



Using wireless technologies for context sensitive education and training

Final Report

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Executive Summary

Context sensitive and location based training has been enhanced/improved/introduced by the use of wireless technologies through the CONTSENS project. The important message is that the technologies used in the project are ubiquitous and available to all stakeholders in the field of life long learning.

All dimensions of the CONTSENS project have been successfully completed. A General System design for context sensitive and location based education and learning using wireless technologies was developed and implemented.

This General System design was localised to the systems of the partners. Sixteen courses with context sensitive and location based characteristics were designed, produced and exploited. These courses were in the fields of on-the-job training, tourism education, mobile learning and language learning. The products of the project were widely disseminated. The project courseware was exploited with VET learners from Ireland, Bulgaria, Hungary and the United Kingdom.

The General System design for the provision of context and location sensitive education and training will enable practitioners in the field of mobile learning to push education and training into the provision of context sensitive and location sensitive courseware, a new development that face-to-face classes, distance education, or e-learning cannot do or cannot do as well as mobile learning.

This General System design has been successfully localised to provide a Local System Design for London Metropolitan University in the United Kingdom, Plovdiv University in Bulgaria, Corvinno Technology Transfer Centre in Hungary and Ericsson in Ireland. This enables these institutions to provide courseware that is context and location sensitive in the field of mobile learning.

The courses developed by the project have been taught to and evaluated by learners in Ireland, the United Kingdom, Hungary and Bulgaria. These courses are in the fields of on-the-job training, tourism education, mobile learning and language learning. The courses were designed, developed and studied by learners. The learners then answered specially-designed questionnaires, the data from which was collated, analysed and reports written.

The results of the project were disseminated widely to a large Special Interest Group, at conferences, in journal articles and on the WWW.

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1. Project Objectives

The profile of the typical mobile device is changing rapidly. Mobile subscribers are growing rapidly. There will be 5.8 billion mobile subscribers worldwide by 2013 (Portio Research). No other media channel offers anything like this reach. Handset figures show strong growth in smartphone sales (Gartner), which will be 29 percent of all cell phones by 2014 (Ovum). This means a richer mobile Web experience for mobile users. More and more phones now support 3G and even faster networks based on High Speed Packet Access (HSPA) (IE Market Research). That means faster downloads. Meanwhile 60 percent of the world's population is now covered by a next-generation High Speed Packet Access mobile network (3G Americas). That means better access to high-speed downloads. Mobile data is expected to balloon: a) revenue-wise, analysts expect data to be bigger than voice by 2011 (Pyramid Research); b) volume-wise, as mobile Internet users will be sending and receiving more data in one month than in the whole of 2008 (ABI Research).

Access is being made on all types of mobile devices: mobile phones, media players, handheld games consoles, ultra portable PCs, etc. Already one is seeing a great deal of convergence in the marketplace; while it is common to see people carrying both a mobile phone and a media player, such as an iPod, these devices are merging, with mobile phones offering gigabytes of storage for audio and video. Devices running Windows Mobile, Android, Symbian and other operating systems have many of the features of laptops or desktop computers and are now being used to access the net at broadband speeds.

As a result it is now possible to envisage an audience for mobile learning content which is media rich, collaborative and always available to the user. Using established technologies such as GPS and SCORM, and developing for newer technologies such as RFID (Radio Frequency Identification), QR Codes, Mediascapes and Mobile Positioning, training content can be developed for both context sensitive and location based delivery. Context sensitive education and training refers to training material which is directly relevant to the training situation that the learner finds themselves in. Location based education and training refers to material which is directly relevant to the location in which the students find themselves.

Because mobile devices can be used almost anywhere, they are perfect platforms for situated learning activities, where real life is used to provide stimuli and activity for learning. An example of a situated learning activity would be troubleshooting a telecommunications node. In this scenario, the learner could pull or be pushed information about the specific node they are working on which would be determined by the mobile network. Handheld devices can be used in public and social settings where larger devices would be intrusive and seem out of place. Using a small device like an audio tour guide or an iPod or a mobile phone web browser is an obvious use of mobile technology; typing on a laptop computer in the same environment may not be as acceptable or practical.

The specific objectives addressed by this project are the development of innovative ICT-based content, services and practice. The basis for this is that every student in every higher education institution in every one of the 27 EU countries possesses a mobile phone (www.bbc.co.uk/commissioning/marketresearch/audiencegroup2.shtml) which they use constantly in every walk of life – except their education and training. This project addresses this lacuna and builds on previous EU funded mobile learning projects by using the latest technological developments to enhance the field of mobile learning and improve its learning content, technical services and student practice.

The aim of the project was to create a General System Design which will enable the development of location sensitive and context sensitive educational courseware using wireless technologies, to localise this development to the systems of the partners and then to

develop 4 different types of mobile learning courseware and to proceed to the teaching of the course materials to learners at the institutions followed by the distribution of questionnaires to the learners who have studied the mobile learning material followed by collection and analysis of data from the questionnaires and the writing and publication of reports from the data.

The aim, as far as is known, was to create for the first time in a European Commission project context sensitive and location sensitive educational courseware and to teach it to life long learners in different parts of Europe. It is confidently asserted that the sort of educational experience achieved in this project is unique to mobile learning. It cannot be achieved either by face-to-face education, or by distance education, or by e-learning.

2. Project Approach

The project benefited from the presence of representatives of one of the world's leading telecommunications companies, and one of the leading providers of technological solutions for content, learning and knowledge management, both of them specialising in wireless technologies. These were Ericsson, here represented by its international telecommunications training centre in Dun Laoghaire, Ireland and Giunti Labs of Sestri Levante, Italy.. The project approach was to entrust the development of the new General System design for location sensitive and context sensitive mobile learning to these two partners in consultation with the London Metropolitan University, Corvinno Technology Transfer Centre and the University Of Plovdiv. The results of this work are published unpassworded on the project website in a 56 page technical document www.ericsson.com/contsens/products and form a central part of the project.

The next stage was the localisation of the new General System design to the systems of the partners: Ericsson in Ireland, London Metropolitan University in the United Kingdom, Corvinno in Hungary and the University of Plovdiv in Bulgaria. Brief presentations of these processes are included in this Final Report.

Once the localisation phase was completed, courseware was designed and developed to run on the different enhanced systems, Four areas were chosen for the development of course content: on-the-job training, art gallery, museum and tourism training, mobile learning and language courses. Seventeen courses were developed, four by each of the partners Ericsson, London Metropolitan University, Corvinno and Plovdiv University and one by Giunti Labs.

The approach taken for these developments entailed 10 stages:

- Course content selection
- Pedagogical considerations
- Didactic strategies
- Courseware development
- Course study by learners
- Development of a scientific questionnaire
- Distribution of questionnaire to learners
- Collation of data
- Analysis of data
- Drafting of reports.

The project approach entrusted the work of the organisation of the project Special Interest Group (SIG) and the management of the dissemination and exploitation of the project to the European Consortium for the Learning Organisation (ECLLO) from Wavre, Belgium.

3. Project Outcomes & Results

THE PROJECT GENERAL SYSTEM DESIGN (WP2)

The General System Design aims to outline the potential technology that could potentially be used to enable the development of context-sensitive, location aware mobile learning.

This document summarises the delivery mechanism for this type of content, and a potential course development mechanism.

When considering the delivery mechanism, the document describes IMS, the next generation mobile network. As IMS did not become commercially available during the course of the project, the decision was made to develop content for the existing GSM/WCDMA network, with the understanding that content could easily be converted for delivery over IMS at a later date.

When considering the content development mechanism, the document outlines the LearnExact Suite.

The GSM/WCDMA network will be used to access the content server, using MPS (mobile positioning system) for location purposes. Positioning is a Location Based Service. It is the process of geographically locating Mobile Stations (MS) in a Public Land Mobile Network (PLMN) by collecting and analysing location information, calculating the position, and reporting it for further usage to an application.

MPS consists of the Gateway Mobile Positioning Centre, GMPC, the Serving Mobile Positioning Centre, SMPC, and network features in the MSC, HLR and BSC/RNC. See appendix for further description.

The Gateway Mobile Positioning Centre, GMPC, is the access point of the mobile network where external LCS clients can retrieve positioning data. The GMPC is common for GSM and WCDMA, and can handle location requests from both networks simultaneously.

