Exploring the Potential of Mobile Services to Support Learning and Communication in University Classes

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Abstract

This paper presents initial results of our on-going activities regarding the use of smart phones and mobile services in university classrooms at Växjö University. The purpose of these trials was to explore and identify which content and services could be delivered to the smart phones in order to support learning and communication in the context of university studies. The activities were conducted within the MUSIS (MULTcasting Services and Information in Sweden) project where 41 students from two different courses at Växjö University participated during a period of 3 months. Generally, the services integrated transparently into students’ previous experience with mobile phones. Students generally perceived the services as useful to learning; interestingly, attitudes were more positive if the instructor adapted pedagogical style and instructional material to take advantage of the distinctive capabilities of multicasting. To illustrate, we report a case study of a class in the School of Humanities. We conclude with recommendations for increasing the potential for successful implementation of mobile services in higher education, including the importance of usability, institutional support, and tailored educational content.

1. Introduction

The rapid appearance of ubiquitous and inexpensive electronic microprocessors and wireless networks has led to the widespread deployment of mobile devices which allow us to access and manipulate information anytime and anywhere [1]. Diverse multimedia applications have flourished with recent advances in hardware and network technology, the proliferation of inexpensive video-capture devices, and widespread adoption of the World Wide Web. All these forms of interactive multimedia and communication offer new possibilities for supporting innovative ways of learning, collaborating and communicating [2].

While the mobile/wireless computing revolution is having a major impact on the ways people communicate and interact, it remains to be seen whether this transformation will live up to its promises and expectations when it comes to schools and universities [3].

In this paper, we describe our current efforts with smart phones and mobile services in university classes at Växjö University. These activities are conducted within the framework of one of our on-going projects, MUSIS. In particular, we present the results of one study conducted as part of the project, focusing specifically on the question of whether students would find a mobile phone useful for supporting their learning, and in particular whether mobile services would be suitable for supporting learning and other activities related to their academic life. In this exploratory study, 41 students enrolled in two different courses at Växjö University (VXU) were equipped with a Nokia 6600 smart phone. The trial lasted for 3 months. In addition to the phone’s standard applications, we developed and implemented specific educational services for students to receive course material, view their timetables, receive reminders about course deadlines and share multimedia objects.

Our results lead us to advocate a comprehensive approach regarding the introduction of smart phones and mobile services in university classes that considers not only technical features but also the individual, social and organizational aspects of technology adoption.

2. The context in which the trials took place: the MUSIS project at Växjö University

The main objectives of the MUSIS project are to explore, identify and develop a number of innovative multicast mobile services with multimedia information to be distributed over wireless networks using multicasting solutions at university campuses. MUSIS (http://www.musis.se) brings together TeliaSonera, Sweden’s largest telecom operator, the City of Stockholm, Växjö University (VXU), and Bamboo MediaCasting, an Israeli company pioneering in the field of cellular multicasting. Also, The Royal Institute of Technology (KTH) in Stockholm and Smålandsposten, a local Swedish newspaper, are strongly involved in this project.
Multicasting services developed in MUSIS are organized as a range of content channels to which users can subscribe. Each user can build a personal portfolio of channels that interest them. Multimedia content is sent, according to a predefined time schedule, to subscribers over the GPRS (General Packet Radio Service) network using multicast technology [4]. It is also possible to program the system in order to send content to the phones based on discrete events. The content sent to the phone is downloaded in the background and it is stored in the phone’s memory card. Once the content has arrived, the phone beeps announcing a new message has been received.

Users can then interact with the MUSIS client installed in the smart phone in order to look at the content; this process can be done as often as the user desires. This approach differs radically from the latest type mobile services offered by the telecom industries which are using streaming technology. The digital content used in our trials included TV news, music, entertainment videos, general information related to student’s activities to lecture notes (including video and audio), and specific information related to the different courses. The size of each MUSIS message sent to the phones can be up to 1 MB (several times larger than the actual size of a single MMS). Thus, we are able to send up to 2 minutes and 20 seconds of high quality video in 3GP format (a proprietary video format for cellular phones) or 10 minutes of good quality audio. Students are also able to send and receive MMS (Multimedia Messaging Service) messages. These two latest facts allow all phones to both receive and send audio and video content.

