Mobile Competence Development for Nomads

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Abstract

This paper outlines an ongoing research project on training, education and sharing of experiences among mobile people, also referred to as nomads. The importance for professionals to continuously learn is widely recognized. Organizations in the new economy are dependent on organizational knowledge and competence. Mobile workers need alternative educational and knowledge development opportunities that are not restrained by time and space.

The goal is providing competence development for nomads using 3:rd generation cellular networks – 3G, which combines high-speed mobile access with Internet Protocol (IP) based services. This allows mobile high quality multimedia. We present a preliminary study of the competence development situation of nomads. We outline two use cases of possible competence development activities suited for the mobile worker and the 3G platform.

1. Introduction

The importance for professionals to continuously learn is given major attention in both research and practice. It is often considered the main source of personal as well as corporate competitive advantage [21]. Organizations in the new economy are dependent on organizational knowledge and competence [17] and managing and developing these is a crucial matter in such organizations.

The new economy changes the nature of work. Evolving from predictable, deterministic work patterns to more contingent and idiosyncratic forms, distributed in both time and space. Work-conditions demand that people become more mobile. The evolution of work and the development of expertise have not been accompanied by innovations in the models used by workplace educators to develop this expertise. Although contemporary models are useful for many types of employee development, their potential for developing the type of skilled performance needed in a contingent and dynamic work environment is questionable [24].

It is often difficult for mobile people to allocate time for educational and training activities, as well as coordinating their mobility so that they can network with colleagues in person. Hence, traditional lecture-oriented courses are not considered as viable. Mobile workers and their organizations request alternative educational and knowledge development opportunities. They have special prerequisites concerning competence development and construction of knowledge.

The traditional classroom interaction pattern puts the learner in the position of an object of assessment: the instructor initiates, learner responds, and the instructor closes the sequence by either accepting or rejecting the learner's turn [22]. Distance education in general is following this pattern.

Contrasting the traditional classroom pattern with a perspective where knowledge is jointly constructed in interaction, i.e., social constructivism (cf. [18], [20]). When applying a different understanding of learning, a different approach to designing competence development activities is needed.

We have investigated the competence development situation of mobile workers, i.e., nomads. We have successfully developed models for stationary, asynchronous and collaborative educational activities for both educational and professional environments. Based on previous research we now are making a transfer to new applications and models, which allow mobile people to engage in genuine interaction in competence development activities.

Our interest is to understand the competence development needs of nomads and to support them with 3G or other wireless solutions as the platform.

The remainder of the paper is organized in the following sections: The first section is a discussion about the mobile people, nomads, and their competence development needs. We then continue with a description of the research approach applied. This is followed by a summary of constructivist learning as our pedagogical fundament. Then we describe the third generation cellular networks (3G). We present our case study concerning nomads and their special competence development situation. In the section Use cases, two possible scenarios of competence development activities designed for nomads using 3G is described. The paper

ends with our preliminary findings, conclusions and an outline of our further research.

2. Nomads and competence development

The workers in today's organizations are to a large extent mobile, both locally (in an office) and traveling between offices and other work locations. Their work is distributed in time as well as place. They operate in temporary work constellations. People work from home, on the move and in flexible office environments. These people are nomads [8]. Three situations, which are typical instances of mobility for nomads are traveling, visiting and wandering. Traveling is moving from one place to another in a vehicle. Visiting is spending time in one place for a prolonged period of time before the next period of travel. Wandering is extensive local mobility in a building or a local area [11].

To give a typical example of nomads we here recapitulate the findings from a previously conducted, not published study. To investigate how nomads perceive competence development we conducted interviews with six project managers from three Swedish organizations. All the interviewees manage large and critical projects. They work while traveling, they wander from one meeting to the next and their working days are filled with unplanned meetings. They seldom have time to network with colleagues and share knowledge. This small sample is given mainly as an illustration of the nomadic workers situation, rather than trying to provide complete understanding.