The **Serving Mobile Positioning Centre, SMPC**, handles the positioning requests in GSM and calculates the final location estimate and accuracy according to the most appropriate active positioning procedure. SMPC can serve one or several BSC depending on the size of the geographical area to cover. In WCDMA these functions are handled by the RNC.

Application Middleware The middleware accesses the support systems of the mobile network and facilitates a rapid and smooth launch of new applications. MPS interacts with LoCation Service (LCS) Clients over MLP and MPP positioning protocols. The MPS SDK provides developers of LCS Clients with libraries for rapid deployment of MPS centric location centric services. Essentially the SDK acts as a simulated GMPC. The Operator can use the SDK to simulate the interface between Service Network and the GMPC (which resides in the Core Network). This allows the operator to test how applications will function on this interface to the GMPC without having to test them on live GMPC for example.

Location Requests and Triggering

- A location request may be initiated from a mobile terminal or from an LBS Application, i.e. LCS clients. (LoCation Service). These two types are referred to as *Mobile Originated Location Request*, MO-LR, and *Mobile Terminated Location Request*, MT-LR, respectively.

- In MPS *Spatial Triggers* were introduced that automatically invokes an application when the location of a mobile terminal meets a certain criteria. Spatial Triggers are non-standard.
- Mobile Originating Location Request (MO-LR) is where the Positioning Process begins on the mobile handset (i.e. requested by the subscriber). Typically the result will be sent to a predefined LCS Client Application.
- Mobile Terminating Location Request (MT-LR) is where the LCS Client requests the subscriber's position from the GMPC.
- Network Induced Location Request (NI-LR) is also support by MPS. NI-LRs involve the Operator network generating the users' location, typically for Emergency Services.
- Spatial triggers is a function that automatically tells the application when users meet certain location criteria -such as when entering or leaving a specific area. See scenarios in next section.
- Spatial triggers are an Ericsson proprietary feature that uses the Triggered Location Reporting Service, defined by Open Mobile Alliance (OMA). This service contains messages that allow LCS clients to define and remove trigger criteria in a GMPC. Another message of the service is used by GMPC to notify LCS clients of fulfilled trigger criteria.

Development Environment – learn Exact suite

Information and educational technologies have rapidly changed in recent years. The application of information technology in the mobile field has become a new technology that enhances the quality of learning. More class time and assignments in introduction to information technology should be dedicated.

In order to address these new challenging and exciting learning requirements, Giunti Labs uses an integrated suite for personalized eLearning and Mobile Learning, called *learn eXact*.

This is a powerful Learning Content Management System (LCMS) that allows course developers to speed up the process of managing eLearning content for new generation digital personal media. It enables the user (author, tutor, and student) to create, manage and deliver content based on Learning Objects, XML, standards and international specifications.

Learn eXact architecture

Learn eXact LCMS platform is composed of several independent, interoperable and optional modules to support a multi-user distributed content authoring process (publishing process) for the production of new generation learning content.

The learn eXact Suite is made up of three main open and interoperable sub-architectures depicted in the figure here under, optimized to manage XML, Reusable Learning Objects (RLO) and standards based professional content production (eXact Packager), storage, online editing and management (eXact Lobster) and multi-support, device and platform delivery (eXact Siter).

eXact Packager is a client module used to create, index and package learning content. Using the eXact Packager authoring tool the author can create and deliver SCORM courses (containing SCORM content) as both eLearning and on mobile devices.

eXact Lobster is a server module with a web-based user interface. eXact Lobster embodies all collaborative workflow features such as content authoring (lite version of eXact Packager), versioning, sharing, and peer reviewing. All the learn eXact data such as eLearning content and its metadata, user data, portal's data, tracking data are stored in eXact Lobster digital repository. eXact Siter is a Learning Management Portal that provides course management and user enrolment functions as well as communication facilities like chats and forum.

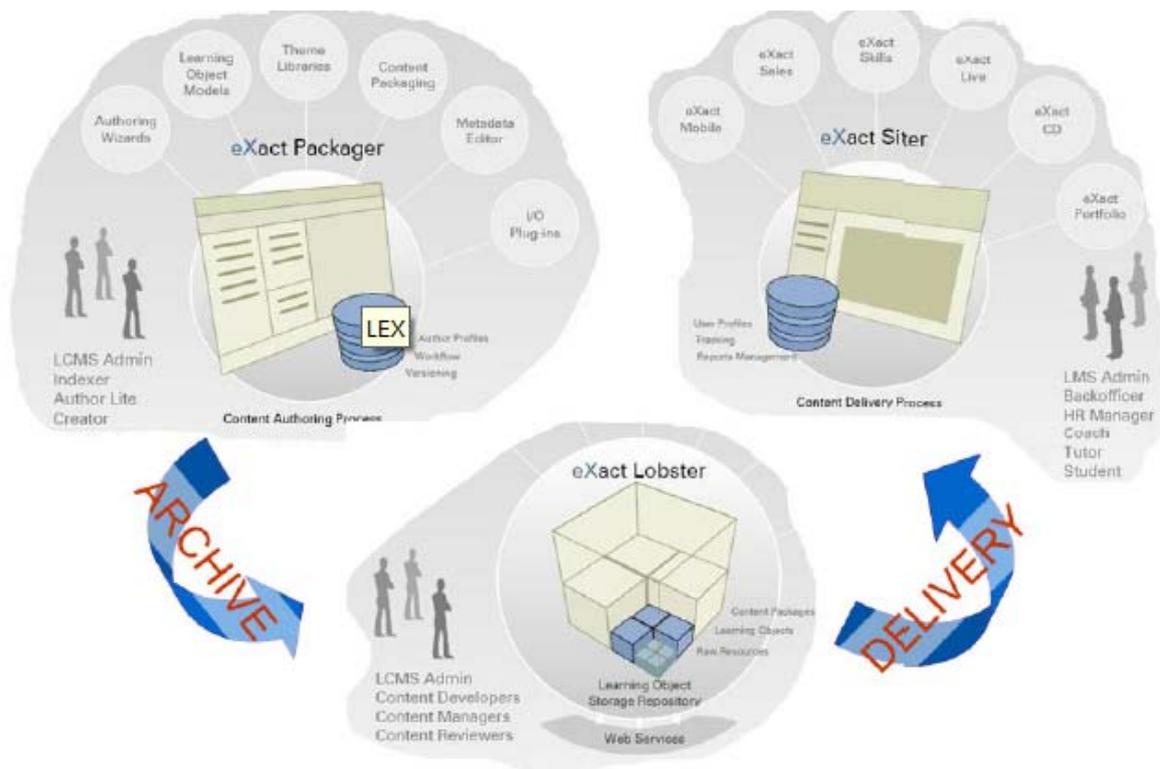


Figure 1 - learn eXact architecture

eXact Packager is a professional content development tool. It is a powerful client/server Windows™ application which empowers editors to easily create, tag and publish Reusable Information Assets (RIAs), Reusable Learning Objects (RLOs) and Reusable Content Packages (RCPs) and structures (templates).

eXact Packager enables ingesting pre-existing assets from all main legacy and editorial formats (for example Word and Power Point) and converting them into multi-delivery publication packages which can include “traditional” formats (e.g. offline CDs and PDF documents), streamline eLearning formats (e.g. HTML and SCORM web based training courseware) and future proof conversion towards all digital media (for example Mobile, Virtual and TV Learning).

Mobile technologies are the next step in the evolution of technology-mediated teaching and learning. It not only connects people in information-driven society effectively, but also it offers the opportunity for a spontaneous, personal, informal, and situated learning. eXact Packager allows the strategic production of mobile content, applications, and resources necessary to support anywhere-anytime connections to formal and situational learning, as well as personal interest explorations.

Using the eXact Packager LCMS authoring tool the author can create and deliver SCORM courses (containing SCORM content) on mobile devices.

This was the solution used by Ericsson and Giunti Labs.

THE PROJECT LOCAL SYSTEM DESIGN (WP3)

Brief summaries of the Local System design are provided here from London Metropolitan University, Corvinno and Plovdiv University.

LONDON METROPOLITAN UNIVERSITY

London Metropolitan University's Local System Design primarily involves using Mediascapes and QR codes for the delivery and manipulation of its work package products.

The way we place ourselves into local context is changing profoundly: GPS technology is used to pinpoint the location, satellite images and 3D maps are available for almost every relevant place in the world and the web contains information about most of these places. It is now possible to construct content and 'place' it in context using mobile devices where other users can access and add to it.