3. Method

3.1. Participants

Participants in this study were gathered by soliciting volunteers from students enrolled in two courses offered at VXU during the spring term of 2005. One course was offered in the School of Humanities, and the other in the School of Mathematics and Systems Engineering. Twenty two students from the course in the School of Humanities and 19 from the School of Mathematics and Systems Engineering volunteered. Each volunteer was given a “smart phone” for the duration of the school term (3 months). Instructors were also given a smart phone of the same type given to the students.

Although the number of participants was limited by the number of smart phones available, we were able to provide phones to all students who wanted to volunteer as participants. Each student signed a contract of use which specified their obligation to participate in the project in return for free use of the phone and a small amount of money they could use to make phone calls. The project also provided continuously available online and face-to-face support. The project began with a workshop session to familiarize the students with the smart phone and the software.

Participants ranged from 19 to 40 years of age, with a mean age of 26. Nineteen were female and twenty-two male. All 41 students already owned at least one mobile phone at the start of project. With regard to the issue of how much they spent on their own phone services before joining the project, on average a student in this group paid 28 USD a month. Twenty per cent of the 41 students participating in this study spent more than 45 USD a month.

3.2. Equipment and Services

The participants of the study were each equipped with a NOKIA 6600 smart phone, running on a Symbian operative system, with 128MB memory. The Nokia 6600 includes an internet browser, a bright 65,536-color TFT display, a camera equipped with digital zoom, a video recorder with audio, and a RealOne player for playback and streaming of 3GPP-compatible and RealMedia video clips. In addition, a MUSIS client has been installed in each phone. Figure 1 illustrates the NOKIA 6600 with the interface of the MUSIS client to access the different mobile services we have developed.

Figure 1. The MUSIS client interface.
throughout the project. However, beginning May 1st, users were able to subscribe to up to 30 channels of their choice using a Web interface (both available via a PC or a mobile phone) specially developed for this project. Results relating to these other channels are under preparation and they will be presented separately. Approximately 10% of the total MUSIS messages sent to the phones was on the educational channel. In this paper, we focus specifically on our experience and results with the educational channel.

Educational material delivered for this project include small “micro lectures” in video format, voice based course information and assignments, and specific information related to the logistics (calendar information, cancellation of lectures and so on) of the different courses. In the case of the “micro lectures,” the audio based and text information, the contents were developed for (and sometimes tailored to) the phone. This particular material sent to the phones was produced by the course instructor. In order to send this material to the phones, the teacher was using a special web interface we designed for this purpose. We also developed a number of solutions that allow internet-based educational resources used in the course to be sent automatically to the phones.

For instance, we developed an application that combines java and XML and it is used to convert the instructor’s contributions on the course FirstClass (FC) forum to an RSS (Rich Site Summary, an XML format for syndicating Web content) feed that is then multicast to the phones. FirstClass is a communication platform used at Växjö University mainly for distance education but also for campus based courses. There are two ways of accessing the FirstClass application. Either the students use the FC client software or they use a web based client directly from any browser. In the current version of FC implemented at VXU, there is no way to deliver this content to mobile phones. Our application has been designed to overcome this problem and it runs in the background of the FC forum, so the instructor’s contributions to the forum are automatically transformed to HTML format and then multicasted, so they can be viewed with the phone’s internet browser.

3.3. Data collection

Given the exploratory nature of this study, we used multiple methods to collect data. This allowed us to surface patterns of uses and attitudes that could be investigated more specifically in future studies. All data were collected in Swedish. First, participants completed web based questionnaires in weeks 1, 5, and 10 of the project. The first survey included items that measured personal attitudes toward mobility, attitudes toward media formats, and how much different media formats were used. The second and third surveys included items regarding perceived effect of the phones on learning, preference for different media formats, preference for channels, and perceptions of telephone functionality and usability.

Second, members of the research team facilitated four focus group interviews with 15 participants, which were videotaped and transcribed. The focus group ranged in size from 3 to 6 participants. The interview covered issues regarding the participants’ perception of the project in connection to the services, their functionality and their usefulness. Additionally, the participants were asked to suggest and discuss additional educational mobile services that could be developed.