The interviews were of informal conversational format [15] and lasted for approximately one hour. The following areas were covered during the interviews: the persons background and how they have developed their competence in the field of project management, how they manage projects in general and people in projects more specifically they were also asked to comment the ideas of mobile competence development. Below we summarize the interviews by recapitulating some of the statements made by the project managers.

Time is a dilemma today. Most of the project managers feel that they only have time for the work that has to be done in the project and nothing else. Projects are becoming more time critical and many times there is a lack of resources. One of the consequences is that competence development is a low priority activity. Only one of the project managers saw the issue of time in a different way. *"Planning is the key to successful competence development; you need to be very thorough with your calendar. If you do that, you can participate in as many courses as you want."* Where as the rest of the

project managers were quite unanimous in their comment. One said: *"It doesn't matter how thoroughly I plan, there are constantly situations emerging, forcing me to give courses very low priority."* However, during the interviews one of the managers admitted that he had participated in courses, but that *"coming back to work after a course you have a lot of work to catch up on, and the days before a course are quite hectic too."*

The organizations have explicit policies stating the importance of competence development to the company. But then the "reality hits" as one project manager put it. *I have seen it so many times, that people been promised to participate in a course, but then requested to cancel their participation because the project comes first."* Half of the managers admitted that they had denied project members to participate due to heavy workload in the project.

A few of the managers had some experience of distance education and computer based training (CBT), but their experiences were not all positive. The main critique was the lack of interaction with other people in the courses they had attended.

The study shows that the project managers find it difficult to allocate time for traditional competence development activities a well as a lack of possibilities to network and share knowledge. We claim that nomads find it problematic to participate in traditional competence development. They require new forms of educational activities, in which they can participate at the time and place of their choosing. New activities for competence development, based on learning through shared practices, shared goals and shared conceptualizations of work tasks are needed. Competence management for nomadic workers must strive to find ways to sustain continuous cooperation among members of the organization, and continuous participation in the development of community knowledge while being mobile.

Clearly, the people we interviewed find it necessary to either change the organizational situation to allow employees to participate in traditional courses or find new approaches to competence development. An organizational change in how competence development is valued will however not change the possibilities of continuous, daily sharing of knowledge and networking among nomads. In the following sections we propose a new approach to deal with these issues.

3. Research approach

It is obvious that what the business world today wants is not so much critical and systematic knowledge in the realm of information technology as creative and

innovative ideas for new applications and services. Informatics is a discipline focusing on the current developments in information technology use [4] and presenting new ideas for such use [5].

This research project is conducted in close cooperation with Ericsson in Sweden and their interest is identifying applications and services suitable for 3G.

4. Third generation cellular networks – 3G

The choice of technology in the research is third generation cellular networks – 3G. The two most important components of 3G technology are WCDMA (Wideband Code Division Multiple Access) and UMTS (Universal Mobile Telecommunication System). WCDMA is the radio access technology selected by ETSI (European Telecommunications Standard Institute) in January 1998 for wide-band radio access to support third-generation multimedia services. It is optimized to allow very high-speed services such as video conferencing and multimedia on Internet enabled mobile devices. The technology will provide access speeds up to 2Mbit/s in hot spots, and 384 kbit/s wide area access with full mobility. Currently WCDMA is only available as evaluation systems developed independently of third-generation end-user-applications, providing a wide range of bearer services that permit different end-user applications to be evaluated. UMTS is the standard for delivering 3G services being developed under the auspices of ETSI. UMTS builds on the GSM (Global System for Mobile phone communications) standard.

However there are still unresolved issues concerning 3G. The limited frequencies allocated for UMTS might not be enough to accommodate bandwidth demanding multimedia. However, there are other technologies with similar capabilities that will cover some of the wideband multimedia services, e.g., Bluetooth and Wireless LAN, at least in more local settings.

5. Learning and Competence

To continuously acquire new knowledge in a changing environment is a crucial competence today, and will be even more important tomorrow. In this research there are three ideals concerning learning. It should be constructive, collaborative and reflective. We strive to support this with mobile technology.

