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Science and Technology

Computer Assisted Language Learning towards 2010
Mobile Learning, User generated Content and Convergence

Lars Are Holth Drabløs

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Supervisor: Lill Kristiansen, ITEM

Norwegian University of Science and Technology
Department of Telematics

Problem Description

...This thesis will mainly concern the technological part of CALL, so pedagogical input will be in limited depth. The technological aspects of CALL are many, so there will naturally be many left out. Another challenge is to classify users of CALL. I will use these three categories:

1.   Pupils learning language at school.
2.   Grown ups learning a language, at own initiative for different reasons.
3.   Grown ups learning a language, in the nature of being exposed to the language in an organization or business.

I will try to address situations for all three categories where the aspects below are central:

•   What approaches for CALL are used today and what opportunities does new technology bring to the field? Key words: eLearning in general and trends for CALL.
•   How can learning take place in mobile environments and what challenges arise compared to stationary learning? Key words: Practical/Technological challenges, Combination of stationary/ mobile environment.
•   How can users generate and share content? What impact does this have for the actors who offer the solutions? Key words: Convergence, Innovation and impact on Service/Application/ Network provider's business models.

Assignment given: 27. February 2008
Supervisor: Lill Kristiansen, ITEM

Preface:

The problem description has been defined in cooperation with Professor Lill Kristiansen at ITEM. Some content has been taken further from the thesis I produced in 2007: Language Learning on Mobile Platforms: Supporting the Social and Personal Context of Mobile Language Learners. However, most of the work and content production with this thesis has been done in the period 10th of January 2008 to the 23rd of July 2008.

I would like to thank my supervisor Lill Kristiansen for help and feedback throughout this period.

SUMMARY / CONCLUSION:

Many topics have been touched in this thesis. I would like to conclude with some answers to the questions raised in the initial problem description and point out further challenges in some cases.

We have seen that there exist several approaches for CALL, with virtual learning communities as one example. The community presented here, moodle.org, is an open source framework and let any user register for free and manage a course. In that way may this framework be used by school institutions, professional language course providers and other users who feel free to organize a course. This environment is quite formal in nature, because most of the use at the portal is related to a registered course. Another portal, italki.com, offers language learning after the tandem method and users are free to search among all (visible) profiles on the sites to find a match. This is a more informal framework as the users are not connected to any established educational institution, they do not necessarily follow a curriculum and the learning is not instructed to follow any pedagogical principles.

These portals may be accessed both in stationary and mobile environments (by mobile browsers). In the case of mobile environments there exist many challenges: Developers of the site are requested to take special considerations of how some material is to be structured to fit the interface at the user's terminal. One of the considerations at moodle.org was for instance to limit graphical content (illustrated in chapter 5.2.1), as this takes up much space on the screen and uses quite a bit bandwidth to download. Other challenges can be related to media richness and context awareness discussed in chapter two. One example could for instance be a video conference lecture held at a moodle course. If some of the users are in a mobile environment without the possibility to transfer video (because of terminal or bandwidth limitation), they should still be given the option of following the lecture by audio transmission. This will reduce the richness of the lecture, but they will be able to catch up the most essential things.

BBC offers another kind of framework which is typically meant for beginner learners in a language. The material in 'Language steps' is instructional and interactive, as it requires response and apprehension from the users. This makes it most suitable for stationary environments, but the content could be presented in a mobile environment to. The

"Rearranging the dialogue" task will probably be suitable for a touch screen handheld. The content in the different modules could also be categorized to fit the current response flexibility of the user. An example of different categories was given in chapter 2. Another framework presented from the BBC portal was their show "The Flatmates". This is an internet based soap show where the episodes can be followed by downloadable tracks or simply be read. The users may contribute to the show with discussion about the characters and give feedback about how the show should continue. This is a good example of how the Internet can be used as a platform for participation among users.

There also exist mobile applications like KODI's dictionary and Coolgorilla's audio phrase books. These can be categorized as referential tools and can be used in many settings, remarking that the audio phrase books in most cases are suited for beginners on vacation in the target language country.

Chapter 6 discussed general possibilities and challenges related to technology and market trends. Web 2.0 was presented as the future trend of Internet usage and web design with key words as creativity, information sharing and collaboration between users (and companies). A survey, held by the Norwegian institute ITU has showed that Norwegian teenagers at average participate in 3,4 'network societies'. Facebook was the most popular. The biggest reason to participate in the networks was to meet friends. Only 8 percent answered that the networks provided help for school related topics. This shows that most of the interaction in these networks are informal among the teenagers. Could we still expect more participation in school related topics in such networks? The answer is yes, and no. The technology exists to promote school related subjects in these networks, but it would be a challenge to mix the pupils' (and the teacher's) roles in such a situation, as depicted in chapter 6.3. Hans Christian Arnseth also points out in [46] that the question about using more web 2.0 applications in the school system is much about ideology – "What do we regard as proper learning and how can/should technology be used in the education?".

At last were some general challenges related to technology presented, with issues around convergence, human aspects, business models and policy as the main issues. Copyright policy and business models can be even more complicated in the evolution of web 2.0 interfaces, where content sharing and user participation goes hand in hand.

Contents:

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Definitions and Abbreviations:

ELL: Electronic Language Learning

Equivocality: The state or quality of being ambiguous in meaning or capable of double meaning.

ICT: Information and Communication Technology.

Google Maps: An application from Google to explore world wide maps. Offers live update of location for handhelds (either via GPS or triangulization, route descriptions and many other services. See maps.google.com.

Handhelds: Portable, electronic devices. They are typically smaller than laptops as they usually can be maneuvered with one hand and carried in a pocket. Often used for data or voice transfer via a wireless network.

POTS: Plain old telephone service - The traditional fixed line phone service.

MLL: Mobile Language Learning.

Mobile Web browser: A web browser that is designed especially for handhelds. Functions are typically adjusted for cell phone interfaces and content (data) is sometimes compressed compared with content for a stationary browser.

Tag / Tagging: A form of categorization of ICT media. A media object can be tagged with several keywords, making search and categorization more dynamic.

Terminals (Stationary/Mobile): PCs, cell phones, PDAs or other equipment containing a CPU that can be connected to a communication network.

Ubiquitous: In this thesis most related to **t**he phenomenon of providing seamless handover of communication between networks or applications.

User: A person who uses a communication service or a system function via a terminal.

VLE: Virtual Learning Environment.

Wiki: Definition from Wikipedia: **"**A wiki is a collection of web pages designed to enable anyone who accesses it to contribute or modify content, using a simplified markup language".

1. INTRODUCTION.

In these days as interaction in a global setting becomes a standard, either on the Internet or in real life, language learning may seem more important than ever. Computer Assisted Language Learning (CALL) has been a topic since the 1960's, and as technology matures we will see more opportunities for computers to assist in language learning. The definition of CALL in Wikipedia states the following:

"CALL is an approach to teaching and learning in which the computer and computer-based resources such as the Internet are used to present, reinforce and assess material to be learned. It usually includes a substantial interactive element. It also includes the search for and the investigation of applications in language teaching and learning".

It is also important to stress that CALL not necessarily is meant to replace traditional class room learning and face to face contact, but is a phenomena that can co-exist and supplement the "traditional ways". Further on are there many aspects of CALL, with the two largest categories as technological and pedagogical aspects. This thesis will mainly concern the technological part of CALL, so pedagogical input will be in limited depth. The technological aspects of CALL are many, so there will naturally be some left out. Another challenge is to classify users of CALL. I will adress these three categories:

1. Pupils learning language at school.
2. Grown ups learning a language, at own initiative for different reasons.
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- What approaches for CALL are used today and what opportunities does new technology bring to the field? Key words: eLearning in general and trends for CALL.

- How can learning take place in mobile environments and what challenges arise compared to stationary learning? Key words: Practical/Technological challenges, Combination of stationary/mobile environment.

- How can users generate and share content? What impact does this have for the actors who offer the solutions? Key words: Convergence, Innovation and impact on Service/Application/Network provider's business models.

2. THE INTERACTION SOCIETY AND COMPUTER MEDIATED COMMUNICATION.

2.1. The Interaction Society.

Mikael Wiberg writes in chapter 1 of "The Emerging Interaction Society" (see [1]) that there are many signs on a shift of focus from the *Information society* to the *Interaction society*. Wiberg argues that the nature of humans as social creatures has driven the technology development to support situations for human interaction in different settings. He mentions areas as awareness technology, groupware, and virtual community support. Use patterns have also changed during the last decades. Wiberg also points out that computers had a more central role earlier. Tasks were handed to a computer for calculation and it could be several people working to feed this computer. Now, the computers are more often used as a tool to communicate with other people, according to the Wiberg.

