideas and share these with others, and jointly reflect on phenomena. This in turn establishes a ground for processes within the individual learner (personal reflection), and deepens the understanding of the learning process.

6.2 How should the flexible learning systems work?

- Universities providing flexible learning systems, including their own P2P services, should not make these exclusively available within the university network. Students should not be limited by walled gardens, but encouraged to take advantage of their time and place independence the system presents them with. Copyright issues can be solved by implementing a copyright scheme such as the creative common.
- Universities should provide an environment where students' individual learning styles are promoted, and where students are taught to reflect on what and how they learn, and to take responsibility for their own learning process.
- With a multitude of sources, based on various technologies and methods that students are familiar with, the need for and appreciation of teachers as guides and mentors will increase. Thus, by providing their knowledge and competence to the flexible learning systems, e.g. the P2P services, and to the environments and methods fostering students as reflective thinkers, the teachers' profession is preserved, albeit an evolving profession.

This is supported by Söderlund (2000) and Diaz (1999) who state that learners, in their learning processes, use different resources that are only partly created or offered by the teacher, and which are necessary for students to become life-long learners. To emphasize and to facilitate the transition from single-source to multi-source information retrieval, dialogue sheets can serve as a suitable internal door-opener for the learners.

Learners also use resources available in their close environment, at work or at home. The actual learning is in fact taking place within various contexts, where learning institutions are but one example of such a context. The learner is an active person using mental tools, e.g. concepts, and artefacts as well as the resources provided by their social interaction with others. In this interaction P2P plays an increasingly important role. And, as Ratti et al (2004) say, an important task when pursuing the P2P track is to harness copyright violations, e.g. by bringing out copyright schemes similar to the creative common.

6.3 Who should provide the knowledge?

- Universities failing to cooperate with other universities will also fail to attract students to the extent necessary to maintain high revenues or high

governmental contributions. Flexible-learning institutions, providing possibilities for students to learn from and with each other, disregarding time and place differences, will not only attract students but also the teachers whose knowledge is highly valued.

- Universities and teachers have to realise that not all knowledge can be kept within a university's or a teacher's domains, i.e. they have to accept that various sources can be utilised to fulfil the requirements of a course and even a whole educational programme.

In general, the drive to attract many students takes precedence over facilitating a flexible learning environment. In fact increased reach is one of the major objectives for higher education according to Popova & Popov (2004). Furthermore, education programmes requiring much equipment, or a bundle of resources, are not beneficial to the universities' and the institutions' financial equations. As Tembe (2003) states, the benefits of (e)learning are the combination of media types, which stimulates the whole brain and that this is preferred over plain text books. Furthermore flexible learning, esp. eLearning, makes learning more effective. But are we aware of the different characteristics of each media type combined? And, are we able to utilise these characteristics in the learning situation? To provide an answer to those questions it might be easier to study the teachers, which are those who promote flexible learning environments and specialised educations, but also those who promote clear (and to some extent rigid) assessment methods in this environment, thus there is a clash between the focus on result and the evolution of the learning process.

Tembe (2003) also asks herself whether the creation of technology and media enhanced learning really is about what new technology or new media can offer, or whether it is about how to better learn how to utilise the separate old media types comprising eLearning? To better maximise the use of new media technology in learning, to move beyond our old pre-conceptions and experiences with regards to media and technology, it is essential that we look upon and reflect on the mere expression of matters and what learning opportunities they can offer. Therefore it is also necessary to continuously improve all media used in learning, pursuing transparency as described by Bolter & Grusin (1999) and Enlund (2000), so that learning media is not considered "mirrors merely reflecting how things always have been done", but rather "windows of opportunity".

Hernwall (2003) suggests that a critique of the use of media (or technological artefacts) in learning is that the human conditions, both perceived and real, transcend into what technology renders possible, i.e. technology does not enhance learning, but rather hinders the evolution of learning. This would then mean that all learning improvements utilising media or technology would

in fact hinder the evolution of learning. However, one should then bear in mind the notion of "all media are combinations of previous forms of media" introduced by McLuhan (1964) and further developed by Bolter & Grusin (1999). And, as Hernwall (2003) continues it is not that technology hinders us as humans, but rather the human conditions that become different through the use of the various tools and methods we have created.