The concept of constructivism has come to cover a wide diversity of perspectives and there is rivalry among the different sects [16]. Social constructivism argues that in addition to most knowledge being an interpretation of personal experiences it is also social in nature: knowledge is jointly constructed in interaction (cf. [18],

[20]). Others [10] have put forward the idea of cognitive apprenticeship [see also, 3]. According to this theory, learning is a process of participation in communities of practice, at first legitimately peripheral, working its way to the more central positions. Learning occurs in interaction through cognitive apprenticeship in real contexts, in authentic learning tasks. From our point of view this theoretical learning framework puts forth interaction, i.e. the meaning making and knowledge construction process, as a focal point of developing new educational solutions and redefining the role of teachers and students. However, the two most important points from constructivism in our research are: "(1) learning is an active process of constructing rather than acquiring knowledge, and (2) instruction is a process of supporting that construction rather than communicating knowledge" [6, p.171].

In a collaborative learning environment participants are likely to learn as much from each other as from course material or from the instructor. We even claim that the most powerful and sustainable learning process occurs among peers who push and stimulate each other rather than being pulled through a fixed route by experts. Sharing of experience among professional is one type of collaborative learning. This way, collaborative learning is a creative process of articulating ideas, having them criticized or expanded, and getting the chance to reshape them or abandon them, all in the light of peer-discussion [19].

In traditional education learners are rarely given specially assigned time for reflection. We have to construct our models and applications so that reflection is supported to fulfill this ideal [14].

6. Learning Models

Here we present two competence development models for stationary settings. These models have been successfully tested in different organizations and are being redesigned and implemented to support nomads. After presenting each stationary model the transformation to mobile settings is discussed.

6.1. Multimedia scenarios

Multimedia scenarios are based on PIER, which is an approach to organizing learning activities using problem based learning (PBL), interactive multimedia (IMM), experiential learning and role-playing.

PBL builds on a fundamentally different understanding of learning than "traditional" teaching methodologies. It is a significant challenge to orthodox beliefs about education and learning [12]. PBL is: "…a

way of constructing and teaching courses using problems as the stimulus and focus for student activity. It is not simply the addition of problem-solving activities to otherwise discipline centered curricula, but a way of conceiving of the curriculum which is centered around key problems in professional practice." […] "… problem based learning start with problems rather than with the exposition of disciplinary knowledge" [2]. The responsibility of the educator in PBL is to present stimulating problems.

A great deal of attention has been focused on interactive multimedia in the educational domain. Commonly, IMM uses hypertext to permit links among pieces of information such as text, sound and graphics, and the learner "explore ideas and pursue thought in a free and non-linear fashion" [1]. IMM has undergone a revolution during the last years, from simple drill-oriented programs to advanced simulations where users receive support for understanding complex matters.

We see three current trends with IMM in general and educational settings. First, the World Wide Web rather than the CD-rom is becoming the main channel for distribution of IMM. Second, there is a shift from multimedia for individual learners towards multimedia application for groups [14]. Third, the interactivity that is getting the most attention is the interaction among the participants in the group working with the IMM, not the limited individual-computer interactivity.

Experiential learning refers to an encounter that the learner experiences. From this encounter, learning is initiated. In experiential learning: "… the learner is directly in touch with the realities being studied … [experiential learning] involves direct encounter with the phenomenon being studied rather than merely thinking about the encounter or only considering the possibility of doing something with it" [9]. Experiential learning is participative, interactive, and applied. It means experiencing the environment at first hand and to be confronted with processes that are uncertain. Experiential learning involves the whole person and learning takes place on the cognitive, affective and behavioral dimension [7].

Role-playing can be described as dramas in which a number of participants each portray a particular character, but no lines are provided as for actors [23]. An area where role-plays are frequently used is medical education where the objective is to simulate and practice different patient-doctor situations. Role-playing helps the students to view situations from alternative perspectives. Other common areas are training in law, police, military service, and management. In a higher education context, role-play is used to prepare the students for their future profession.