Enabling factors are also discussed in the chapter. Wiberg states the following: "The Interaction Society is mainly enabled on top of two major and global technical platforms." The first is the telephone network (including mobile networks for voice and data communication). The second is the Internet. The telephone network enabled geographically dispersed people to communicate. Wiberg writes that the Internet has enabled a more sustained interaction and opened up for different communication arenas using technologies as email, chat, virtual communities, discussion forums and bulletin boards. Nowadays, the platforms are also melting together in the form of IP telephony over data carrying networks. IPv6

Another important aspect in this "new" society is that more interaction is getting mobile. Wikipedia [2] shows that as of November 2007, 3.3 billion mobile subscriptions was registered world wide. This was a milestone, reaching 50% of the world's population. There are also several communication possibilities with mobile phones. Modern phones with 3G often offer video telephony, a *Mobile Web browser,* support for email, instant messaging in addition to standard voice and SMS functionality. Most phones also come with a digital camera, a media player and a lot of other utility functions. I would therefore use the phrase *handhelds* to reflect that these devices support much more than phone calls. Wiberg also mentions that improvement of battery life, screen size and total size has had a positive impact on the market penetration of handhelds.

Another important aspect related to the Interaction Society is the evolution of *ubiquitous* networks and applications. Wiberg mentions the ICQ application as an example. This application was one of the first instant messaging applications. The breakthrough with this technology was that it offered an overview of which users was online, thereby providing a more synchronous communication platform among the users logged in. There are numerous applications like this that works both on stationary PCs and handhelds. As long as the user has an Internet connection on the handheld, he can stay logged in to the application and continue the chat he left from his stationary PC.

With this variety of communication options we will probably see new use patterns of handhelds in specific situations. A fresh example of a new scenario is the combination of instant messaging and positioning technology. The magazine "Nettverk og Kommunikasjon" [4] mentions that the Mobile operator Orange has developed an application that sends the current location of the user plotted in a map via Google Maps and Twitter.

2.2. Computer Mediated Communication (CMC).

2.2.1. Media Richness.

Sun and Cheng writes in [3] that Media Richness Theory analyses the efficiency of communication based on different media and presentation forms. One description they use of Media richness is the following:

Media richness is the ability to facilitate shared understanding within a time interval.

Sun and Cheng further point out that this phenomenon is very important in the field of eLearning. One reason is that development and use of rich media instruction is more expensive than leaner instruction. The following criteria were used in [3] to classify how rich the media is:

1. Capacity of immediate feedback.
2. Capacity to transmit multiple cues.
3. Language variety.
4. Capacity of the medium to have a personal focus.

Criteria number four addresses both the capacity of transmitting personal details, and take into account that the receiver might need tailoring of the information. An example of the first case could be a person that wanted to tell an experience from a vacation. Some moments in this short story would probably have been perceived leaner by a listener that heard the story face to face, than a listener that heard the story over a phone call. An example of the latter case could be transmission of sound to a person with impaired hearing. The sound quality should in such a case often be better than "normal". The person would probably also need the opportunity to adjust the volume (to a higher level) and in some cases also get the information repeated.

The goal of Sun and Cheng's article is mainly to prove these two hypotheses:

1. *Use of high richness media in highly equivocal and uncertain instruction units has significant positive effect on learning score and learning satisfaction than the use of low richness media.*
2. *Use of high richness media in units with low equivocality and uncertainty has no difference on learning score and learning satisfaction than the use of low richness media.*

The results from the experiments held in [3] underpin these hypotheses. This means that translation of trivial words like numbers and nouns seldom need a rich media format to achieve understanding by a learner. These words can in most cases be translated in text, and

in some cases beneficially with pictures. More complex words like adjectives and adverbs could make further progress by the learner when presented as an animation or demonstrated in a video. Instruction units that cover more complex tasks like understanding written texts and poems would require even richer media. This could be achieved by contacting an expert, the teacher of the course or other students face to face for explanation and discussion.

2.2.2. Social Presence.

Heibø [5] uses this definition of Social presence:

The extent to which the receiver feels psychological nearness to the communication Partner.

A media's social effects are caused by the degree of social presence it offers it's users, according to Heibø. Different media can further be divided in four categories, as the figure below shows.
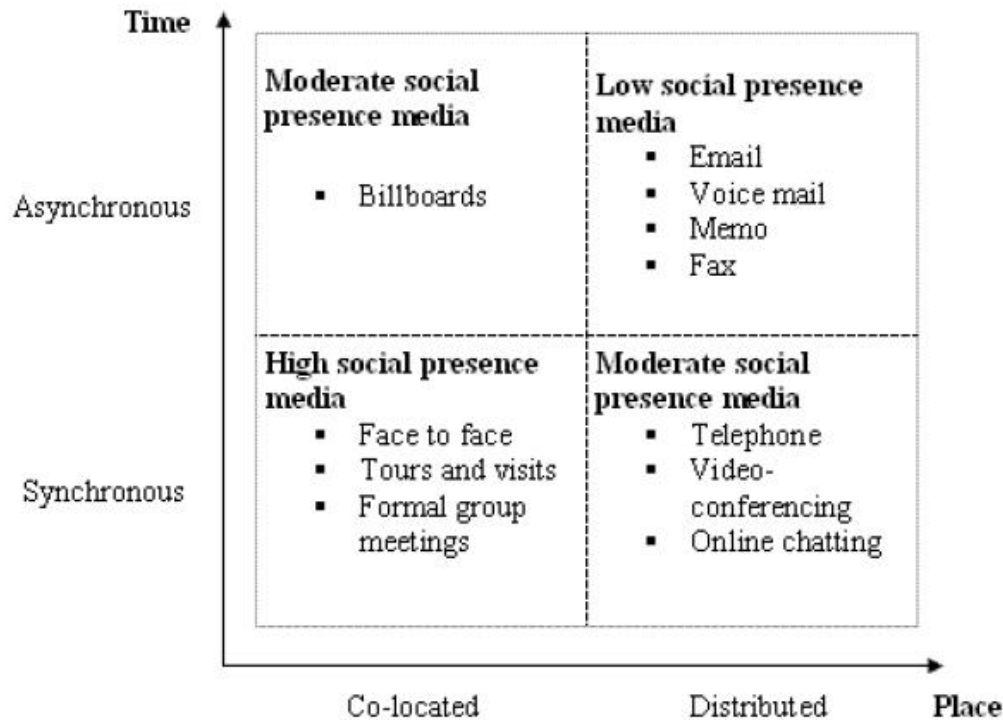
Figure 1 - Media Classification [5]

Further writes Heibø that that it's worth to consider that the higher social presence the greater degree of commitment is required from the participants. The reasoning behind this is that lower presence media can more easily be ignored than higher presence media.

2.2.3. Context Awareness.

Anind and Abowd has written a good paper in this field, see [6]. They write (on page 2) that the goal of context aware computing should be to make interaction with computers easier. I would like to go one step further and stress that the goal should be to make interaction easier, in general. We saw in chapter 3.2.1 that the whole society is under impact of more interaction. So in any way, context awareness should be taken into account when designing applications for communication systems. A description of the phenomenon is therefore natural to include in this thesis. Anind and Abowd have done the approach by first describing context and so go on with context-awareness. I'll do the same here.

Among many descriptions mentioned by Anind and Abowd are at least the following attributes associated with Context [6]: Location of the user, identities of objects and people

around the user, date and time of day, season, temperature, user's emotional state, focus of attention and orientation. Anind and Abowd says "context is all about the whole situation relevant to an application and it's set of users". And they further state that there is no set prioritization of these aspects, since context will change from one situation to another. Anind and Abowd break it down to this definition of Context in [6]:

Context is any information that can be used to characterize the situation of an entity. An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves.

Further do they stress that the attributes *location, identity, time* and *activity* are the most important to describe context. These attributes are mentioned as *primary* context types. Further is it possible to dig into *secondary* context types given the *primary* type. For instance can identity of a person give us information about age, phone number and a lot of other attributes. At the same time is it also possible to find *primary* context types of other entities related to the same context. For example other persons or activities identified at the same location as our initial *primary* entity. With this framework, it should be possible to describe context in any situation, according to Anind and Abowd.

It's then time to jump further to context-awareness. Following definition is used in [6]:

A system is context-aware if it uses context to provide relevant information and/or services to the user, where relevancy depends on the user's task.

Anind and Abowd stress that this definition is more user-centered as other more specific definitions and solutions in the field. One example of this is an application that only displays the context of the user's environment. The application is still context-aware, but it doesn't modify its behaviour. Some definitions would exclude this application as context-aware, according to Anind and Abowd.

They've also categorized context-aware applications after what features they can and should support. The result in [6] is a combination of two earlier taxonomies, ending up with three categories:

1. *Presentation* of information and services to a user.
2. Automatic *execution of a service.*

3. *Tagging* of context to information for later retrieval.

Their conclusion also mentions that context awareness is especially important in handheld and ubiquitous computing, where a user's context is very dynamic. Chapter 2.2.4 is meant to illustrate some further issues around context awareness in mobile environments.