Mediascapes are a new form of media which combine and layer digital sight, sounds and interactions onto the physical world to create immersive and interactive experiences. Users equipped with a mobile device can move through the physical world and trigger digital media with GPS via an invisible interactive map, in response to their physical location.

Mediascape design is a process of 'experience design' which involves interaction design, choice of location, media region design, and an overall specification of the program logic and content production.

Mediascape involve producing specific narrative scripts of the work package training and specifying the logic for the interaction flow of the dialog. Any time dependencies for playing the scripts are also built in.

Deciding how, when and in what form the user can interact with the media is central. The QR also allows the attaching of information to space. A QR or 'Quick Response' code is a two dimension bar code that can be read by all mobile camera phones. When a QR code is read it will automatically open your mobile web browser and access a web page. This adds significant value as it improves accessibility to information on the move. The QR code leads to the 'clickable world' where any physical object can become an interface to the virtual world (web resource). For more information on this please refer to this short video which was produced for JISC techdis (<http://www.techdis.ac.uk/>) describing QR Code use and best practice: www.rlo-cetl.ac.uk/developers/smith/techdis.mov

CORVINNO

Being mobile while studying is not a new idea. It has been incorporated into teaching activities and official curricula a long time ago in the form of field trips and on-the-spot training. The appearance of mobile technology in education in the mid 1990s has extended the scope of teaching and led us into a new world of education. At the same this transition has its institutional limitations. In traditional educational institutions, like in the Corvinus University of Budapest, learning technology should be an integral part of knowledge transfer between students and lecturers, but it can not be the only platform of teaching.

However, it is essential to keep up with students' demand – which forces institutions to involve technology more and more in their everyday teaching activities, enabling students to be flexible in their learning – and construct F2F based learning platforms, which provide elasticity in course content development and delivery. To meet the challenges, emerging from combining ICT enhanced learning and traditional classroom education, a blended service framework has been elaborated. This service portfolio designed by the educators of Corvinus University of Budapest is described in Figure1.

The core element of the portfolio is F2F education. The scope of curricula taught in the training programs is represented by the recently developed educational ontology, which is going to be the domain of future content development as well. On top of traditional classroom teaching a Virtual Learning Environment (VLE) supports individual learning, enabling the use of different independent learning styles.

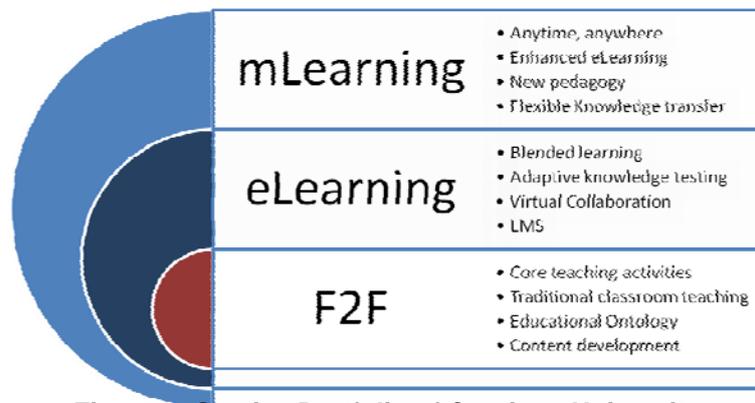
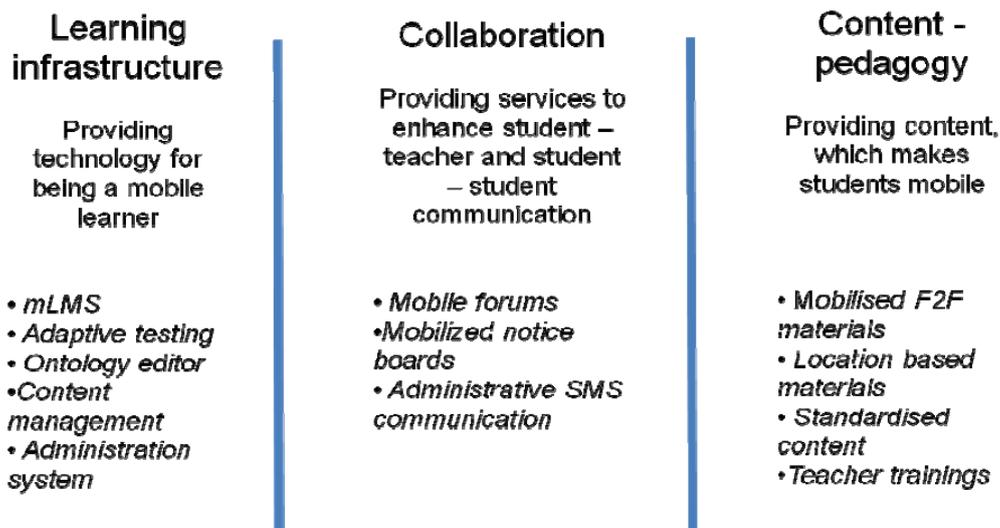


Figure 2: Service Portfolio of Corvinus University

As Figure 2 indicates, there are three different aspects of mobile learning that are being covered at Corvinus University of Budapest.

Figure 3: Aspects of Mobile Learning at the Corvinus University of Budapest



STUDIO – ONTOLOGY DRIVEN LEARNING ENVIRONMENT

Motivation background

The primary objective of the Studio approach and system is to provide support in exploring missing knowledge areas of candidate students in the frames of an electronic learning environment in order to help them to complement their educational deficiencies.

The major role of this learning environment is to actively support the whole learning cycle, independently from its form (e.g. workstation- or mobile phone-based learning). This learning infrastructure consists of an Ontology Repository and a Content Repository — that are the two major pillars of this solution —, a Content Presentation tool, a Test Bank, an Adaptive Testing Engine, and some additional support tools as well. The figure below presents how the above mentioned system elements are connected to each other to provide a comprehensive solution.

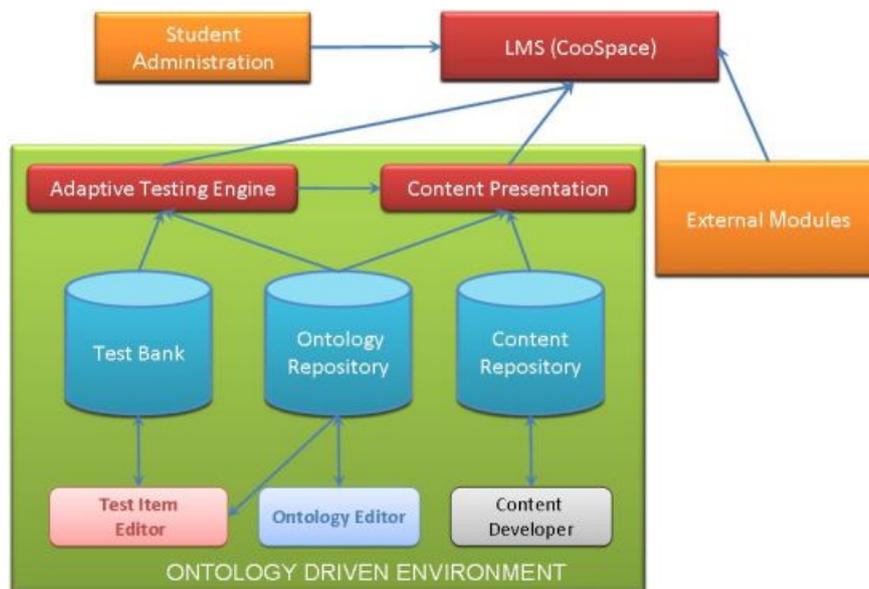


Figure 4: Corvinus Mobile Learning Infrastructure

The significance of information society lies in the fact that – thanks to the use of computers – communication devices are functionally dynamic. This feature of these devices enables them to meet new requirements very quickly. Parallel to this the preparedness of individuals is changing more and more rapidly and sharply. The relevant preparedness tends to mean the ability to access and obtain awareness itself rather than the ability to store information like an encyclopaedia. Thus heading towards the information society should establish research and education systems that are suitable for the mobilization of skills of the society.