6.4 Focussing on the learner

The diminished time available for students, combined with increased student responsibility, crave more and flexible learning resources. Students involved in flexible learning, as well as in peer learning, also need support from the universities and teachers to be able to "learn how to learn", and to focus on the learning process instead of just focussing on "what's on the exam?" It is therefore important to emphasise qualitative interactions between teachers and students, as well as between students. In the life-long learner perspective it is also important to bear in mind that with the new, digital technology it is possible for every user to become a producer, for every user to copy and store material with maintained quality, just as if it was the original.

Learning development has by tradition been teacher-centric, e.g. focussing on the development of new forms of student assessment. The learner-centric approach calls for students becoming entrepreneurs in the learning community. This means that some of the most innovative forms of learning may be developed by the learners, and not by those providing learning today, which was foreseen by Ewing et al (1997) in their studies. Of course, this could then be perceived as a threat to the learning institutions. However, we are all learning for an unknown future, and by cooperating and collaborating in the evolution of learning we can get a glimpse of the future, enabling us to prevent undesired outcomes.

Members of a learning community have the ability and opportunity to embrace technology development, and to put trust in the learners' ability to take responsibility for their own learning process, as well as their ability to learn from each other.

7 Further research

With starting-point in McLuhan (1964) and Bolter & Grusin (1999) and a notion of *"all forms of learning are just combinations of previously available forms of learning"* there would be a great interest in investigating the mechanisms of interaction and cross-fertilization between physical and virtual learning situations; where physical examples are class room lectures and group seminars, and where virtual learning situations for instance are web-based distance learning, discussion groups and Internet communities. In this context it would then be interesting to analyse an assumption that the shift from physical to virtual environments is influenced by the learners' experiences from the physical domain, and vice versa; that experiences and attitudes formed in the virtual domain will create new expectations on the physical learning methods and environments, thus creating escalating expectations in mixed learning environments. Summarising these two approaches one could work with the assumption that learning process and attitudes of each learner are influenced by his or her previous learning experiences.

Löfberg (2003) states it is an important pedagogical research task to try to understand in what ways **people** adopt the new technology as a natural part of their everyday lives, but it is also important to try to understand specifically how **teachers and students** adopt new technology.

As described in the previous chapter, an embracing by the universities of the new technological solutions offered could lead to an improved reputation of P2P, and possibly defusing the debate on file sharing. Since P2P suffers from a tainted reputation, there is a need to study the reputation's implications on the use of P2P in socially non-obscure activities, such as learning.

To better understand if universities and the learning market can learn from the telecom industry – referring to the transformation of argumentations from the 3G example to the learning context in the previous chapter – this would have to be investigated further. A first step in this investigation would then be to launch a follow-up study on the content dilemma focussed on in Paper II. A "content dilemma revisited" study would provide valuable input to the comparison of the technological developments affecting the traditional learning institutions and the mobile telecom industry.

The survey that was performed for Paper III would benefit from cross-sampling with students at various locations. Also, the number of technological implementations investigated should be reduced. However, to better

understand the influences that various media have on learning, a thorough follow-up and analysis of the outcomes of the numerous dialogue sheet sessions in higher education that have been held, should also be included in the survey. In this way a comparison of different media can be executed.

Furthermore, the use of the tetrad model (McLuhan & Powers, 1989) in the mediated learning context should be further investigated.

8 Author's contribution to the papers

In Paper I; "New Methods for Focussing on Students' Learning Process and Reflection in Higher Education", I was the main contributor to the paper. Leif Handberg wrote parts of the Problem Background, the Research Field, a smaller part of The Study, part of The Research Process, and contributed to the Initial Findings, Lessons Learned and Conclusions. Ambjörn Naeve participated in the discussion on the conclusions and initial findings and performed the proof-reading. The design of the research issue was made by a group of researchers and professors at the Royal Institute of Technology (KTH), the Stanford University, and the Uppsala University. I managed the fieldwork, however, the other co-authors participated in the study, and Leif Handberg supervised the project at KTH.

In Paper II; "Solving the 3G content dilemma as a prerequisite for traffic generation", the actual fieldwork was performed by the other co-authors, who also contributed to the Results, and the Conclusions/Further Work. I wrote the majority of the paper. The design of the research issue was made by Professor Roger Wallis, who also supervised the co-authors in their work.

In Paper III: "From Peer Learning to P2P Learning – new life or obsolescence for the traditional learning institutions?", the field work was performed by the other co-author, who also contributed to the Empirical Studies, and the Statistics Analysis. I wrote the majority of the paper. I also designed the research issue, and, together with Professor Roger Wallis, supervised the other co-author in his fieldwork.

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