2.2.4. Special Considerations for Context Awareness in Mobile Environments.

There are many things to think about when the users are mobile and they interact with a small device like a mobile phone. In a mobile environment, there are more things that can disturb the user. For instance is there much more noise around the user while sitting on a subway, than when he is home. And when a user is walking around, he hasn't got the opportunity to make responses on the device all the time, because of traffic and other people in his way. With this in mind is it important to offer different services that suit the user in different situations. Below is a table that categorizes these situations by two parameters, *available time* and *response from user.* (I also considered a "noise/stress factor", typically high on the subway, but omitted it for a simpler categorization.)

	Unknown/short time	**Known time**
Limited response	- "On the move" (Category 4)	- Long walks or bicycle rides - While exercising (Category 3)
Full response	- Waiting for an appointment - Short distance transport (noise and stress can reduce response) (Category 2)	- At home - At school - Longer transport (Category 1)

Figure 2: Response flexibility for use of handheld functions.

The least flexible way of using handheld functions is when a user is on the move. He is then often not able to give responses to the device and he does not know for how long time he can use the function until he gets interrupted. I will call this the "Category 4" of response flexibility. The next category offer a little more flexibility to the user. This is when he is able to use a function for a longer time, but his responses are limited because he is busy with

another main activity. This may for instance be bicycle rides and during physical workout. The two most flexible ways of using handheld functions is when the user is able to give full response to the device. By full response I mean that the user's apprehension is fully kept to the device and he is not being seriously disturbed by surroundings. Examples of this are given in the table.

3. LEARNING AND E-LEARNING IN GENERAL.

3.1. *Learning.*

This chapter is meant as a brief introduction on different ways to approach learning and how learning is carried out. As I'm no expert in the field, there are probably many pedagogical areas left out. The intension is to get a brief overview of the concept and have some phrases to link later use cases to.

Wikipedia [8] refers to *Learning Sciences* as a field of study that works to further (scientifically) understand the principles of learning and also engages in the design and implementation of learning innovations. Northwestern University (see [9]) presents the field as three themes with the following descriptions:

- **Cognition**: Constructing scientific models of the structures and processes of learning and teaching by which organized knowledge, skills and understanding are acquired.
- **Design**: Building environments for learning and teaching, incorporating multimedia, artificial intelligence, computer networks and innovative curriculum and classroom activity structures.
- **Social Context**: Examining the social, organizational and cultural dynamics of learning and teaching situations, including classrooms, schools, school districts, museums, corporations and homes.

The next chapters will mostly involve theory about design. Social context will also get some attention. Context awareness was described in chapter 3 and much of this theory can also be applied for the social context in learning. Examples in later chapters will illustrate this. Theory about cognition will not be discussed very much. There will be a presentation of some

approaches related to language learning in chapter 5, but the approaches will not be analyzed in detail.

Another aspect (related to all the three fields above) is whether learning is carried out as formal or informal learning. Wikipedia, [32], describes informal learning with some of the following characteristics:

- It does not take place in special educational establishments.
- It has no curriculum and is not professionally organized.
- It is not planned pedagogically conscious.

Researcher Leila Walker at the innovation center Futurlab comments in [33] that the following benefits have been observed with informal learning: Higher aspirations, greater self-esteem and specialized knowledge, skills and competencies. In addition to this does she also mention that social skills in general will approve and that disengaged and low-achieving pupils may benefit from being able to learn in different ways outside of the school setting. Critics of

Formal learning could naturally be described as the opposite to informal learning. However, in most learning approaches and frameworks, there exist elements of both formal and informal learning. We will see examples of this in the following chapters.

3.2. eLearning in general.

Since this thesis mostly is concentrated about how technology can be used to develop alternative and beneficial learning methods, I find it natural to say something about e-learning in general. I will use this definition of the phrase e-learning:

E-learning constitutes all learning that is supported, fully or partly, by any electronic device.

The term e-learning is the most general of the terms who deal with electronic learning since it naturally includes web-based learning, computer assisted learning and mobile learning.

3.2.1. History and Evolution.

Paul Nicholson [18] provides a good overview of how eLearning has evolved since the beginning. The table below is taken from this article:

Table 1-1. The changing focus of educational technology over the past 30 years (after Charp, 1997; Herrington, Reeves et al., 2005; Leinonen, 2005; Mortera-Gutiérrez, 2006; Nicholson & McDougall, 2005; Pilla, Nakayama et al., 2006; THOMSON, 2005)

Era	Focus	Educational characteristics
1975-1985	Programming; Drill and practice; Computer-assisted learning – CAL.	Behaviourist approaches to learning and instruction; programming to build tools and solve problems; local user-computer interaction.
1983-1990	Computer-Based Training; Multimedia;	Use of older CAL models with interactive multimedia courseware; Passive learner models dominant; Constructivist influences begin to appear in educational software design and use.
1990-1995	Web-based Training	Internet-based content delivery; Active learner models developed; Constructivist perspectives common; Limited end-user interactions.
1995-2005	E-Learning	Internet-based flexible courseware deliver; increased interactivity; online multimedia courseware; Distributed constructivist and cognitivist models common; Remote user-user interactions.

Figure 3 - An Overview of eLearning since the 1970's, from [18].

As we see, the educational technology has gone from a local, instructional approach with the learner in a more passive role in the 1970's, to a more flexible, distributed and learner-centered approach from the 1990's to 2005. However, it's worth to notice some words by Nicholson in his introduction [18]:

> *"E-learning has evolved in different ways in Business, Education, the Training sector and the Military, and currently means quite different things in different sectors."*

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To sum up the differences, Nicholson points out that the Higher Education, Business and Training sectors mainly focus on Internet-based delivery of content and programs that focus on sustaining particular communities of practice. Further does he mention that the drivers in these sectors typically are expectations of improved productivity and cost reduction. For the wider education community, Nicholson cites that this sector not only focuses on online contexts, but includes the full range of computer-based learning platforms and delivery methods, genres, formats and media.

It's also worth mentioning from [18] that in addition to the uptake of a more social constructivism in the community of education, also the evolution of (ubiquitous) global networks has had a great impact on the trend towards collaborative online learning environments. He also stresses that the concluded perspective (shown in Figure 3) hides many of the underlying interactions and processes between different actors. These interactions and processes could be described and analyzed with activity theory, but this is out of the scope for this thesis.

3.2.2. Categorization of applications.

Patten, Sánchez and Tangney have in [19] concluded an example framework for design of collaborative, constructionist and contextual applications for handheld devices, weighted on educational principles. They state that some applications replicate those available on laptop computers, typically application types as administration, referential, interactive and microworlds. Even if the categories are meant for handheld applications I think it constitutes a good overview of eLearning categories in general. Below is a description of each category:

- *Administration*: This is typical personal information applications like calendar, contacts and tasks specified by the user. It's also possible to share this information with other users. These applications are not meant for knowledge construction, according Patten et al.

- *Referential*: Patten et al mention 'office style' tools (like Word and Powerpoint), dictionaries, translators and e-books. In general, I would say these applications let users retrieve and store information in a way that should suit the users demand and context.

- *Interactive*: These applications follow in many cases the 'response and feedback' approach, according Patten et al. Typical applications are multiple choice tests and presentation of content in ways to make the user memorize as much as possible.

- *Microworld*: Patten et al. describe this type as "… allow learners to construct their own knowledge through experimentation in constrained models of real world domains." Not many examples exist for handheld devices (yet), but I would say most games fit this category. "Real world domains" may not apply for all games, but most games are somehow designed in a constrained model and behavior options are limited (due to rules or implementation constraints).

The authors in [19] state that the following categories apply especially for mobile devices:

- *Data collection*: Is about recording data and information about the users' environment. Patten et al. stress that mobile devices are well suited in this field as they can be used (almost) anywhere and at any time. One example mentioned in [19] is medical students who record observations that later can be used to aid in reflection. Handheld devices do now come with opportunity for capture of photos, sounds and video. This can be used for note taking in classes, meetings or other settings.

- *Location aware:* Is about 'contextualizing learning activities by enabling the learners to interact appropriately with their environment', according Patton et al. I would say that this category could be redefined to 'context aware' as there are more things to take into consideration than location only, when offering contextualized services (also to mobile users). This has been illustrated in chapters 2.2-2.4 above.

- *Collaborative*: This category "aims to encourage knowledge sharing between users", claims Patten et al. Wikis is a good example of frameworks where users contribute, share and gather knowledge.

There are of course applications and frameworks that cover more than one of these categories. Virtual learning environments (VLEs) are a good example of this. Moodle.org is an open source VLE which offers the users the possibility to create and manage online courses. Among the features available is plugins for activities, resource types, question types, data

field types, graphical themes, authentication methods, enrollment methods and content filters (see [35]). With these possibilities Moodle can be placed in the categories collaborative, administration, referential and interactive. Moodle can also be used in both formal and informal settings, dependant on how the course is structured.

3.2.3. Benefits and Challenges:

Here is a listing of some benefits and challenges related to eLearning.

Benefits:

- *Flexibility*: As long as the user has access to the learning system via an electronic device, learning can take place at any time and anywhere. If the system has a good variety of learning methods, the user can pick the method that suits him best at the moment.