A multimedia scenario takes about three hours to go through and are conducted face-to-face in groups of 6-8 persons with big screen IT-support.

The scenarios paint a colorful picture of a situation relevant to the participants. For example: one scenario describes the progress in a fictitious development project. This scenario is used in an organization that has a problem with projects. The participants are confronted with some background information. They are each given different roles to play in the scenario. A story about a project is introduced to the participants, the storytelling is made vivid by multimedia. The members of the role-playing project group have to make choices trying to make this project a success. A session is two to three hours depending on how much discussion the participants engage in. When the scenario ends the project also is finished. This way time is compressed in the project to create an overview. The multimedia scenarios have been successfully tested in face-to-face settings.

Figure 1: The picture shows a multimedia scenario and the PIER approach in a stationary setting where the group of learners participates synchronously in the scenario with the use of a large screen.

Our application of the PIER approach consists of four activities: (1) concrete experience through role-playing with the aid of a multimedia scenario, (2) a period of reflection, (3) seminar where the scenario is discussed, and (4) ongoing and organized learning processes. The first activity is given most attention in this paper. The multimedia scenarios have been successfully tested in both educational and professional settings.

6.2. Mobile multimedia scenarios

With wireless 3G we will have the technical possibility of turning the multimedia scenarios truly

mobile. Participants will have the possibility to connect and role-play at the time and place of their convenience. The transfer to a mobile setting is however a great challenge.

The original multimedia scenarios, being face-to-face, are suitable for role-playing, communication and direct response for the participants. In the mobile multimedia scenarios we attempt to sustain as much as possible of the original environment's benefits. It is problematic because of the limitations of communication technology and small screens. We are attempting to create a human-computer environment on handheld devices that encourages and simplifies communication within groups as well as having support for our educational models in order to facilitate collaborative learning.

The duration of the mobile multimedia scenario will not be as compressed as in the multimedia scenarios. Since they are asynchronous and it is important that the scenario is role-played as a group activity, it is rather dependent on how much time the participants spend using the mobile multimedia scenario and how fast they role-play through it. The story that guides the role-players will not continue until all participants have viewed the last part (this puts some pressure on the members to engage in the activity and not keeping the others waiting for them). We also make a "cliffhanger" effect at the end of each part of the scenario: we want the participants to anticipate the continuation of the story and actively use the mobile multimedia scenarios.

6.3. Thematic modules

Thematic modules is a structuring philosophy which divides a net-based course into several self-contained uniformly structured units [13]. Every module has a well-defined beginning and ending. This is different from traditional modular structuring where a large topic area is divided into subtopics small enough to digest for learners (e.g., chapters in a book). In thematic modules, each module introduces a separate issue or problem, like tiny islands in a vast ocean of knowledge. The construction of "bridges" between the islands is done through facilitated net-based collaborative activities.

6.4. Nomadic modules

Our previous work with thematic modules is more easily applied to a nomadic environment than multimedia scenarios. The structuring ideas are applicable when planning and designing the basic structure of the 3G-based competence development as well as when choosing and refining the content of a education based on the concept of nomadic modules.

7. Use cases

In this section we outline two fictitious use cases of possible competence development activities suited for the mobile worker using 3G. The first use case is applying mobile multimedia scenarios as technology and methodology, and the second use case is applying the notion of nomadic modules.

7.1. Use case 1 - 3G project manager education through a mobile multimedia scenario

In this section we present a use case where a mobile multimedia scenario is used with 3G. A group of eight project managers working in a global telecommunications company are participating in a project manager education, which consists of distributed role-playing supported by a mobile multimedia scenario. The mobile multimedia scenario is supposed to prepare them for an international project. They will each be in charge of a part of the project at their local office. Below we illustrate a user's participation in the mobile multimedia scenario in a typical work situation.

