

Using wireless technologies for context sensitive education and training

Progress Report V. 1

Public Part

Project information

Project acronym: CONTSENS

Project title: Using wireless technologies for context sensitive education and training

Project number: 2007-1968/001-001

Sub-programme or KA: Multilateral project (Development of innovation)

Project website: www.ericsson.com/contsens

Reporting period: From 1.1.2008
To 31.12.2008

Report version: Interim

Date of preparation: 10.01.2009

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This project has been funded with support from the European Commission.

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Executive Summary

In an address to the United Nations on 25 September 2008, the CEO of Ericsson, Carl-Henric Svanberg stated 'Today there are more than 3.700.000.000 mobile subscriptions around the world. In a few years we will pass 5 billion. 90% of new growth will come from emerging economies'.

There is an old adage in distance education research which states 'It is not technologies with inherent pedagogical advantages which are successful in distance education, but technologies which are generally available to citizens'.

It is important that European education harnesses for education and training this unprecedented availability of technology.

In recent years the European Commission has generously funded a number of projects in the field of mobile learning. From these projects the following structure for the provision of mobile learning has emerged:

- Level 1. SMS messaging
- Level 2. 5 to 6 screen shots of educational material
- Level 3. Mobile learning course modules
- Level 4. Mobile learning course modules with context sensitive and location sensitive characteristics.

In this project the partnership aims to avail of the latest technological developments to bring mobile learning to the next level.

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 studying art in a gallery instead of from an online photograph or a text book. In this scenario, the learner would be pushed information about the specific artwork they are standing in front of 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 is not as acceptable or practical

The concrete aims and objectives are to contribute to the continued development of mobile learning and to address the imbalance identified above between the availability of mobile devices and the lack of education and training provision on the sophisticated communications devices which every student in every EU country carries and uses constantly – except in education.

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 and Mobile Positioning, training content can be developed for both context sensitive and location based delivery.

It is the aim of this project and its objective to contribute to the advance of mobile learning by harnessing the latest technological developments in the field (GPS, RFID, Mobile Positioning) for learning. This will address the development of innovative ICT-based content, services and practice for Lifelong Learning.

The range of target groups addressed by this project are:

- Learners in the target institutions in Budapest, London, Plovdiv, Genoa and Dublin.
- Learners within the catchment areas of the partners' institutions who will receive just-in-time training as an enhancement of the present training provision, by the use of intelligent technologies in the system with learners accessing training that is contextually appropriate based on who they are and where they go.
- E-learning experts and stakeholders are an important target group who will be informed of the outputs of the project either by being informed via the Special Interest Group or the ECLO Network and will be encouraged to introduce mobile learning into their own institutions.
- The museum and art gallery courseware is addressed to the general public. The product training courseware is an ideal model for telecommunications and other technical employees who require just in time technical learning materials and also for sales people in all companies who need up-to-the-minute training in the latest products for sale.
- The general mobile learning community will be addressed and encouraged to take the outputs of the project and reuse the general system design described in work package 2 within their own environment. The Technical Working Papers describe a methodology, a way for course developers to create and deploy courseware characterised by the use of context sensitive and location based technologies.
- The Technical Working Papers are available to all online via the project website to foster the development of mobile learning.
- This project will be the subject of articles in the European online educational journals, like ELEED or EURODL.

The long term beneficiaries are those who will benefit from the development of mobile learning as a sector of educational and training provision, on a par with the way distance education became a recognisable sector of provision with the foundation of the open universities in the 1970s and the way e-learning became a recognisable sector from 1995 onwards.

Some specific aims of the project are to:

- create a General System Design which will enable the development of location sensitive and context sensitive educational courseware using wireless technologies

- localise this development to the systems of the partners
- develop 4 different types of mobile learning courseware
- evaluate student reaction to the mobile learning materials,
- write and publish reports from the data.

The project website is available at www.ericsson.com/contsens

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1. Project Objectives

The profile of the typical mobile device is changing rapidly. It is estimated by 2010 that the number of people using mobile broadband connections will have increased to over half a billion. This 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 and Symbian 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 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 studying art in a gallery instead of from an online photograph or a text book. In this scenario, the learner would be pushed information about the specific artwork they are standing in front of 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 is not 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, 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 is to:

- create a General System Design which will enable the development of location sensitive and context sensitive educational courseware using wireless technologies
- localise this development to the systems of the partners
- develop 4 different types of mobile learning courseware
- evaluate student reaction to the mobile learning materials,
- write and publish reports from the data.

The aim is to create for the first time in a European Commission project, in so far as is known, context sensitive and location sensitive educational courseware and to teach it to actual students in institutions in different parts of Europe. It is confidently asserted that the sort of educational experience already achieved in Year 1 of 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 partners intend leveraging new technologies such as IMS (IP Multimedia Subsystem) to develop context sensitive location based training.

IMS delivers multimedia services across fixed and mobile access. It is the only open, standardized way to deliver convenient IP-based consumer and enterprise services to fixed, mobile and cable communities, enabled by one common core and control for all types of networks.

IMS is access-independent. It combines the quality and interoperability of telecoms with the quick and innovative development of the internet – making the unique values of the telecom industry readily available to the application development community. It enables operators to mix and match equipment and applications from multiple vendors, and for mobile users to access their personal set of services wherever they roam.

IMS includes the tools and functions needed to handle numerous non-standardized services in a standardized way. This ensures the interoperability, access awareness, policy support, charging, security and quality of service functionality required to meet consumer demand for attractive and convenient offerings. It has been developed to interwork with existing networks.