Third, electronic copies of communication between students and members of the technical support team were archived. These messages were generated through a FirstClass discussion forum, or through an email listserv. Between 2 to 3 students on a weekly basis contacted the technical support team in order to report incidents at the beginning of the project.

Finally, a 90 minutes workshop with the students was held at the end of the term, which was videotaped. The purpose of the workshop was to carry out an open discussion with most of the students in order get an overall view of how the students experienced the project. The main objectives of this activity were to assess the usefulness and quality of the services, to identify problems experienced by the students and to explore how future MUSIS services could look like.

4. Results and discussion

4.1 General use and attitudes

The majority of the students participating in the MUSIS project had mobile phones of their own before they joined the project. Therefore, delivering content directly to the phone is transparent for them, integrating not only with their existing day-to-day practices, but also with their views of mobility and accessibility as central to their life-world [5]. However, before this project, even if their personal handsets supported a variety of features such as e-mailing, surfing the Internet, calendaring, and so forth, most participants used their phones only for making ordinary voice calls or for receiving/sending SMS. Generally, students’ attitudes toward the services improved when they could start choosing the channels of their preference. Students perceived MUSIS’ mobile services as something useful, dynamic and integrated in their everyday life.

4.2 Did students find mobile phones and services useful for supporting their learning?

Participants were more likely to see the mobile
services as useful the more it was integrated into their course content. The two courses in this study differ substantially in how the instructor used the technology. One instructor (for MEA708, in the School of Mathematics and Engineering) did not adapt his assignments or activities for the technology. The other instructor (for GIX 131, in the School of Humanities), actively produced content for this medium. In addition to sending a relatively high number of MUSIS messages (41) to students, 7 were multimedia in form (video and audio).

The importance of integrating the service into the pedagogy or instructional style of the course is illustrated in Table 1, which reports results from the survey item, “How useful did you experience the course related information sent to the educational channel?”

Table 1. Perceived usefulness of the educational mobile services after 5 weeks (n=41) and 10 weeks (n=41).

<table>
<thead>
<tr>
<th>Course</th>
<th>Week</th>
<th>Very Useful</th>
<th>Useful</th>
<th>Fairly Useful</th>
<th>Not Useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIX131</td>
<td>5</td>
<td>27.3%</td>
<td>45.5%</td>
<td>18.2%</td>
<td>9%</td>
</tr>
<tr>
<td>MEA708</td>
<td>5</td>
<td>10.5%</td>
<td>52.6%</td>
<td>21.1%</td>
<td>15.8%</td>
</tr>
<tr>
<td>GIX131</td>
<td>10</td>
<td>40%</td>
<td>26.7%</td>
<td>20%</td>
<td>13.3%</td>
</tr>
<tr>
<td>MEA708</td>
<td>10</td>
<td>3.9%</td>
<td>35.3%</td>
<td>41.2%</td>
<td>17.6%</td>
</tr>
</tbody>
</table>

In both classes, the majority of students saw the educational multicast services as useful or very useful in week 5. However, by week 10, that figure had dropped to less than 50% for MEA708. At the same time, the number of students in GIX131 viewing the services as “very useful” grew substantially.

With regard to usability and functionality of the phone itself, participants reported dissatisfaction with the small size of the mobile phone buttons, the quality of video, the small screen size, and some problems with video and audio getting out of sync.

4.3. Results from the class in the School of the Humanities: Fundamentals of Swedish language and literature (GIX 131)

This course is offered in the School of Humanities at VXU, and students in this course are training to be upper secondary school teachers. During the time of the MUSIS project, the course focused on grammar, phonetics, text analysis and language history. Content was delivered through weekly lectures, complemented by a First Class (FC) web conference discussion forum. The FC forum was used on a daily basis by both teachers and students for publishing documents (text, audio as well as video), discussions (mostly questions and answers regarding the trickier parts of the course) and also for signing up for exams and forming study groups.

Fifty students enrolled in the course, and 22 were given smart phones as part of this project. All students had access (either by computer or smart phone) to the same course information generated by the instructor, which was published to the web on FirstClass. We use the java application described in section 3.2 in order to convert the instructor’s contributions on the FC forum to an RSS feed that was then multicast to the phones. We did not deliver student messages because we judged that the high amount of these messages would be perceived by the students as mobile phone spam. Interviews with students confirmed this judgment; students reported they wanted only information from the instructors.