Sarah is the project manager of the Brazilian office. She is having hectic day at work as usual. At the moment she is at a customer waiting for prototype presentation to begin. Nice with some time to relax, but after a while she is getting bored. She is eager to see if there are any replies to her comment on the decision she and seven other project workers are trying to reach a in the scenario. The scenario they are role-playing is a fictive IT project. She thinks that there is enough time to engage in some 3G competence development so she connects her terminal to the 3G project manager education. She views the new contributions to the discussion (Figure 2).
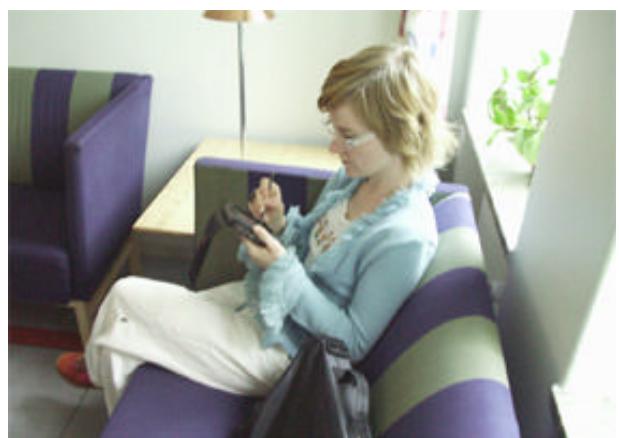
Figure 2. Sarah views the new contributions to the discussion in the mobile multimedia scenario.

Sarah is acting as a controller in the scenario, an unusual role for her. Bob, who is acting the project-manager, has argued for the decision alternative that leads to high risk and high cost, being in the controller position Sarah feels as that the risk is too high. The other participants seem to go with Bob and she feels she has to explain to them that the consequences will be devastating for the project. She disconnects and walks into the meeting-room just in time for the presentation.

Later that day, driving home from the customer, Sarah gets stuck at a road construction. She doesn't get very upset by this because all day she has been planning her comment to the group in the multimedia scenario, she has just been waiting for a moment to record it. Once again she connects to the project manager education (Figure 3).

Figure 3. Sarah records her contribution to the discussion while being stuck at a road construction.

She records her contribution. Now the cars around her start to move so she puts her device on audio and listens to the contributions concerning the decision while driving home. When she reaches her destination and has parked the car, she decides to vote for the low risk decision alternatives. It was predetermined that this scene in the scenario should end this evening and that all votes should be submitted before midnight. Through her terminal she chooses the low risk alternative. She looks forward to the next scene that depends on the result of the vote. It will be available the next morning.

7.2. Use case 2 - E-business education for mobile workers through Nomadic modules

An insurance company is currently in the midst of an organizational transformation. In order to create a well-grounded starting-point for the change process concerning the sales-persons, an e-business education program, based on the idea of nomadic modules, is launched for the workers (that to a large extent are nomads). A group of 15 sales-persons are participating in the activity. Below we illustrate a user's participation in the educational activity in a typical work situation.

Jack is traveling by train to meet a customer. He has to get prepared for the meeting but after reading through the background material of the customer he has time to engage in some 3G competence development. He connects to the e-business education that started this week, and views a short video that introduces the first week's topic (Figure 4).

Figure 4. Jack views the introduction of the e-business education on the train.

The video raises some interesting points. Jack is especially interested in the point about customer relations' management (CRM). He decides to initiate a videoconference with a colleague in his group to discuss the issue right away. The 3G platform indicates that his colleague will accept incoming videoconference calls related to the e-business education. Jack makes the call and they talk for five minutes and reach the opinion that CRM seems to be a fad. Jack decides to share their thoughts with the rest of the group and posts a short written message in the common discussion area.

When the train stops he disconnects and in the cab to the costumer he looks through the background material for the meeting once more. Later that day during a coffee break he is excited to know if the other participants have given any replies to his submission. He connects to the discussion area with his terminal. There are three responses to his original message: one written message and two video-mails (Figure 5).

Figure 5. There are three responses to Jacks posting on the subject CRM.

The written message is from Susan who has posted a part of a study showing that CRM systems can increase customer loyalty by 54%. The two video-mails are from colleagues who argue about the pros and cons of CRM. Jack is pleased by the quick responses; he enjoys and benefits from discussing with his colleagues. This has up until now been problematic due to their nomadic style of work.