- *Personalization*: The system can offer a wide selection of topics in different levels, making sure that the user can have a learning session suited to his interests.

- *Alternative communication options*: A flexible system can offer the users different ways to communicate. A synchronous voice/video conversation or live chat could be a good option between two (or more) users if detailed and urgent information is needed to be exchanged. Comments and contributions to discussions, blogs and not so urgent dialogues, can with advantage be done by asynchronous communication. Joanne Copper states in [17] that asynchronous interactions can be more thoughtful and creative because the users have more time to think about their contributions. Another benefit around communication lies within the fact that e-learning systems organize content in an effective way. Conversations, discussions and dialogues can be saved and easily accessed later for review.

Challenges:

- *Lack of Face-to-Face communication*: Even if videoconferencing shows the faces of all participants, the interaction still has physical barriers. The concept Media richness was described in chapter 2 and illustrates this.

- *Cost and complexity:* Most applications take time and effort to develop. An important aspect is to understand what needs the users of eLearning applications have, and try to meet these needs without making the solution too complex.

- *Ease of use*: Another important aspect is the e-learning application's ease of use. It's extremely important that learners (and teachers) not think of it as a tedious process to use an e-learning system, as this may place a barrier to the use. This aspect is naturally linked to complexity described above.

4. APPROACHES IN LANGUAGE LEARNING:

4.1. Approaches in Language Learning.

SIL International (formerly known as Summer Institute of Linguistics) provides a good introduction on ways to approach language learning (see [10]). The introduction explains the phrases *approach, method* and *technique* in the following way: "In brief, a language learning *approach* refers to theories about the nature of language and language learning that serve as the source of practices and principles in language teaching. A language learning *method* is an overall plan for presenting language material, based on the selected approach. A language learning *technique* is a particular strategy or procedure used to accomplish a particular objective."

Not surprisingly does it exist unlimited ways of learning approaches, methods and techniques. However, some have gotten more attention than others. The thesis by Markiewicz (see [14]) provides a good overview of the most general approaches. Below is a listing of these approaches. The descriptions are taken from [14], but made shorter to illustrate the most important aspect, in my view:

- **The Grammar Translation Method**: This method focuses on the learning of vocabulary that is relevant to the texts being studied, and the language rules necessary to translate the text from the target language to the native language.

- **Oral Approaches and Situational Language Teaching:** This approach focuses on spontaneous use of oral language and absence of translation. The learning is conducted only in the target language.

- **Audio-lingual Approaches:** This approach is highly structural and focuses on the differences between the native and target languages. The approach emphasizes formal drilling and memory. It has been widely used with technology such as tape recorders and the language laboratory. Through the language laboratory learners get to focus both on speaking and listening as well as reading and writing. However, this method can seem both tedious and inefficient. It does not seek to motivate the learner because the interest for learning is not an important aspect in this method. Repetition alone is intended to be enough to induce learning.

- **Communicative Language Learning:** This method seeks to introduce communicative competence. This is usually attempted by carrying out tasks or solving problems in pairs or groups using the target language. The communicative approaches focus on meaning, while teaching of structure is downplayed. The importance of memory is also minimized in favor of internalization of language rules which may not be explicitly explained. The source of motivation for this approach is thought to be the naturalistic use of language for communication.

Englishraven.com [15], states that Communicative Language Learning (CLT) is the one that has become the most accepted approach nowadays. Further does [15] provide a list of the most general learning approaches associated with CLT. The descriptions are taken from [15], but some are made shorter to illustrate the most important aspect, in my view:

- **Interactive Learning**: This concept goes right to the heart of communication itself, stressing the dual roles of "receiver" and "sender" in any communicative situation.

- **Learner-centered Learning**: This kind of instruction involves the giving over of some "power" in the language learning process to the learners themselves. It also strives to allow for personal creativity and input from the learners, as well as taking into account their learning needs and objectives.

- **Cooperative Learning**: This concept stresses the "team" like nature of the classroom and emphasizes *cooperation* as opposed to *competition*. Learners share information and help, and achieve their learning goals as a group.

- **Content-based Learning**: This kind of learning joins language learning to content/subject matter and engages them both concurrently. Language is seen as a tool or medium for acquiring knowledge about other things, instantly proving its usefulness. An important factor in this kind of learning is that the content itself determines what language items need to be mastered, not the other way around.

- **Task-based Learning**: This concept equates the idea of a learning task to a language learning technique in itself. This could be a problem solving activity or a project, but the task has a clear objective, appropriate content, a working/application procedure, and a set range of outcomes.

Another important aspect in Language learning is to effectively learn a vocabulary. Agnieszka Uberman (see [7]) writes the following about Vocabulary teaching techniques:

"There are numerous techniques concerned with vocabulary presentation. However, there are a few things that have to be remembered irrespective of the way new lexical items are presented. If teachers want learners to remember new vocabulary, it needs to be learnt in context, practiced, and then revised to prevent learners from forgetting. Teachers must make sure learners have understood the new words, which will be remembered better if introduced in a memorable way. Bearing all this in mind, teachers have to remember to employ a variety of techniques for new vocabulary presentation and revision."

Further does A Uberman list these three other techniques:

- **Visual techniques**: These pertain to visual memory, which is considered especially helpful with vocabulary retention. Learners remember better the material that has been presented by means of visual aids. Visual techniques lend themselves well to presenting concrete items of vocabulary-nouns; many are also helpful in conveying meanings of verbs and adjectives.

- **Verbal explanation:** This pertains to the use of illustrative situations, synonymy, opposites, scales, definition and categories.

- **Use of dictionaries**: Using a dictionary is another technique of finding out meanings of unfamiliar words and expressions. Learners can make use of a variety of dictionaries. For instance bilingual, monolingual, pictorial and thesauri (synonyms).

4.2. Former Studies and Trends in Language Learning.

4.2.1. Approaches from former studies.

Cristopher Jones mentions in [12] that key strategies for vocabulary acquisition should be linked to contextualization and personalization. The paper examines experiences related to a basic vocabulary instruction program (in a fixed location) with the following features:

- Illustration/pictures of words with a recording of a native pronunciation.
- Categorization of vocabulary with illustration of "everyday" settings.
- Testing the learner in both writing and speaking. The latter was done by recording the learner's own speech.

Jones cites that lexical skills are best developed "when vocabulary is learned in contexts that make possible linking the new information to prior knowledge, and to do so in a varied and rich way". He further stresses that a student's self-study must form the basis for an upcoming task, and that there should be different task types that test the learner. Jones draws a good example of a learner that studies basic vocabulary in the category clothing. After having done

a self study of the vocabulary in this category the learner is presented with the following tasks (in a classroom setting):

- Describe orally what they wear self. Could be classified as a 'prepared task'.
- Describe orally what another student is wearing. Could be classified as an 'unprepared task'.
- Write a short description given by the tutor or from a recording. Could be classified as a 'written assessment'.
- Take notes from a description given by the tutor or from a recording. Could be classified as an 'aural assessment'.
- Act the part of a fashion show commentator. Could be classified as a 'role play', either prepared or unprepared.

I think these task types constitute a solid framework for classification of task types in any learning environment. Prepared and unprepared task types could further divide all types in two dimensions. We might also add assessed tasks as another task type. Jones points out that self study related to non-assessed task types might provide a more personalized vocabulary as the learner focuses on things of interest. Assessed task types should still be used as it is effective in the way to stress importance of basic vocabulary and grammar.

Seghayer mentions in [13] that especially two principles apply when creating effective multimedia instructional materials:

1. "Instructional materials designed to accommodate individual differences should combine the use of integrated media." This is based on the empiric findings that students may have personal preferences about what media that suits best for the learning situation.
2. "The selection of presentation mode should be based on how it best supports a particular cognitive process."

Seghayer therefore concludes that a combination of media types is essential in language learning. His main findings in [13] are that video clips generally provide better vocabulary retention than still pictures. This should be compared to the principles in the chapter about Media Richness. Sun and Cheng mentioned that use of high richness media might provide

better results than lower richness media if the learning unit had low equivocality and uncertainty. It is probable that some of the units in Seghayer's experiment included this element, such that the richer media provided better learning results.

4.2.2. Other Trends in Language Learning.

Below are descriptions of some other trends related to language learning:

- *Language Trips / Vacations:* A common way of practicing a foreign language is to attend an organized Language trip or vacation. Some schools organize such trips at own initiative, one example can be seen from [30] . In this example the school has achieved contact with 'friendship schools' located in Germany, France and Spain. In some cases are the pupils offered to stay at a hosting family in the visited country. This will naturally strengthen the cultural experience from the country compared to reading about the culture in text books. Organized companies also offer similar 'Language vacations' where any student (who meets the application requirements) can join. Edu-culture International, see [31], is one example of such a company. It offer the students different hosting opportunities. They can choose between staying in dorms with other students or staying at a hosting family. In the case with a hosting family, the program is prepared such that the student is expected to spend most of the first week together with the family. The programs are also typical accomplished with organized field trips and group sessions that may include theory about the language or culture. This approach blends formal and informal learning as there typical are aspects of both organized and unorganized activities on these trips and vacations.