Mobile learning environment

To exploit the advances of mobile technology it is indispensable to transform the traditional learning environments into mobilized learning spaces otherwise users can't benefit from mobility. Challenges of limited resources of mobile devices have to be tackled and fitted to

the long-established campus-workstation based services. In the Corvinus University case, the mobilized infrastructure provides access point to selected services using a mobile phone. All mobilized content is uploaded to the CooSpace, which is reachable via the following URL: <http://coo.uni-corvinus.hu>

Within the CooSpace a Mobile Learning Space has been created for the students, where all the mobile phone compatible teaching materials are collected. (These are the various contents in HTML and WML versions) The rest of the material is assigned to the additional lecture notes section. Students, who log into the system from a mobile phone, using the mobile interface of the LMS, can access and read the content, which is in the Mobile Learning space. The format of the material there is readable for mobile devices as well. They can also download documents, which are not assigned to the Mobile Learning space, but probably they can't open and read the documents, however this might be possible with some of the latest handheld devices.

All the materials are also reachable via the normal internet interface as well. PDAs, smartphones with Wireless LAN function are capable to enter the LMS via the normal interface.

In the case that the WAP browser of the mobile phone is not capable of accessing the website, it is recommended that students use the Opera Mini browser, which is a free internet browser application for a wide range of mobile phones. This Java based browser runs on almost all commonly used devices. The downloading instructions for the Opera browser were provided through the LMS as well.

UNIVERSITY OF PLOVDIV

At the University of Plovdiv DIPSEIL is a system to define, develop and test a *distributed* system for *individualized* learning and the underlying pedagogical procedures to implement, facilitate and promote performance-centered learning experiences in the context of international university education. mDIPSEIL is a wireless version of DIPSEIL designed for use with mobile devices. The Local System Design (WP 3) involved developing mDIPSEIL v2.

The main modules of the mDIPSEIL v2 system are:

- Determine the Device Position using GPS;
- Usage of the GPS Co-ordinates in the System;
- Structure of the Educational Content;
- User Roles;
- Integration with DIPSEILv2;
- Developing Educational Content by Teachers;
- Viewing and Studying Educational Content by Students;
- SCORM;
- IPSS_EE Learning Objects

Main Modules of the mDIPSEIL v2 system

The mDIPSEIL v2 Mobile Learning Management System (MLMS) consists of three main, interdependent modules:

- a J2ME client application, which must be downloaded and installed to the client's (student's) phone;
- Database Engine – such as MySQL, for storing the educational data;
- a Web-Engine - such as Apache, for managing the data.

Determine the Device Position using GPS

Upon loading the J2ME client application for the first time it invokes a process, which tries to determine the device co-ordinates using the Global Positioning System (GPS). This process starts with a procedure, which tries to load the positioning libraries of J2ME. Because not all mobile devices support these, in the cases they are missing the process terminates immediately without any warning or error and also disables all features which are related to positioning. There are no warnings or errors, since the application can continue its normal work also without these features. After this initialization the GPS device of the phone is woken up and a request is sent to determine the co-ordinates. For one minute the application process sleeps. This one minute is needed for the device to startup and take the co-ordinates. This long period should provide enough time even if the device is next to high buildings or in areas where the GPS signal is not so strong. Co-ordinates cannot be determined inside of buildings or other closed areas. If after a minute the position of the device is not recognized all features of the application which require positioning will be turned off, again without any warning. If the GPS receiver of the device has successfully determined the coordinates, they are stored in the application memory for later use, using the Storage Module.

ON-THE-JOB TRAINING (WP4) COURSE MODULES **RNC3180 Troubleshooting (Ericsson)**

RNC 3180 Troubleshooting, a course based around troubleshooting tasks for the RBS 3180 was developed by Ericsson and tested by telecommunication field engineers and other staff based in the field of telecommunication-related service delivery and consultancy.

The development software used for this project, *eXact Mobile* developed by Giunti Labs, enables access to a Learning Management System (LMS) with mobile 3G, WiFi and GPRS devices. This allows the engineer to access Learning Objects (LOs) and learning paths specifically customized for the available peripherals and for the location of access.

This course was geo-located to two separate offices in Dublin, Ireland. The offices are approximately 10KM apart. Thirty-eight staff in total participated in the evaluation.

Both offices have test plants with different types of Radio Base Stations (RBS) and, for testing purposes, these can be used to simulate a field engineer visiting a node on-site. The tasks required to be carried out on each site differs completely so as to simulate the context based situation, in this case, the engineer visiting two different locations for two separate network faults.

The testing dealt with a mix of genders and age groups which would have been ideally suited to trial this course. In addition, the skill and knowledge of the group dealing with handsets

was high. This meant that training was not required and the course developed was intuitive to the needs of the learner.

The ability to download the appropriate material in the right location was achieved. This was achieved with no issues relating to the download procedure. The context sensitive aspect of the trial was not emphasized during the evaluation process. As the subject in the course was directly related to telecoms, it was felt that the emphasis was more implicit than explicit

The learner's reaction to the courses was very positive. Percentages of over 94% were achieved with the learners finding the experience useful and indicating they would take other courses in this format. However, issues such as course design and technical aspects of the mobile device were highlighted. These issues relate to areas such as screen size and phone functionality. These issues are common across most research in this area. Issues such as screen size have been addressed somewhat by handset manufacturers and will continue to be addressed as handset development increasing to suit the changing needs of the end users.

The training of urban professionals (London Metropolitan University)

London Metropolitan University's approach to context sensitivity throughout the CONTSSENS project has focused on the contextual factors which influence and affect learning. How can we augment learning by changing features of the context? What design elements can help engineer authentic working space? A common approach in all our case studies has been to investigate whether the augmented context for development (ACD) can fundamentally alter the use of context in the design of learning activities. We have also been examining the role of learner generated context on knowledge formation. It is hoped that our contribution to the definition of context within the CONTSSENS project may provide some potential design guidelines for other VET architects who hope to augment their own learning contexts.

The relationship between Learner Generated Context (LGC) and Augmented Contexts for Development (ACD):

Luckin (2007) who is one of the founding members of the Learner Generated Context group (LGC) states that 'the rapid increase in the variety and availability of resources and tools that enable people to easily create and publish their own materials as well as to access those created by others extends the capacity for learning context creation beyond teachers, academics, designers and policy makers. It also challenges our existing pedagogies' (LGC Wiki, 2007).

According to the LGC, context is 'created by people interacting together with a common, self-defined or negotiated learning goal'. The key aspect of learner-generated contexts is that they are generated through the enterprise of those who would previously have been consumers in a context created for them" (LGC Wiki, 2007).

Furthermore Cook (Cook, 2007a, 2007b) has proposed a more specialised definition of a Mobile Learner Generated Context (MLGC) "conducted by learners who may be communicating or individually reflecting 'on the move' and who, in the course of a dialogue with another person or interaction with multimedia resources, raise questions that create a context; when an answer to this context-based question is generated this can give rise to knowledge. The generation of context is characterised as an action on tools where a user actively selects, appropriates and implements learning solutions to meet their own needs." (Cook, 2007a)

Cook has more recently created a proposal for extending Vygotsky's Zone of Proximal Development (ZPD) into a Augmented Context for Development (ACD) in order "to open up

the dynamic of the child and learner's development again in view of the conditions of the new prevailing contexts of the early 21st Century". (Cook, 2009)

Cook also provides an example ACD: "The following combine in an Augmented Context for Development to enable the students to collaboratively problem solve: (i) the real world's visual-spatial field in terms of the ruined Abbey and the student gestures, (ii) the help of speech, (iii) the aid of the developmental stage that the learners have reached in terms of archaeology, and (iv) the addition of the mobile 3D visualisation. Furthermore as they evolve their understanding of the architectural form under investigation they develop and *embed their own micro contexts for learning*."(Cook, 2009)

The relationship between LGC and ACD is interesting. The LGC represents the sub context but the ACD is primary. The argument against LGC would be that if learning just *happens* then you cannot design for it. The ACD is only *instantiated* when the interactions begin but it already exists because it has to be pre designed. This declarative design context is an *interpretation* of the environment for people to work within. To understand the relationship between LGC and ACD it is useful to use an analogy. Arguably cooking (LGC) only actually occurs when people cook but without the kitchen (ACD) and its design no cooking can take place. Your actions are controlled/influenced by the environment.