Overall, students in this course responded positively to the use of MUSIS messages. This seems to be due to two major reasons. First, easy access to the instructor and to course materials was particularly important to these students, because they were off campus 4-5 weeks each semester, on site in schools. The constant presence of the phones in pockets and handbags meant that course information could reach the participants instantly. For example, the teacher sent out a number of grammar exercises and “small lectures” about syntax analysis. Indeed, from the data we have collected during the interviews and the final workshop students reported that the messages they got from the teacher have been useful.

One of the students stated “A funny way to get information about ‘boring’ things (syntax analysis)”, while other student said “It is easier to understand when someone explains it instead of reading it yourself”. The students valued course related information, e.g. schedule updates and the short, effective videos containing audio as well as text, sent prior to exams and lectures. Second, the pedagogical style of the instructor fit well with the values of communication and mobility offered by the phones. This latest fact has been confirmed by the feedback we received from the students in the final workshop. The majority of them claimed that the teacher’s use of audio-visual materials was very important for bringing interesting content and adding value to the smart phones. The instructor sent 7 multimedia messages that were related to assignments, course readings and project reports.

4.4. Discussion

This study was designed to discover the patterns of use of a number of mobile services used by students in a university campus environment and other locations of their choice. Impact on learning itself was not measured, nor would it have been possible to measure meaningfully when the devices were used for such diverse purposes. Phone-optimized content was well used, and there was a clear request from students that more resources be made available in this format, including administrative information from the university. There is no conclusive
knowledge work. These services were constantly tested in the accomplishment of everyday activities, including a number of services that have been designed to facilitate information, video micro-lectures and scheduling issues of the services. All mobile services related to course MUSIS may be one of the reasons for the high acceptance accessible almost everywhere. This particular feature of were delivered in a simple, user friendly way and were involved in the design process. MUSIS services highly ranked among users and they were perceived as very useful when it comes to support their daily activities, both social and intellectual.

Ownership of the technology is clearly important. As long as the phones are loaned, students are reluctant to invest time and money in personalization and extension. Despite this, several of the students were able to see future benefit of the devices as learning aids and invested time as part of their course activities in thinking about new possible services that could be developed. Because students received music, video clips and other content, they are likely to become more embedded in their whole lifestyle.

5. Conclusions and future development

Students in the MUSIS project were actively experiencing a number of services that have been designed to facilitate the accomplishment of everyday activities, including knowledge work. These services were constantly tested in order to assess their functionality and usability, and users were involved in the design process. MUSIS services were delivered in a simple, user friendly way and were accessible almost everywhere. This particular feature of MUSIS may be one of the reasons for the high acceptance of the services. All mobile services related to course information, video micro-lectures and scheduling issues were highly ranked among users and they were perceived as very useful when it comes to support their daily activities, both social and intellectual.

Our results confirm the importance of designing applications and services for learners that are easy to use “on the road,” that could be completed in short bursts of time [6]. Multicast mobile services are one way to support what Brodersen, et al. [7] call “nomadic learners,” who are more project oriented and who send much of their daily life “in transit between many physical places (“oases”) such as classrooms, labs, workshops, libraries, museums, the city, nature, clubs and at home” (p. 298).

However, our results also suggest that, in higher education, a challenge is designing content appropriate for “perpetual contact” [8] between the student and the instructor. As more students bring the technology with them to the university, change will most likely be driven by their demands as consumers. It has been shown that the smart phones used in this study did not generate a radical change in students’ styles or patterns of learning. As smart phones become a more intrinsic part of everyday life, it is important that these patterns and demands are known and understood.

As our work continues, we will try to enhance the educational aspects of the mobile services by developing and implementing various solutions to specific problems we have identified based on our observations and the data we have collected from the students. Our future efforts will continue to refine both the technology and activities for providing learners with more meaningful experiences with regard to the use of smart phones in university settings. During the coming fall term we will continue with the trials in the context of the GIX131 course and we will incorporate two new additional courses with 30 Media Technology students.

6. References