- *The Tandem Method (or Language Exchange):* Wikipedia, [34], describes it as "a method of language learning based on mutual language exchange between (usually two) partners. Ideally, each learner is a native speaker in the language the other wants to learn." This method is practiced by several language schools. There also exists web portals where any user can register and search for a partner that match required search options. Italki.com is probably the largest site in this genre, and will be presented in chapter 5. This method seems like a highly informal way of learning a language, since the partners may define the learning process completely by themselves. However, a

partnership may choose to organize their language exchange in a structured and organized way, such that the method turn more formal.

- *CALL:* There exist many trends related to CALL. Existing frameworks and services will be presented in chapter 5, whereas chapter 6 will point out general trends in ICT that also affect CALL.

5. EXISTING FRAMEWORKS AND SERVICES OF CALL.

This chapter will present some existing frameworks and services of CALL, both for stationary and mobile environments.

5.1. Existing Frameworks and Services – Stationary Environments.

5.1.1. Moodle for Language teaching.

There exists an own category for Language teaching in Moodle. It offer task types as audio recording, chatting with other online course members and a forum for teachers about how learning can be carried out, what task types that are appropriate at different levels and so on. This Framework constitutes a good option for teachers who want to offer a solid, formal environment to their learners.

5.1.2. italki.com

This is a social network portal where any user can sign up and request partnership with other members. Learning happens with the Tandem method mentioned in chapter 4, as well as by studying material brought by other members (documents and media files) or reading/contributing in discussion forums (groups) and wikis. This

5.1.3. BBC's Language Steps, Flat mates and Blog area.

Bbc.co.uk offer different language learning services on their web site. Most of their services are of good quality and user friendly, so I find it naturally to include some of them as examples here. Their beginner's programs to different languages are especially good.

Language Steps:

Here is a presentation of the different features BBC offers in the 'Language Steps' section. All figures are found in Appendix A.

- **Overview of the different stages/modules in the program** (see Figure 7): BBC recommends doing these modules in order, but if the user is comfortable with some of them he can just move to the next one.

- **Syllabus** (see Figure 8)**:** Contains an overview of the different learning units, as well as objectives, grammar tips and cultural facts related to each of the units.

Here is a slightly modified definition taken from englishraven.com:

A syllabus outlines the sequence and content of a learning program, and how learning is to be carried out. It embodies the general and specific objectives of the course. A syllabus can be as simple as a sequential order of textbooks to be studied, or it can be more elaborate and include types of testing, learning objectives according to level, accompanying materials, teaching aids, homework schedule and assignments.
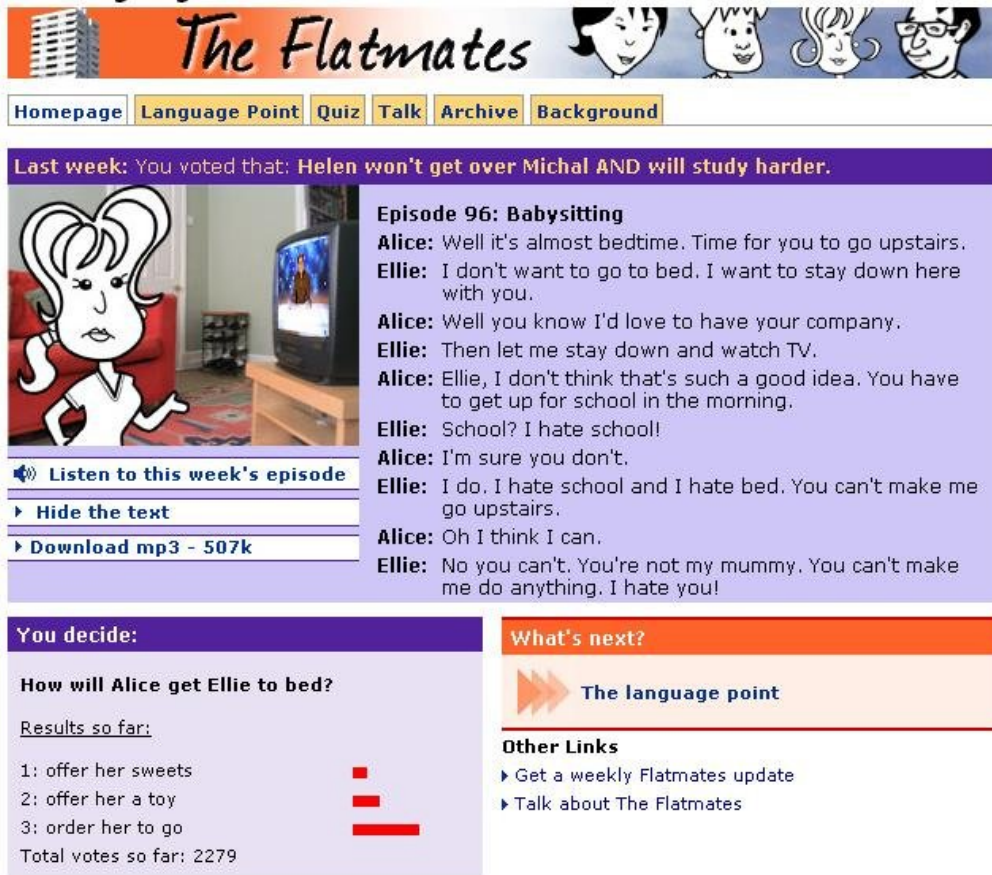
- **Grammar Tips** (see Figure 9)**:** We see there are several units in each module, and each unit deals with one grammar tip. A click on a grammar tip brings a short explanation of this grammar.

- **Fact files** (see Figure 10): The fact files give an introduction about the culture in the target language.

- **Dialogue presentation** (see Figure 11 **,** Figure 12 and Figure 13)**:** As we can see from Figure 11, the user is presented a dialogue in Spanish as a slide show. The expressions are being played from a recording as the text appears on the screen and a picture illustrates the setting clearer. If the user wants to hear the expression again he can click on "Show Spanish/English/Sound only". "Show English" means English text, but the dialogue voice is still in the target language. When the user is comfortable with the expression he moves to the next. After being exposed to five expressions the user gets a summary of the dialogue (see Figure 12). The expressions are then replayed and the user can replay the dialogue as many times he needs. After this part is done, the user is expected to do a couple of activities. One example is to rearrange the dialogue by dragging the right expressions to the right illustrations (see Figure 13). As a help to understand the dialogue better, the user can access the relevant grammar tip or get a list of the key words related to the dialogue (see Figure 10).

- **Different tasks based on the dialogue:** After the user has studied the conversation and gotten familiar with the key words, he gets exposed to different tasks. One example that illustrates this is given in Figure 15. Here is the user asked to find a location on a map, based on some instructions given. In Figure 16 we see a grammar example where the user is asked to find the right articles of illustrated words. Figure 17 is showing a listening exercise where the user shall match the recordings with the different pictures.

Comments: We see that the features in this "package" are interactive at some points and also provide a great deal of content based learning and task based learning. As we learned from [16] in chapter 4.1, visual techniques, verbal explanations and use of dictionaries were said to be good techniques for vocabulary learning. Some of the features here do have elements of these techniques.

'The Flatmates'.

Figure 4: BBC's Flatmates. [21]

The Flatmates is a kind of Internet based soap show, presented with audio recordings and text. The author adds a new episode every week and the audience gives feedback on how the story shall carry on. In addition to the dialogue presented are there also these sections:

- A "Language Point" section, explaining the language in more detail,
- A "Quiz" section, testing the learner's received knowledge,
- A "Talk" section, offering the audience a place to discuss the episodes,
- An "Archive" section, with all previous episodes.
- A "Background" section, presenting the different characters in the show.

Comments: This framework is a good example of how it's possible to create a learning environment on the Internet that is not a typical school course. All users are at some level able to make influence on the show, which is a step towards user generated content.

Blog area.

The user can regularly be active in discussions on different blogs, including his own. The motivation for expanding the language knowledge is then based on the principle of "learner centered learning", mentioned in chapter 4.1. Blogging can also be provided by different media (text, pictures, recordings and videos), offering the user different ways of blog contributions. This activity helps the learner to both train reading, listening (recordings and video clips), speaking (own recordings) and writing.

Comments: Blogging has already become a widespread phenomenon. One example of that is that Google now offers a separate blog search, blogsearch.google.com. There are many benefits about being an active blogger in the target language: The user has to sort out his thoughts and come up with a presentation that is available for a wide audience. Further on will he get and give feedback on different subjects such that many dialogues are carried out at the same time.

5.1.4. Translation Tools.

There are numerous translation tools that are able to translate documents, texts and websites. Babelfish [22] is one example. Robert Godwin-Jones writes in [23] that Gymnaziella is an open source tool that also offer creation of glossary lists to texts requested. It's also applied a link to Google's Image search for a visualization example of the word or phrase.