As a designer you create the possibility of an augmented learning context that learners may choose to activate. In that way it is declarative. Instead of creating a context sensitive system deciding (in a procedural way) that this intervention should occur at this point in time the feature is simply made a part of the context. Ultimately one of the major design challenges in VET is the creation of context (which is pre determined by the designer and completed by the learner). The ACD is an interactive scene, a structured space.

The training of urban designer course aimed to support student teachers in exploring their knowledge and understanding of urban education in a meaningful context. An urban area close to London Metropolitan University was used to explore how schools are signifiers of urban change and continuity of educational policy and practice from 1850 to the present day.

The learning content developed for the mobile devices was directly relevant to the context of the learning needs and the location of the learners. It provided evidence of how the organisation and (re)structuring of urban space worked alongside educational discourses and policies to support participation in civic urban life and educate generations of working class children. The use of a historical perspective demonstrated continuation, change and causation and enabled a better understanding of both contemporary and future urban contexts. LGC Wiki: <http://learnergeneratedcontexts.pbworks.com/>

Urban architecture of Budapest: Door handles (Corvinno)

The current development has targeted the creation of location sensitive courses that can fully support the face to face education processes. The application is a smart mobile framework that can handle great amounts of content and can assign the data to locations.

The courseware itself has been developed by an urban history Professor for art history courses. It contains an overview of old gates' door handles and their connection to the social and architectural context of certain districts in Budapest. The courseware is in Hungarian. The course contains 68 different buildings, which are important for the urban architecture history of Budapest, but not very well known to the public.

There are several vocational education programs that have been identified, where this approach may enhance the learning experience. Here we provide a list of programs, where

the tested application and content fits to the accredited curricula (all these programs are officially accredited in Hungary, the national registration number is also provided):

- *Idegenvezető* (Tourist Guide) OKJ 54 812 01
- *Műemlékfenntartó technikus* (Monument Maintenance) 54 581 02
- *Multimédia-alkalmazás fejlesztő* (Multi-media content developer) 54 213 04
- *Kőfaragó, műköves és épületszobrász* (Building – sculptor) 31 582 14

Analogue electronics (Plovdiv University)

Plovdiv University developed the course “Analogue Electronics” in English, with the context sensitive characteristics according to the Scenario 2: Mike is a learner (trainee/master degree student/working person). He has a registration and login to a mobile Learning Management System which he accesses via the web browser on his mobile device. The system then offers the learner content that has been designed to match the specific needs of the learner. The system also interrogates the mobile device to identify its characteristics, the quality of mobile services at Mikes’ location and will then present the learning material according to the results from this interrogation. For example, when the mobile device of Mike has characteristics of an advanced mobile device, the learner may be offered streaming video / text / voice, whereas for a lower quality connection and a legacy GSM, he may be only offered text and voice.

We performed an experiment with learners from the “Center of qualification and certification” at Physic Faculty, Plovdiv University. We had nine learners. Three of them were with engineering background – finished bachelor degree at Plovdiv University, Physic engineers, the others were technicians – electronic professional secondary degree, received from the professional schools. Four of them were unemployed, the others were working people.

Main conclusions: It’s necessary to use advanced mobile devices (big screen, 3G, with operational system, browser etc.) for learning purposes; It is difficult to guarantee that the using file-format for content presentation will be opened on all kinds of mobile devices. The good solution is to present the one and the same content in at least 2 common file formats; It is not a good solution to experiment new technology, new system, on new devices, with the content in different from native for the learners language.

MODULES FOR TOURISM TRAINING (WP5)

Dun Laoghaire pier (Ericsson)

This training package has been developed with three locations in mind, all of which are well known tourist destinations:

- Dun Laoghaire Harbour
- Peoples Park, Dun Laoghaire
- 40 Foot, Sandycove

These three locations are within the same 5KM radius. Information on each location consists of text and graphics explaining the history of that area and features which are of interest to tourists and the general public.

The testing phase took place in Dublin during December 2010. The participants were:

- Telecommunication engineers, consultants and project managers working for Ericsson in Ireland
- Members of the public working in various fields such as media, IT, Finance

The learner's reaction to the courses was very positive, with the only negatives relating to course design issues, rather than to the training concept. Learners found the experience useful and indicated they would take other courses in this format.

Cultural heritage (London Metropolitan University)

The concept behind work package 5 (Cultural heritage) was to create an environment of archaeological material based on three-dimensional augmented heritage reconstructions of the Cistercian abbeys in Yorkshire. These reconstructions were seen by the project team as providing a way to train archaeologists in the skills of surveying and documenting archaeological sites.

Context aware mobile computing is a powerful tool as the functional meaning of any site is more accurately translated through an actual understanding of the structured navigation of the space. The project's central ambition was to use the architecture as an explanatory teaching device, to answer questions about the nature of this expression of the monastic ideal through explicit reference to the shape and form of the buildings within which it was expressed.

Urban architecture of Budapest: Fountains (Corvinno)

The current development has targeted the creation of locations sensitive course that can fully support the face to face education processes. The application is a smart mobile framework that can handle great amount of content and can assign the data to locations.

It contains an overview of historical fountains in the city centre of Budapest and their connection to the social and architectural context of certain districts in Budapest. The courseware is in Hungarian.

Several vocational education programs have been identified, where our approach may enhance the learning experience. Hereby we provide a list of programs, where the tested application and content fits to the accredited curricula (all these programs are officially accredited in Hungary, the national registration number is also provided):

- Idegenvezető (Tourist Guide) OKJ 54 812 01
- Műemlékfenntartó technikus (Monument Maintenance) 54 581 02
- Multimédia-alkalmazás fejlesztő (Multi-media content developer) 54 213 04
- Kőfaragó, műköves és épületszobrász (Building – sculptor) 31 582 14

Historical Plovdiv (University of Plovdiv)

Plovdiv University developed the course "Historical Plovdiv" with the context sensitive characteristics and location-based characteristics. Upon start of the J2ME application on the student's mobile device it tries to determine the current client's location. Since not all mobile devices nowadays support GPS (Global Positioning System) it is possible, that this process is skipped. After the current coordinates of the user are obtained they may be used in the following two ways: 1) to determine all tasks related to objects (specific for the task), which

are near the student; 2) to show only tasks in the language, which is spoken in the country the client currently is. For example if the learner is studying in a bus in Bulgaria, then (if he chooses the option) only tasks in Bulgarian will be shown.

For our learners we have developed several tasks in Historical Plovdiv both in English and Bulgarian. Since they use their mobile devices only in Bulgaria, they were presented only with the Bulgarian version. Of course, it is possible for tasks in other languages to be shown, if the user requests so.

When the teacher uploads the educational content to the system, he/she specifies which of the materials are for advanced and which for legacy devices. When the learner connects with his device the using mobile learning management system (Plovdiv University case) mDIPSEIL determines what functions it supports and what characteristics it has. Then it presents the learner with the materials specified for his/her device. We performed an experiment with adults/working people/part-time master degree learners at the “Center for qualification and certification” at the Physics Faculty, Plovdiv University, and for tourists, in Bulgarian and English, in May 2009. The main conclusion is: All agree and recommend that it is necessary to develop more content not only for these 4 places in Plovdiv. They agree that this form is ideal guide for tourists visiting Plovdiv

MOBILE LEARNING (WP6) COURSE MODULES

RBS Troubleshooting (Ericcson)

The course developed is a process-based mobile instruction guide of how to solve advanced technical problems that an RNC engineer will encounter as part of their functional role. The package utilizes location firstly to identify what type of RNC node the engineer is working on, in terms of its hardware and software release, and context sensitive technologies to supply the engineer with a list of common troubleshooting processes to carry out for different types of common faults.

The advantage of using such technologies is that the engineer does not have to be familiar with all the steps required to troubleshoot a problem before attempting to identify and solve common problems on the node.

The development software used for this project, eXact Mobile developed by Giunti Labs, enables access to a Learning Management System (LMS) with mobile 3G, WiFi and GPRS devices. This allows the engineer to access Learning Objects (LOs) and learning paths specifically customized for the available peripherals and for the location of access.

Fifteen staff in total were tested, all of whom were telecommunication field engineers and other staff based in the field of telecommunication-related service delivery and consultancy.

The test phase took place on a single site at Ericsson’s Global Services Delivery Centre in Dun Laoghaire, County Dublin. The participants downloaded the appropriate material for the task at hand to their mobile phone.