On his way to his hotel, Jack connects to the e-business education and streams a recording of a recent debate on customer empowerment from public radio. At the hotel he reads through some of the articles available through his terminal. He feels he is able to make a stronger argument in the discussion now and sketches a line of argument on his hand-held terminal. Just when he is about to record his message he gets a phone call. His boss is in town and asks him to attend a dinner meeting this evening. On the subway on his way to the dinner Jack records his message (Figure 6). He smiles to himself and thinks: "This is mobile learning at its best…."
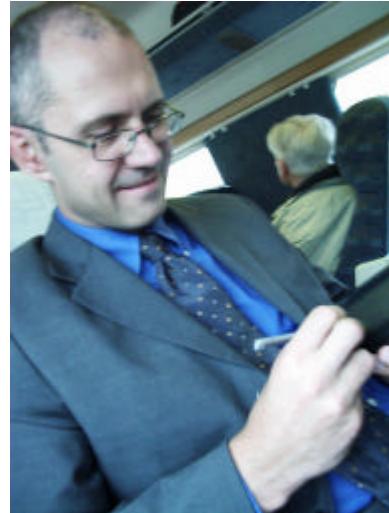

Figure 6. Jack records his message on the subway.

8. Initial findings

To examine whether mobile multimedia scenarios and nomadic modules is a feasible way to support nomads we made a preliminary study concerning the principles of mobile multimedia scenarios and nomadic modules. Twelve people who we consider nomads have been guided through the presented use-cases as well as confronted with a basic prototype of nomadic modules. They had hands-on opportunities and were asked to think out loud. They were enthusiastic. One commented the use-cases: "*It would be great to have the opportunity to competence develop while traveling but it should never be a must*". Another nomad said: "*I like the idea of sharing knowledge with colleagues, I never have a chance to do that in my daily work*". When trying out the prototype we received mostly technical and design comments but one participant said, "*I like the built in networking activities, but I doubt that having videoconference in public will really work*".

From this study we draw the conclusion that mobile multimedia scenarios and nomadic modules are worth exploring and therefore the concepts will be further refined.

To be able to redesign and evaluate multimedia scenarios and thematic modules on handheld devices we have used Compaq iPAQs Pocket PC and Sony VAIO C1 Picturebook (Figure 7). iPAQs were used for simulation of the expected small screens of the portable 3G – terminals (Figure 8). The Vaio (small size, built in video camera) is excellent for testing videoconference with a wireless LAN (simulating future 3G networks). Initial testing with demonstrational prototypes has been

conducted. This has given us valuable input on the possibilities and limitations of our concepts.

Figure 7. The Sony VAIO picturebook C1XS

Figure 8. The Compaq iPAQ.

9. Conclusion and further research

In this paper we have discussed problems and possibilities concerning competence development for mobile workers, also referred to as nomads. Based on a case study and the transfer of two educational models currently applied in stationary settings we propose two possible competence development activities for nomads. The ideas are exemplified with two use cases based on the third generation cellular network (3G). Using mobile multimedia scenarios and nomadic modules is one way to make the educational situation for mobile people better. We don't claim to have found the ultimate solution to the problem of competence development for nomads. The cultural and organizational issues have big importance concerning how nomads prioritize. Maintaining and developing competence is an organizational issue, not a technical. However wireless technology gives us the possibilities to reshape competence development.

Despite the technical possibilities with 3G, it is not realistic to expect that most people will engage in nice-to-have job-related training on their own time. We are also aware that many people find education as very important to get away from their regular work. These are two of the many soft issues this project is to investigate further.

Further research in this project will focus on exploring the situation and needs of the nomads and their relation to competence development. This part of the research will be conducted through fieldwork applying ethnographic methods.

We will develop more sophisticated prototypes and test them in environments similar to the expected 3G-platform, with small handheld devices (e.g. the Sony VAIO and the Compaq iPAQ).

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