5.2.   Existing Services and Frameworks – Mobile Environments.

5.2.1. Moodle for Mobiles.

Moodle for Mobiles support two features at the moment – A quiz application and a feedback application (for detailed information, see Moodle.org). This means it is possible for learners

to both create quizzes (if it is allowed by the course instructor) and feedback schemas, as well as participating in these modules.

Another interesting thing to mention is the design tips presented for learning tutorials for iPhones (see figure below):

Creating Mobile Learning Tutorials for iPhone/iPod Touch

SumTotal who now owns Toolbook created this best practices for Mobile Learning Development

Limit Graphical Content With the tight mobile device screen being roughly a twelfth (or smaller) of a desktop screen, large-screen graphics not only increase load times, but also take up valuable space that is needed to display text, hyperlinks, and other important information.

Text Considerations Text should be limited - briefer is better. Layout should be structured to avoid the need for scrolling. Thus, this involves breaking up text into smaller pieces/sections and linking to those smaller pieces, instead of putting a lot of text on one screen. Smaller fonts are also recommended. For example, Microsoft Windows Mobile standard is Tahoma with a point size of eight, which is an appropriate size for text viewed in the Apple iPhone's Safari Web Browser.

Limit Use of Data Entry Since the keyboard is a limited size, input fields should be kept to a minimum to reduce the amount of typing. Where possible, provide possible text or phrases to avoid needing the user having to type. These text items should have a hyper-link associated with them to serve as an easy way for users to select them, rather than their having to type them on the keyboard.

Utilize Empty Space Another design guideline is to utilize screen space. Avoid excessive horizontal and vertical spacing between screen elements. Unlike designing a print ad or brochure, you don't need a lot of "white space" on mobile device's screen.

Place Non-Essential Links at the Bottom of the Screen Hypertext links that are not relevant to the

Figure 5: Best practices of how to create learning tutorials for iPhone and iPod Touch [45]

5.2.2. KODI.

KODI is a dictionary application for mobile phones that support Java. It supports several languages and is designed for numerous phone types. It offers search in both language directions, presents synonyms and suggests the most similar terms if a word is mistyped.

This application could be used in both formal and informal settings, in the same way as other dictionaries are used.

5.2.3. Coolgorilla's talking phrasebook.

Coolgorilla.com offers downloadable phrasebooks with possibility for audio playback of the phrases for most Nokia, Sony Ericson and Apple handelds. Other users are free to use the online version where it's possible to download each soundtrack manually. Phrases are sorted in different categories, much in the same way as BBC has done with their phrases.

This is a typical informal service that for instance is useful when being on vacation in the target country. It could also be used in any other setting where the user wants to exercise pronunciation of phrases.

6. TECHNOLOGICAL POSSIBILITIES AND CHALLENGES.

6.1. Technology and Market Trends, in general.

6.1.1. Web 2.0 and user generated content.

Wikipedia introduces Web 2.0 with the following definition:

"Web 2.0 is a term describing the future trend in the use of World Wide Web technology and web design that aims to enhance creativity, information sharing, and, most notably, collaboration among users."

The concept became widely known after a conference held by O'Reilly Media held in 2004, according Wikipedia, see [28]. Tim O'Reilly describes the phenomenon as using the Internet as a platform by designing web sites and solutions after one or more of the following seven principles (taken from [27]):

1. Services, not packaged software, with cost-effective scalability.
2. Control over unique, hard-to-recreate data sources that get richer as more people use them.
3. Trusting users as co-developers.
4. Harnessing collective intelligence.
5. Leveraging the long tail through customer self-service.
6. Software above the level of a single device.
7. Lightweight user interfaces, development models, AND business models.

Facebook is a successful example of a Web 2.0 service. It is one of the biggest social network sites, together with LinkedIn and MySpace. The common factor for these sites is building virtual networks by requesting a bond to friends, family or colleagues. Facebook offers a wide selection of applications, which can be developed by anyone by using the Facebook platform. MySpace offers the same opportunity with the API 'Open Social' developed by Google [29]. One of the most popular applications on Facebook is 'photos'. This let you upload an unlimited number of pictures to your profile. It's also possible to gather the pictures in albums and *tag* the pictures with person names or key words. Other popular applications are 'events', which let you invite (parts of) your network to your own or other events. An important aspect of the socializing is that members may publish 'feeds' when they change their status, join events or tag other members in photos. These feeds then appear in the 'news' window by the member's friends. Similar feeds might be distributed by any other application as well. These sites follow at least principle 1, 2 and 3 at a high degree. Facebook and MySpace also offer their service in mobile versions and might therefore apply for principle 6, as well.

Wikipedia is a good example of a website that has made success with principle 4. It is a huge encyclopedia holding as high quality as other "professional" encyclopedia (according source to come), with content production from volunteering contributors.

Amazon.com is a typical example of a company with a selection of products which meets almost any taste from the customers. They offer million of titles of books and music. This makes the company benefit from the Long Tail theory (introduced by Chris Anderson) which in short states that the total sales of less frequently sold titles equate the sales of the top titles. Further analysis should be done to see detailed statistics. It may also differ between business areas. Another example in this genre is seeqpod.com, who offers streaming of music directly from the users' artist or song title search. If the song or artist doesn't exist, the seeqpod team states that they will do an effort to get the demanded item.

Youtube.com is another classical Web 2.0 portal. The site consists of millions of videos contributed by the users, available by streaming. The videos can be everything from how to knit a tie, to crazy karaoke performances in family parties.

As we see, web 2.0 is much about participation and user generated content. Research results in [37] shows that 70 % of Norwegian youths (aged 16-19) daily participate in 'network societies'. The most popular sites, as of December 2007 was Facebook and Youtube. Reasons why they participate in the societies are listed as:

(According the survey in [37], held December 2007.)

1. Meeting friends. (82% agreed)
2. Easy to share photos and videos. (58%)
3. Nice to see 'what is going on'. (51%)
4. Getting new friends (37%)
5. Appreciate new applications/plugins (35%)

Interestingly, only 8 percent answer that the network societies help/are used for school related work. The results also show that the youths in average contributes in 3,4 societies, but these societies should offer different kind of value to the user.

6.1.2. Rich Internet Applications and Network Access to content.

Robert Godwin-Jones also mentions in [23] that we probably will see richer documents in the future. 'Richer' refers mainly to more dynamic content presentation and more flexible search

options and possibilities. The user will also be able to link comments/notes directly on components in the document.

Photo albums on Flickr.com, Videos on YouTube.com and mail on Gmail.com is stored on distributed servers, such that the content is available for the user any time he has a connection to Internet.

6.1.3. Fixed Cost for general Internet Access. Various Business Models for Content and Services

Fixed monthly cost for Internet access from fixed line operators has been the standard for some years now (at least in the US and most of Europe). It seems like mobile Internet access will follow the same pattern, but at the moment it is more expensive and the bandwidth and general QoS is not as good as for fixed line subscriptions. Here is a simple example: Unlimited mobile access from Netcom or Telenor costs kr 499 per month. Maximum download capacity is 7.2 Mbits/s with the HSDPA technology, but tests has shown that experienced capacity seldom is more than 1-2 Mbit/s. The capacity also varies much according a test from Dinside, see [38]. In comparison does a fixed line subscription up to 16Mbit/s cost 465kr per month from Tele2 (as of July 2008).

Variable cost for content on Internet: Single "event tickets" can be bought for big culture and sports events. During the world championship in soccer did it cost kr 49 to see some of the football matches from TV2.no. Yahoo.com charges the customers $2.99/3.99 (as of July 2008) for unlimited use of their music service Launchcast Plus which offer customized radio channels with million of songs. sf-anytime.com offer movie rental from 9kr per movie or 99kr per month for a subscription that gives access to 25 chosen movies for that month. Many companies charge software licenses for the software they have developed which is available for download. The antivirus company AVG charges for instance 35 Euro for their Anti Virus 8.0 license that covers one year use on one computer.

Another typical business model can be to earn from commercials posted on the internet sites. The commercials can either be paid by 'number of clicks' or by a fixed amount for a banner over a set time period. Yet another model can be to charge users for items they want to sell. Finn.no, a popular market place for used items in Norway, offers private persons the possibility to post items for sale. One advertisement costs from 0-35kr dependant of advertisement type and period length.

6.2. Specific Technology and Market Trends for the Mobile Segment.

6.2.1. Different Mobile Browsers among the Terminals.

There exist several Mobile browsers for today's mobile phones. According [39], Apples Safari and Nokias browser on the S60 platform dominate the market. Nokias browser is based on WebKit (according Wikipedia in [40]), an open source framework also used for Google's Android platform and mobile browser. Other popular alternatives are Microsoft's Explorer for Windows Mobile, Firefox will soon release a mobile browser and Opera has both Opera Mobile and Opera Mini. [39] Mentions that Opera Mini is the largest independent browser (which means browsers that are not pre-installed in the terminal). The special thing about Opera Mini is that Opera first compress the downloaded side at their server in Norway before this compressed version is sent to the users phone over the wireless network. The other browsers read the original pages as they are and present them customized for use on the supported terminal(s).