The evaluation dealt with a mix of genders and age groups which would have been ideally suited to trial this course. In addition, the skill and knowledge of the group dealing with handsets was very high. This meant that training was not required and the course developed was intuitive to the needs of the learner.

The learner’s reaction to the courses in general was positive with the majority of participants responding that the concept, look and feel, and usefulness of such learning technologies was positive. As in WP4, issues such as course design and technical aspects of the mobile

device were highlighted and can be addressed in future course development. As before, these issues relate to areas such as screen size and phone functionality.

Marketing Management (London Metropolitan University)

The aim of Work Package 6, Use of context sensitive technologies in mobile learning was to build up practical skills in the area of marketing management, brand awareness and consumer psychology through actual situated practise. One of the core tasks was to gather data using mobile technology to assess how local retailers were presenting their shop fronts to consumers during the Christmas period.

Kotler suggests that people respond to a “total product” perspective (which is arguably the content and the context within which that content resides) when making a purchase decision. As a result the environment (in this instance the store and the storefront) is deemed to play an important role in shaping a shopping experience. The core premise was that the shopping atmosphere can influence consumers’ emotional responses, purchase intention, as well as their shopping behaviour.

Artificial Intelligence (Corvinno)

The course contains an overview of Artificial Intelligence applications in the city centre of Budapest and their connection to the social and technical context of the city. The courseware is in Hungarian.

The downloadable application after the authentication identifies the user and provides learning content based on the user profile and the location of the user. Currently 2 other learning materials are available. For the details please consult technical working paper 4 and 5. In this working paper only the currently finalised new learning content will be discussed.

Vocational education programs have been identified where our approach may enhance the learning experience. Hereby we provide a list of programs, where the tested application and content fits to the accredited curricula (all these programs are officially accredited in Hungary, the national registration number is also provided):

- Idegenvezető (Tourist Guide) OKJ 54 812 01
- Közművelődési szakember I. (Cultural Manager I.) 61 345 01
- Közművelődési szakember II. (Cultural Manager II.) 52 345 02
- Műemlékfenntartó technikus (Monument Maintenance) 54 581 02
- Multimédia-alkalmazás fejlesztő (Multi-media content developer) 54 213 04
- Kőfaragó, műköves és épületszobrász (Building – sculptor) 31 582 14
- Vendéglátó és idegenforgalmi szakmenedzser (Tourism Manager) 55 812 01
- Protokoll és utazásügyintéző (Protocol and Travel assistant) 54 812 02

Information technology (Plovdiv University)

Plovdiv University developed the course “Information Technology” in Bulgarian, with the context sensitive characteristics according to the Scenario 2 as mentioned previously

An experiment was undertaken with learners from the “Center of qualification and certification” at Physic Faculty, Plovdiv University. There were 28 learners. Some of them were technicians, others – working people, ten were master degree students at Physic Faculty, Plovdiv University. Each learner completed a questionnaire about their gender, age, mobile device usage, learning by Internet and mobile devices, etc. The learners had 6 tasks

for performance – one task per week They came to DIPSEIL Lab every week, 4 learning hours per week They were working and finishing the task performance at home, or anywhere outside DIPSEIL Lab They received for each performance credits, at the end they received the final mark from all collected credits during these 6 weeks For the learners, that the credits were not enough to receive a mark more than 3,00 (Bulgarian system), there was a final test in June, automatic on PCs, Task Manager from DIPSEIL environment.

The main conclusions were that more information should be included when developing content for mobile learning (to be presented on mobile devices); When learners perform tasks using their mobile devices, they need more time for thinking on the content: the speed of the screen changes has to be decreased the possibility to pause the screens without changing the size of the screen (full screen); The quality of the video – much is better, but we need a compromise, because we have to use a format for the video available for more mobile devices; The success with the material doesn't depend on the technology used; It doesn't matter if we use PC to present the content, or the content is presented on a mobile devices; The technical stage in the content presentation of mobile devices and services, gives the possibility to use a form of the presentation that is used on PCs.

LANGUAGE LEARNING (WP7)

English as a Second Language (Ericsson)

The training package developed is a context sensitive-based mobile learning of day-to-day scenarios that a vocational professional may encounter as part of their experience of living in Ireland. The package utilizes location firstly to identify what type of context the professional is currently in, and context sensitive technologies to supply the learner with a list of common scenarios based on living in Ireland. The advantage of using such technologies is that the learner does not have to be familiar with all the local terminology before for e.g. making a haircut appointment, it may reduce the amount of time/money spent on researching such topics and assist in language learning of the various contexts.

The material was developed based on four language learning scenarios provided to the user to help them adapt to living in Ireland within a language context sensitive environment.

The development software used for this project, eXact Mobile developed by Giunti Labs, enables access to a Learning Management System (LMS) with mobile 3G, WiFi and GPRS devices. This allows the engineer to access Learning Objects (LOs) and learning paths specifically customized for the available peripherals and for the location of access.

The target audience for this course is: English language learners based at the Ericsson offices Dun Laoghaire aiming for English language level of Upper-Intermediate and above (European Common Framework level B2). The prerequisite to this course is that student should have at least Intermediate level of English (European Common Framework level B1).

The testing phase took place in Dublin during November 2009. The 20 participants were a mix of vocational professionals in Telecoms from a range of countries worldwide representing up to 15 nationalities. Some of these participants were living in Ireland and found the language learning element of the courses very relevant and helpful. the audience ranged across a number of nationalities including: Lithuanian, Hungarian, French, Spanish, Czech, Romanian, South African, Jamaican, Dominican, Macedonian, Egyptian, Turkish, Filipino, Haitian and Qatari.

The majority of people found the experience to be fun with participants commenting that they would do a similar course again. The fun aspect of learning will encourage people to engage

in lifelong learning as they will be more engaged and active in the learning experience, and will feel they have a greater control in their own development.

In general, the context and location sensitive course was well received by all participants and the vast majority can see the benefits that such technologies will have for end users, this is evident by comments such as “Simple to use” and “innovative”.

Many participants were highly impressed by the learning courses tested, one stating “*it has potential to become a new way of learning worldwide*”.

Language learning skills (London Metropolitan University)

The aim of Work Package 7, *Use of context sensitive technologies in language learning* was to examine the relationship between structure and activity during language learning. The urban planning tour which was designed for work package 4 was reused to test the core theory that language learning for working professionals will improve if carried out in situ. The digital ‘technoscape’ was created to represent urban land, space, and subjects using a combination of social and cultural scripts. These included oral histories, local historical stories, and material elements that detail changes in the urban form, such as old photographs of pupils and landmark school buildings and historical maps.

The intention was for the student to *move through* the re-constructed landscape and thus “perform that landscape” and to experience the locale through a virtual tour of the past and present.

The tour was translated into four languages: German, Spanish, Italian and French. The evaluation of the work package showed that learning a language in situ reinforced learning and ensured better recall.

Language learning skills (Corvinno)

The learning content for WP7 contains a language learning game for the Artificial Intelligence applications in the city centre of Budapest and their connection to the social and technical contexts of the city. The game supports learning English as a second language, putting this into a technological context.

The downloadable application after the authentication identifies the user and provides learning content based on the user profile and the location of the user..

This is the final version of the application during the lifetime of the CONTENTS project. This version is capable to determine the user location and combine this information with the user’s learning profile, stored in our CooSpace learning management system. The content is pushed to the students based on both of these inputs

German for beginners (Plovdiv University)

In WP7, Plovdiv University developed the course “German for Beginners” in German for English speaking people, with context sensitive characteristics and location-based characteristics. Our learner has a registration and login to a mobile Learning Management System, which he accesses via the web browser on his mobile device. The system then offers the learner language course content, depending on the position of the learner, for example if the learner is in a German speaking country, the system presents the course in German.

We asked five young people to perform three tasks from the course “German for beginners”, using their own mobile devices. They had 1 day around Graz, Austria to perform three tasks. Five people from two SMEs from Bulgaria were on a specialization in Graz, Austria, as part of an European project. Two were from TEPOLSofts Ltd. and have an informatics and computer technology background. They speak English. They don’t speak German. The other three learners were from Romit Ltd. with a physics-engineering background. They speak English. They don’t speak German.

Conclusions: Our observation during the experiments in the CONTSENS project, give us an impression that a lot of learners, working people, adults, have two mobile devices. The users use their mobile devices mostly for phone calls, which doesn’t exclude the usage for Internet and SMS and chats. They think that m-learning is interesting, or optional. This is absolutely identical with our opinion that to use and develop mobile learning is not necessary, but optional to e-learning. Most of our users answered that they will recommend the mobile learning as a method of study to others and that they will take another mobile course if it answers to their training needs. The most important questions were “was it easy to study the course” and “accessing course content was easy”. All answered “agree” and “strongly agree”, which means that the location-based and content sensitive characteristics of the course presentation and system is something very positive and useful for the mobile courses. It is not necessary to navigate and select to reach the exact course, and sometimes this is very important when you are on the streets, you have not a smart phone etc. No one agreed with the statement that mobile learning increases the quality of learning. They disagreed or were uncertain. This is true and logical if we return to the question for the necessity of the mobile learning. The result is that the mobile learning is an option to e-learning! Our VET focus in the CONTSENS project, in WP4, WP5, WP6 and WP7 development, is connected to the performance-centered method application in the mobile learning. Performance-centered mobile learning is the right educational method for mobile learning for VET!

THE REMAINING WORK PACKAGES HAVE BEEN SUCCESSFULLY COMPLETED

The following documents have been developed and placed on the project website on these topics:

- The CONTSENS detailed work plan (wp1)
- The CONTSENS quality assurance plan (wp 9)
- The CONTSENS exploitation plan (wp 10)
- CONTSENS and EU policies (wp 10).

A comprehensive dissemination and exploitation plan has been completed. Central to this is the project Special Interest Group (SIG) which was organised around the contacts of the European Consortium for the Learning Organisation (ECLO).

Since its inception, ECLO has accumulated a comprehensive list of 1500 named individuals from universities, corporations, VET organisations, SMEs, business schools, public organisations and independent consultants. The source of these are delegates who have attended one of the 16 annual conferences, periodic members driven workshops, current and ex-members, partners from previous EU funded projects, members from networks with which there are reciprocal arrangements, contacts who have requested to be kept aware of ECLO’s activities etc.

Although primarily a European organisation, with members from 10 European countries, ECLO also has members in America, Australia, Russia and China. Complemented with contacts from the other CONSENS project partners, this has resulted in a rich and diverse SIG of interested learners. For the composition of the SIG 500 of the named contacts were selected because of their business and educational interests.

As planned four communications were made about the project to the 500 SIG members:

April 2008	Project presentation
April 2009	Report on Year 1 of the project and announcement of the project dissemination conference on 18-19 June 2009 in Hertogenbosch, Netherlands.
July 2009	Report on the dissemination conference with presentations and photographs
December 2009	Final presentation of the results and achievements of the project.

4. Partnerships

The project partnership was built up from one of the world's leading telecommunications companies, Ericsson, Ireland and one of Europe's leading providers of technological solutions for content, learning and knowledge management, Giunti Labs of Sestri Levante, Italy, two important European universities, London Metropolitan University from the United Kingdom and Plovdiv University from Bulgaria's second city and two SMEs, the Corvinno Technology Transfer Centre, Budapest, Hungary and the European Consortium for the Learning Organisation from Wavre, Belgium.

In the partnership Southern Europe is represented by Italy and Bulgaria, Eastern Europe by Hungary and Bulgaria, Central Europe by Belgium and North Western Europe by Ireland and the United Kingdom.

All members of the partnership had worked extensively in mobile learning before, usually in partnerships led by Ericsson, Ireland. Thus Corvinno was a partner in the Ericsson-led partnerships *Mobile learning: the next generation of learning*, *The incorporation of mobile learning into mainline education and training* and *The role of mobile learning in European education*, the European Consortium for the Learning Organisation was a partner in *The role of mobile learning in European education* and the University of Plovdiv in *The role of mobile learning in European education*.

From the start it was planned that Ericsson and Giunti would form a partnership within the partnership for the design and development of the General System Design.

A number of other partnerships were developed during the course of the partnership. All of these partnerships led to the dissemination and exploitation of the concepts and the products of the project. These partnerships included:

A partnership between Ericsson and English as a Second Language schools in the Dun Laoghaire, Co Dublin area for the development of language learning courseware with location based and context sensitive characteristics.

A partnership between Plovdiv University and the University of Graz, Austria for the development of German for Beginners courseware with location based and context sensitive characteristics.

The Corvinno Technology Transfer Centre's Living Lab initiative is an international partnership for the dissemination and exploitation of project results.

The London Metropolitan University has joined the MATURE project partnership consisting of Structuralia (Spain), University of Warwick (UK), BOC (Austria) U Paderborn (Germany), Pontydysgn (UK), U Innsbruck (Austria), Fachhochschule Nordwestschweiz (Switzerland), SAP (Germany), TU Graz (Austria) CIMNE (Spain) and FZI (Germany). This grouping focuses on Mobile Phones as Mediating Tools within Augmented Contexts for Development. Augmented Contexts for Development are an extension of Vygotsky's Zone of Proximal Development that takes into account the characteristics of 21st Century mass media structures and practices.

The London Metropolitan University is establishing a partnership with the diocese of Canterbury, United Kingdom, in the field of architectural analysis and tourism on mobile phones as a follow up to its work on location and context sensitivity carried out in this project.

Plovdiv University has set up a partnership for a study of Mobile Performance Support Systems (mPSS) consisting of the Open University of the Netherlands, UNED (Spain), Corvinno (Hungary), Distance Education International (Ireland), ISCN (Austria), TU Sofia (Bulgaria).

The Living Lab initiative developed by the Corvinno Technology Transfer Centre is an important partnership. Living Labs are open innovation platforms which provide research, development, innovation and market validation services in real-life environments.

Participants of a Living Lab come from all segments of public and private sectors: private companies (profit and non-profit), public and private research organisations, governmental institutions, public bodies and also individuals can benefit from this cooperation. In this case many of the participants are former partners of Corvinno in European Commission projects, including the CONTSENS project.

All these partnerships contribute to the dissemination and exploitation of the CONTSENS project.

5. Plans for the Future

Ericsson

Ericsson has embedded the context sensitive, location based courseware development into its mobile learning portfolio. This will be promoted to Ericsson personnel and customers where applicable. So in short, context sensitive education and training is now part of the education product portfolio.

Approximately 8.4 billion dollars was spent on IMS during 2009 and it's expected to rise to 17.3 billion dollars by 2014. As operators migrate to LTE, and with other developments like the completion of the Rich Communication Suite (RCS), it is believed there will be strong IMS market growth. Presently, the IMS networks in Bulgaria, Hungary, Ireland and the UK don't support location based services (ILS) which were necessary for this project. As IMS networks grow and mature, operators will begin to provide location based services, using the IMS networks, to provide a more enhanced experience for the end user. The working undertaken by Ericsson on this project is future proofed as the context sensitive, location based application developed will port easily to IMS.

Giunti Labs

Giunti Labs has participated in important mobile learning events in the latest 6 months of the project and the following message has been communicated by Fabrizio Cardinali, CEO and founder of Giunti Labs: "At Giunti Labs Research, we are working on Personal Ambient Learning Services (PALs). This involves adding portfolio, skills and mobile learning to our Learn eXact LCMS and HarvestRoad Hive digital repository (DR) solutions to provide content personalisation. PALs will bring personalized learning and knowledge content at the press of a button on iPhones and Blackberrys. They will adapt the learning material to the learner's context (such as time, device and location) and portfolio (learning history, skills and competencies)".

Mobile learning and Personal Ambient Learning Services (PALs) are two important features where the project CONTSENS has contributed by adding added value in terms of location-based and context-awareness: the existing Giunti Labs m-learning technology was brought to the project and customized for geo-localisation for a high percentage of mobile devices (first Windows Mobile and then J2ME).

This is the first step in a long-term program where the target is to provide Mobile learning and Personal Ambient Learning Services to all the types of device and especially iPhones and Blackberrys.

In order to achieve this objective, Giunti Labs has planned to proceed with a series of actions to achieve a successful exploitation of the results of the project. First, after a proper requirements analysis and engineering, the CONTSENS solution is going to be integrated into the next eXact Mobile release. This will guarantee an immediate first commercial exploitation of the CONTSENS outcomes.