The challenge lies in the usability of mobile services. Surveys have shown that the users of Apple's Iphone surf on Internet much more than users with other phones, according [41] CTIA 2008 flourished with touch screen devices that will try to take up the battle with Iphone writes New York Times in [42]. We might therefore expect many applications and browsers to be customized for touch screen handhelds in the near future.

6.2.2. Dedicated e-Book Readers:

- **Dedicated e-Book Readers:** Reference [23] also mentions the appearance of new dedicated, portable e-Book Readers. The largest progress has been improved readability and portability. The readability is naturally better with larger screens, but the article also mention these considerations regarding readability: "The enabling technology is called E-ink, which uses electrically charged microcapsules of ink (black and white) to display the letters. It requires no backlighting and consumes power only when the page is turned, thus improving battery life." The article also mentions another technology, e-Paper, that is

superior to e-Ink regarding refresh rate of pages. Other features of these readers are connectivity over a USB connection, WiFi or the 3G Network.

6.3. Convergence.

6.3.1. Convergence in general.

This topic is highly relevant when discussing all types of new (and existing) technology, services and platforms. It has many aspects so I'll only present the issues that are most relevant to the scope of this thesis. Gunilla Bradley provides a good high level overview of the main convergence processes in chapter 3 in [24]. She mentions ongoing convergence processes within the following areas:

- *Globalization*: Convergence between technology, economy, values, norms and labour markets across nations.

- *ICT*: Convergence of computer technology, telecommunication and media technology in general.

- *Life Environment:* Bradley points out that work, home and public environment are converging to a common 'life environment' where work and public environment are moving into our homes. One example could be that workers bring their mobile phones home, thus still available for a work related dialogue.

- *Life role:* The professional, private and citizen's role melt together. Bradley stresses that this is an important aspect in social psychology where the roles represent a level between structures and the individual.

As we see has ICT a large impact on all the convergence areas, and further theory mainly apply to ICT and Media Convergence.

6.3.2. ICT and Media Convergence.

Henten , Falch and Tadayoni provide a good overview of this aspect in [25]. They present the following sectors and level of equipment that are involved:

	IT	Telecom	Broadcasting	Other media
Content/ services	Software based content	Telecom based services and content	Broadcast programs	Film, music, newspapers, etc.
Transport/ software	Generic software	Network services	Transmission	Cinemas, video rentals, etc.
Equipment/ hardware	Hardware	Telecom equipment	Broadcast equipment	Reproduction of films, printing, etc.

Figure 6: Overview of sectors and equipment often associated with ICT and Media Convergence [25].

The authors in [25] make it clear that we can have convergence (and divergence) both vertically and horizontally in the matrix. They further remark that content can be distributed by more than the "traditional" sector, since digitalized media can be transported on different infrastructures.

An example here is distribution of music. The traditional way of purchasing music was by visiting a record shop and get albums or singles in form of LPs or CDs. The record shop industry has decreased its sales the last years, due to competition from legal digital distribution by actors like Apple and Amazon, and illegal downloads between users on P2P networks. In several countries have also telecom operators joined the competition by offering music downloads directly to mobile phones.

The authors in [25] also mention the following factors that impact the convergence processes in the infrastructure:

- *Network architecture:* The broadcast networks were originally designed for one way communication, as the main goal was only to transport the signals to the end users terminal (typically TV). In the later years have we seen a demand for interactive services, thus have the digital broadcast networks included two way communication. However, the capacity per user is still limited because users are connected to distribution points in the network and share the network resources. Telecom networks were traditionally built to provide point-to-point services (using POTS as example), and network resources between the user and the first switch in the network are not shared. This makes it a flexible type of

architecture. But if we will distribute broadcast content in this network type, there will be much overhead as each switch and router must provide the same job for every user. As we see are the broadcast networks most suitable for distribution of common content, while the telecom networks (traditionally) are designed for point to point communication. Therefore are there many things to take into consideration when introducing a service on one or another network architecture.

- *Capacity / bandwidth:* Distribution of video content demands much bandwidth. Therefore are not all networks able to carry this service type. Resolution and screen size is also an important aspect to consider here. Video telephony has been offered (for small screens) by the telecom operators since 3G was introduced, but a full HD transmission to a larger screen would demand several Mbits/s (dependant on coding scheme). It's also important to check that all (central) underlying network components support enough bandwidth, as the narrowest link will be the bottle neck in the network.

- *Quality of Service:* Most services have user expectations related to maximum response time, delay variation, error rate and other measures. These factors must also be taken into consideration when introducing a service on a network.

- *Way of use:* The authors in [25] address the typical question if a service is to be used in a fixed or mobile network. If a service is to be introduced for use in moving cars or trains, one must live with the fact that the bandwidth gets narrower. For 3G networks the speed reduction is typically from 384kbits/s to 128kbits/s, according Wikipedia, [26].

The third main convergence process is for the equipment/terminals. For handhelds do we see that phone, camera, music player, file storage, GPS technology, mail client, web browsing and utility functions as calendar, timer, memos and so on are becoming standard. Nokia's N95 is one example with these specifications. Perhaps will we see that the dedicated eBook readers also converge with these terminals in the future. The authors in [25] mention the PC as a competitor against the TV as an access device to broadcast channels, as low cost TV tuner cards are available for most PCs. At the same time do many people nowadays connect their big screen TV to a 'media server' that might run on Windows Media Center, offering Internet services via a standard web browser plus interactive TV services via specialized program guides. I

I would also like to especially illustrate the convergence processes that happen in the fixed and mobile networks nowadays. Reference [43] provides a good presentation of this phenomenon. We see examples that voice traffic is being carried over data networks with Skype and other IP telephony vendors as the largest drivers. Voice traffic has traditionally been associated with switched line networks as POTS and GSM. But this is now changing as the IPv6 protocol supports wireless real time media. Mention At the same time do we also see that more and more data traffic is being carried over the mobile networks as the terminals are getting more user friendly for web surfing with new browsers and terminal interfaces (like touch screens). This might lead to a situation where speech and data will be carried over the same network protocol in the future.

It is also possible for entities to diverge. One example is the case of divergence between network operators as own companies and other (merged) companies who supply equipment for the physical network, as described in [43] in chapter 3.4.4.

6.4. Challenges Related to Technology.

There are many challenges related to all technology. Below is a short description of some:

6.4.1. General Technological Challenges.

- *Standards and formats*: Many technologies are designed for a particular standard or format. There are several examples of equipment that only support a limited set of media formats, software platforms, communication protocols and wireless technologies. Therefore will users in most cases have something to gain and something to lose when choosing equipment type. Apple's iPhone is one example since it does not support the wide spread media format WMA. This is a typical strategic move by Apple in order to push Microsoft's proprietary format aside from the market. There are organizations that work to develop, interpret and maintain standards in cooperation with consumers and companies. Examples are ISO (International standards organization), ITU (International Telecommunication Union) and IETF (Internet Engineering Task Force).

- *Migration of technologies and standards***:** Most migration cases related to technology come with issues. Software developers must for instance assure that new versions of an application or service are backward compatible with an older version. Another example is the migration of speech communication to the IP networks. It has been observed several challenges regarding security and QoS on this topic. Rossebø and Sijben (see [44]) illustrate some issues regarding authenticity, privacy, and availability.

- *User friendliness:* It has been mentioned in an earlier chapter, but I would like to stress it again – user friendliness is crucial for a technology to be successful. If it takes to much effort from the user to using the technology, he simply isn't interested.

6.4.2. Social/human challenges.

Bradley (see [24]) mentions that we have an increased dependency on computers and networks. She doesn't concisely say from when (apart from mentioning year 2000 in the introduction), but I would say we can assume from the Internet as a global phenomena (which at some degree could be early in the 1990's). This leads to increased expectancy that things work as a whole, and stress situations arise when things don't work as expected. Bradley mentions stress phenomena as,

- *Information overload*: Type the key words 'museums in Rome' at google.com and you receive more than 5 million hits (as of 14th of July 2008). It is not trivial for a user to know which site provides the necessary information.

- *Contact overload*: This phenomenon is also described in Chapter 2 and reflects that increased availability via communication devices also might lead to an increase in requests. This is again boosted by the convergence of life roles depicted by Bradley.

- *Demands for availability:* I would say that this apply for both humans and communication networks. When it's known that people can be reached in several ways it's also expected to get a response, at least when trying all options. Speaking for myself I can be reached via a phone call, SMS, email to work address, email to private address or by sending me a message on Facebook. For the communication networks we expect that they work every

time we want to use a communication service that is offered by the network. Users get frustrated and might speak negatively about the service if it's too often unavailable.