Meanwhile, Giunti Labs is actively working in another FP7 European Project, IRMOS where the CONTSENS solution is the starting point for a more complex mobile solution in the area of the Virtual and Augmented reality: the geo-localisation is not any more based on the real position of the user, but on position of the avatar (computer user's representation) in the virtual world. In fact, the 12.9m Euro IRMOS Project is developing PALs involving 'real-time' interaction between people and applications in virtual and mobile learning scenarios over a Service Oriented Infrastructure (SOI), where processing, storage and networking need to be combined and delivered with guaranteed levels of service. This enables 'extended geo-

learning', delivered 'in-class', 'in-house', 'in campus and 'in building' on an urban, suburban and global GPS basis.

Even if Giunti Labs have got these activities to exploit successfully the results of the CONTSENS project, we have been working in project proposals at the European level to extend further our work in the mobile learning and Personal Ambient Learning Services.

London Metropolitan University

London Metropolitan University's plans for future use of CONTSENS revolve around Knowledge Transfer Partnership (KTP) and FET work. The KTP Scheme is a UK Government funded scheme that contributes to the costs of collaborations between the Knowledge Base and organisations. For example, we are in negotiations with the Archdiocese of Canterbury to develop a KTP in Church Tourism. Other plans at the European level include an in progress FP7 ICT FET proposal to extend our work to the area of Augmented Reality.

Corvinno Technology Transfer Centre

Corvinno thinks that context and location sensitive content delivery and the underlying technology have great potential in the future. Below are listed possible developments and further research directions:

- Inclusion of project products into a Living Lab. Living Labs are open innovation platforms which provide research, development, innovation and market validation services in real-life environments. Living Labs are willing to share knowledge, research services and products through a common platform. Participants of a Living Lab come from all segments of public and private sectors: private companies (profit and non-profit), public and private research organisations, governmental institutions, public bodies and also individuals can benefit from this cooperation.
- Incorporating the flash application deeper into the STUDIO architecture, on a SOA (Service Oriented Architecture) basis. This includes establishing connection between semantic MediaWiki and the flash, solving authentication problems and the ontology based semantic content organization on a mobile interface.
- Investigating exploitation of this technology outside education. There are several other commercial and non-commercial services, where location and context awareness might be crucial. eGovernment, mGovernment applications are one of the first ones, as Corvinno has experience on these fields and sees possibilities of transferring the knowledge gained during the Contsens project to those fields.
- Merging the emerging field of augmented reality applications with the Contsens approach. Several open source approaches on different platforms are ready to be trialed.

Plovdiv University

Plovdiv University will continue developing materials for the course Historical Plovdiv, because the course was widely discussed at a local level within the city council in Plovdiv and the region. There is a large interest in using mobile devices as an audio and text guide for

tours in Plovdiv for tourists and guests of the city (the course "Historical Plovdiv" with location-based characteristics is in English and Bulgarian).

The courses "Electronics" and "Information Technology" will be used in the regular plans of the Centre for Qualification and Certification at the Physics Faculty for training of unemployed and working people. The mobile devices delivery platform (mDIPSEIL system) will be used as an option to DIPSEIL, which is the main e-learning platform at the ECIT Department.

European Consortium for the Learning Organisation

It is ECLO's intention to:-

- Maintain the link on the ECLO home page to all EU projects that it has been involved in.
- Maintain the link from ECLO's home page to the 3 mobile technologies EU projects that they have been involved in (which includes Contsens).
- Continue to maintain a dedicated home page for the Contsens project and to post content provided by project partners on it
- Continue to offer to all project partners the opportunity to present at ECLO.'s annual international conference
- Offer to the project partners the opportunity to communicate and / or disseminate developments in the field of mobile technologies and m-learning to members of ECLO.'s SIG
- Actively seek opportunities to work with project partners on future EU supported projects.

6. Contribution to EU policies

This project has a policy document on the CONTSENS project and EU policies. It considers six major EU initiatives and how the project implements them. These EU initiatives are:

- The Lisbon Agenda, 23 March 2000
- The Maastricht Declaration 12 October 2001
- The Copenhagen Declaration 29 November 2002
- The Helsinki Manifesto 20 November 2006
- European Year of Creativity and Innovation 2009
- The Bordeaux Communiqué 27 November 2008.

The Lisbon Agenda

During the meeting of the European Council in Lisbon (March 2000), the Heads of State or Government launched a "Lisbon Strategy" aimed at making the European Union (EU) the most competitive economy in the world and achieving full employment by 2010. This strategy, developed at subsequent meetings of the European Council, rests on three pillars:

- An economic pillar preparing the ground for the transition to a competitive, dynamic, knowledge-based economy. Emphasis is placed on the need to adapt constantly to changes in the information society and to boost research and development.
- A social pillar designed to modernise the European social model by investing in human resources and combating social exclusion. The Member States are expected to invest in education and training, and to conduct an active policy for employment, making it easier to move to a knowledge economy.
- An environmental pillar, which was added at the Göteborg European Council meeting in June 2001, draws attention to the fact that economic growth must be decoupled from the use of natural resources.

The CONTSENS project contributes to making the European Union the most competitive economy in the world and achieving full employment in 2010.

Mobile learning is the next generation of learning, a successor to e-learning, and the use of wireless technologies will be a feature of the most competitive economy in the world.

The CONTSENS project prepares the ground for the transition to a competitive, dynamic, knowledge-based economy.

European Commission documentation tells us that Europe has world leadership in the development of wireless technologies. It is important that Europe should have world leadership in mobile learning too. The CONTSENS project is contributing to this.

The Maastricht Declaration

The Platform of Action urges research communities and institutions

to enhance the knowledge base in the substantive and geographic areas where they work in a manner consistent with the needs of relevant stakeholders and with the view to ensure its utilization:

- to advocate for the appropriate support and infrastructure for demand-led research in institutions of higher learning, autonomous research centers and local communities.

The importance of the Declaration of Maastricht for the CONTSENS project is that it focuses on education and training and on educational research, which are central to the project.

The CONTSENS project builds a constituency for demand-led research, committed to the production of knowledge that can address poverty, inequality and environmental degradation.

The Copenhagen Declaration

Economic and social developments in Europe over the last decade have increasingly underlined the need for a European dimension to education and training. Furthermore, the transition towards knowledge based economy capable of sustainable economic growth with more and better jobs and greater social cohesion brings new challenges to the development of human resources.

What is important about the Copenhagen Declaration is that its focus is Vocational Education and Training, the precise area in which the CONTSENS project works.

The focus of the Copenhagen Declaration is the transition towards a knowledge based economy capable of sustainable economic growth with more and better jobs and greater social cohesion

The CONTSENS project with its focus on wireless technologies and context sensitive courseware characteristics contributes to the knowledge based economy, better jobs and social cohesion.

The Helsinki Manifesto

The Helsinki Conference considered that in order to improve its global competitive position, Europe needs immediate and strong measures to boost its economic growth through productivity and innovation for job creation in 2007-2013. There is also an urgent need for institutional, structural and financial changes at EU, national and regional level to facilitate focused and innovation-based growth for Europe's global competitiveness.

While the overall education level is very high in Europe, it is vital for Europe to take the opportunity to create a globally competitive unique profile as a knowledge-intensive service economy. The R&D for knowledge-intensive service economy business and technology innovations should also facilitate the creation of single European markets for jobs and growth.

The CONTSENS project contributes to the facilitation of focused and innovation-based growth for Europe's global competitiveness and knowledge-intensive service economy business and technology innovations.

European year of creativity and innovation

Europe needs to boost its capacity for creativity and innovation for both social and economic reasons. The European Council has repeatedly recognised innovation as crucial to Europe's ability to respond effectively to the challenges and opportunities of globalisation. In December 2006, for example, it noted that "Europe needs a strategic approach aimed at creating an innovation-friendly environment where knowledge is converted into innovative products and services".

Mobile learning is the most innovative form of education and training and the CONTSENS project is well placed to create an innovation-friendly environment as it pushes the innovative field of mobile learning onto the new horizons of context sensitivity and location sensitivity.

The Bordeaux Communiqué

The four objectives set in Bordeaux for the period 2009-2010 are:

- Implementing the tools and schemes for promoting cooperation in the field of VET
- Heightening the quality and attractiveness of VET systems
- Improving the links between VET and the labour market
- Strengthening cooperation arrangements.

The CONTSENS project can implement the tools for promoting cooperation in the field of VET, heighten the attractiveness of VET systems by putting them in contact with state of the art technologies, improve the links between VET and the labour market by developing just-in-time skills and strengthen cooperation between various educational sectors.