- *Lack of organizational filters*: Bradley mentions that the new 'Network companies' evolve in a way that make all organization units easier available for each other. I've heard stories from older colleagues who tell that at some companies in earlier days you had to have an appointment before you could walk in (or even use the elevator) if you wanted to meet someone in another organization unit. Today, anyone at a company can be reached via their mobile phone or email address. Although, employee rank and (the company's) cultural etiquette might limit the cross-unit requests.

- *Difficulty of separating 'noise' from essentials*: I would say this is a consequence of the information overload and contact overload described above.

6.4.3. Challenges related to Economy and Politics.

- *Copyright of content:* Wikipedia defines copyright in this way: "Copyright is a set of exclusive rights regulating the use of a particular expression of an idea or information". Naturally, musical compositions get copyrighted. Digital books and music can be perfectly copied and easily traded, for instance over P2P networks. Restrictions on copyrighted music usually make such trades illegal and this form of trading is often associated with piracy.

- *Business Models*: There are signs that lead to business models where the users pay for access to a package of content from several contributors. (Yahoo's customized Internet radio is one example). How should the contributors be paid in this way? It will be impossible to define a completely "fair" model, so compromises and negotiations must be made.

- *Hard competition:* Globalization and capitalism has partly contributed to a world with a handful of big actors in the ICT business. Microsoft, Google and Nokia are three examples of actors that control a large market share in each of their sector. As convergence is a matter of nature (described earlier) companies like these will probably

expand their operation across sectors, as well. With a world with big actors it is not easy to come in as a small actor. They often have to operate in niche markets or they get bought from the bigger actors (for a big sum of money) when they see the entrants have potential for competition.

- *Regulation:* Henten et al. describe in chapter 5.1 in [25] that the purpose of regulation in ICT generally can be analyzed in two categories. The first is to remedy market failures, and the second is to promote a social agenda. Despite a suggestion of different scenarios for regulation in chapter 5.4 there are complex considerations that must be taken by the regulators and there is seldom a single answer to what outcome is the best in these cases.

7. SUMMARY / CONCLUSION.

Many topics have been touched in this thesis. I would like to conclude with some answers to the questions raised in the initial problem description and point out further challenges in some cases.

We have seen that there exist several approaches for CALL, with virtual learning communities as one example. The community presented here, moodle.org, is an open source framework and let any user register for free and manage a course. In that way may this framework be used by school institutions, professional language course providers and other users who feel free to organize a course. This environment is quite formal in nature, because most of the use at the portal is related to a registered course. Another portal, italki.com, offers language learning after the tandem method and users are free to search among all (visible) profiles on the sites to find a match. This is a more informal framework as the users are not connected to any established educational institution, they do not necessarily follow a curriculum and the learning is not instructed to follow any pedagogical principles.

These portals may be accessed both in stationary and mobile environments (by mobile browsers). In the case of mobile environments there exist many challenges: Developers of the site are requested to take special considerations of how some material is to be structured to fit the interface at the user's terminal. One of the considerations at moodle.org was for instance to limit graphical content (illustrated in chapter 5.2.1), as this takes up much space on the

screen and uses quite a bit bandwidth to download. Other challenges can be related to media richness and context awareness discussed in chapter two. One example could for instance be a video conference lecture held at a moodle course. If some of the users are in a mobile environment without the possibility to transfer video (because of terminal or bandwidth limitation), they should still be given the option of following the lecture by audio transmission. This will reduce the richness of the lecture, but they will be able to catch up the most essential things.

BBC offers another kind of framework which is typically meant for beginner learners in a language. The material in 'Language steps' is instructional and interactive, as it requires response and apprehension from the users. This makes it most suitable for stationary environments, but the content could be presented in a mobile environment to. The "Rearranging the dialogue" task will probably be suitable for a touch screen handheld. The content in the different modules could also be categorized to fit the current response flexibility of the user. An example of different categories was given in chapter 2. Another framework presented from the BBC portal was their show "The Flatmates". This is an internet based soap show where the episodes can be followed by downloadable tracks or simply be read. The users may contribute to the show with discussion about the characters and give feedback about how the show should continue. This is a good example of how the Internet can be used as a platform for participation among users.

There also exist mobile applications like KODI's dictionary and Coolgorilla's audio phrase books. These can be categorized as referential tools and can be used in many settings, remarking that the audio phrase books in most cases are suited for beginners on vacation in the target language country.

Chapter 6 discussed general possibilities and challenges related to technology and market trends. Web 2.0 was presented as the future trend of Internet usage and web design with key words as creativity, information sharing and collaboration between users (and companies). A survey, held by the Norwegian institute ITU has showed that Norwegian teenagers at average participate in 3,4 'network societies'. Facebook was the most popular. The biggest reason to participate in the networks was to meet friends. Only 8 percent answered that the networks provided help for school related topics. This shows that most of the interaction in these networks are informal among the teenagers. Could we still expect more participation in school related topics in such networks? The answer is yes, and no. The technology exists to promote school related subjects in these networks, but it would be a challenge to mix the pupils' (and the teacher's) roles in such a situation, as depicted in chapter 6.3. Hans Christian Arnseth also

points out in [46] that the question about using more web 2.0 applications in the school system is much about ideology – "What do we regard as proper learning and how can/should technology be used in the education?".

At last were some general challenges related to technology presented, with issues around convergence, human aspects, business models and policy as the main issues. Copyright policy and business models can be even more complicated in the evolution of web 2.0 interfaces, where content sharing and user participation goes hand in hand.

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9. APPENDIX A: SCREENSHOTS FROM BBC

Itinerary

1. Finding your feet
- Taking a taxi ride
- Checking into a hotel
- Ordering a snack
- Finding your way around
- Challenge

2. Night out
- Ordering tapas
- At a restaurant
- Meeting people
- Going for breakfast
- Challenge

3. Shopping
- Using a cash machine
- At a market
- At the supermarket
- Choosing clothes
- Challenge

4. At home
- Being shown round a flat
- An invitation
- Meeting a Spanish family
- Chatting over a meal
- Challenge

5. Moving on
- Buying a ticket
- Getting tourist info
- Finding a hotel room
- Visiting the sights
- Challenge

6. Work and play
- Saying what you do
- Describing a company
- Arranging a meeting
- Your spare time
- Challenge

Grammar tips   Syllabus   Cultural factfiles

Figure 7: Overview of learning modules. [20]

Stage 1

Finding your feet
Coping with the very basics when you first arrive in Spain

Unit	Objectives	Grammar tip	Culture
¡Taxi! Taking un taxi from the airport to the city centre	• Saying hello and goodbye • Understanding and replying to ¿dónde? • Saying thankyou • Reading/pronouncing street names	Sounds of Spanish	Taxis
El hotel Booking into un hotel	• Saying you've booked a room • Understanding key questions/requests • Recognising the numbers 0-10	More sounds of Spanish	Accommodation
Una tortilla Ordering a snack and a drink in una cafetería	• Understanding key questions in a café • Asking for a simple snack and a (non-alcoholic) drink • Using "por favor" • Asking for the bill	Two words for 'a': un and una	Snacks Refreshing drinks
Perdón, ¿el parque? Finding and checking out atracciones turísticas	• Politely attracting someone's attention • Asking the way to a place • Understanding key direction words • Asking for clarification • Using words for some tourist sights	Two words for 'the': el and la	Museums Spain's Royal buildings
The Challenge Finding out how much you've learnt	Coping in situations 1-4 above		

Figure 8: Syllabus of one stage/module. [20]

Grammar Tips	Unit
1. Finding your feet	
Sounds of Spanish	Taking a taxi ride
More sounds of Spanish	Checking into a hotel
Two words for 'a': un and una	Ordering a snack
Two words for 'the': el and la	Finding your way around
2. Night out	
Plurals	Ordering tapas
The dictionary form of verbs: llevar, comer and preferir	At the restaurant
The words for 'I' and 'you': yo and tú	Meeting people
I and you verb endings: tomo and tomas	Going for breakfast

Figure 9: Overview of Grammar Tips. [20]

Fact files

I've always loved Spain, the language, the people, the way of life. Have a look at these fact files and you'll get to know a bit more about them.

Accommodation
Whether you're looking for a five star hotel or a student hostel, learn about where to stay in Spain and Latin America.

Breakfast specialities
Don't miss out on the most important meal of the day and some key facts on Spanish breakfast specialities.

Chemist's
Check out some emergency medical vocabulary and find out what makes the Spanish pharmacy so different.

Cinema
Spanish cinema is giving Hollywood a run for its money – find out the movers and shakers on the Spanish film scene.

Coffee
They drink an awful lot of coffee in Spain – here's where you can find out about the many varieties of the much-loved drink.

Figure 10: Fact files. [20]

Figure 11: First expression in a Spanish dialogue. [20]

Figure 12: Summary of the dialogue. [20]

Figure 13: Rearranging a dialogue. [20]

Figure 14: Key words. [20]

Figure 15: Finding locations on a map. [20]
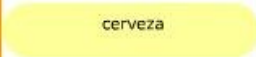
Figure 16: Illustrated grammar excercises. [20]

Figure 17: Listening exercise. [20]