For users, IMS-based services enable person-to-person and person-to-content communications in a variety of modes – including voice, text, pictures and video, or any combination of these – in a highly personalized and controlled way. It provides a future-proof architecture that simplifies and speeds up the service creation and provisioning process, while enabling legacy interworking.

Enriched communication and improved interaction between voice and data are important aspects to person-to-person communication. The following scenario illustrates how IMS enables these capabilities to help in everyday life.

While in a taxi from the airport, Anna calls her work colleague Andrew on his mobile number to discuss some issues with an important construction project. Anna activates the phone's video mode so that she can show Andrew exactly what she is talking about. Andrew views the images on his mobile while they discuss how best to move forward. The two decide that they need a little help from their colleagues back in the office. Anna selects the project work group from her buddy list, sees who is available, and initiates a push to talk group session. John and Jeff answer that they have also been thinking about the problem, and have a few ideas that they would like Anna to look at. When she gets to the hotel, Anna starts her laptop computer, opens her personal buddy list and invites Andrew, John and Jeff to join a videoconference. John opens up a presentation and shares it with his colleagues. At the start of the videoconference, Andrew is

still walking back to the office and participates on his mobile phone, but swaps to his PC when he arrives at his desk a few minutes later.

This scenario shows us how simple rich communications can be when supported by IMS. It is not only technology that will dictate the evolution to these capabilities: end-user and enterprise needs will drive multimedia service demand for both mobile and fixed operators.

There are a number of applications which are built into IMS which can be utilised for educational purposes including the Push to Talk (PTT) Application, which is a walkie-talkie type of single duplex communication, and the WeShare family. The Push to Talk Application enables real-time communication one-to-one and one-to-many with the press of a button. The solution is based on the Push To Talk over Cellular (PoC) standard to secure global interoperability. WeShare is a family of services enabling the sharing of pictures and video while talking. The IMS solution also includes Engine Multimedia Feature Server and Presence Server to provide IP Centrex applications for enterprise customers as well as multimedia offerings to residential broadband customers. Also included in the Ericsson IMS is the Service Development Studio which is a development tool with an open source integrated development environment for new applications that can run on the Ericsson IMS platform. It is possible for developers to develop content that use the services offered by the Ericsson IMS e.g. Presence, group lists and so on.

The Presence service is a component of the IMS platform that may be used by other applications e.g. WeShare. It enables a user to subscribe to another user's presence. This means that user1 will send a message to user2 requesting the ability to see their presence and any changes that may occur to it. User2 will see a pop-up message with this request and can either allow it or not. If they allow it, User1 will be able to see when they log on. All users will have the ability to change their availability, much in the way that MSN Messenger does i.e. busy, out of office. Even moods will be possible to indicate. So User1 will see any of these changes when user2 changes them. So for example, in WeShare, when a list of buddies is called up on the mobile handset, it will be possible to see who is logged on or not. A tutor would be able to initiate a WeShare session with a student or vice versa.

Group List Management is the IMS platform whereby a list of buddies (addresses) may be stored in a shared server, or on application specific servers. This is a component that is available to other applications, e.g. Push To Talk. If a user wished to contact one of their stored PTT buddies, it is simple to lookup the buddy address and send a voice message. Similarly, if a tutor wished to notify a group of students as to an upcoming deadline, for example, he can simply select this group name and send a message.

As IMS is not yet commercially available in the countries of the partnership, other solutions such as GPS and QR codes are being utilised in phase one.

3. Project Outcomes & Results

WORK PACKAGE 2 THE GENERAL SYSTEM DESIGN FOR THE PROJECT HAS BEEN SUCCESSFULLY COMPLETED.

This work package describes the solution that enables the deployment of content in a context sensitive and location based environment. Due to the fact that IMS (IP Multimedia Subsystem) is being developed by almost all tier 1 telecom operators and their vendors, and due to the innovative nature of this project, it was decided to use IMS to setup, manage and terminate sessions from the content server. From a technical perspective the IMS architecture is a relatively new standard that reuses previously developed IP protocols and introduces new application servers.

The IP Multimedia Subsystem (IMS) standard defines a generic architecture for offering Voice over IP (VoIP) and multimedia services. It is an internationally recognized standard, specified by the Third Generation Partnership Project (3GPP/3GPP2) and embraced by other standards bodies including ETSI/TISPAN. The standard supports multiple access types including GSM, WCDMA, CDMA2000, wireline broadband access and WLAN.

Ericsson's IMS-based services enable communication through various media, such as voice, text, pictures and video, or a combination of them. Adapted to each individual's preference IMS enables a consistent experience across multiple access technologies, user devices and geographic locations for business or private use. It also allows users to better indicate their accessibility – or their 'presence' – so they can control how, where, when and by whom they can be reached.

A key application server in IMS, that will enable the deployment of content in a context sensitive and location based manner, is the IMS Location Server (ILS). The Ericsson ILS is an enabler providing location on users to IMS services and solutions. The ILS aggregates and manages location determination systems in various access networks, including mobile, wireless (e.g. WLAN) and wireline broad band (e.g. xDSL, Fiber and CAT5). The ILS abstracts access network specific positioning systems providing one common interface for all access networks. The location is presented to IMS servers or clients using SIP Subscribe/Notify with geographical (spatial) filter criteria's and SIP Publish.

The ILS offers the possibility to subscribe either on a user or a group of users location(s), but also to subscribe on an area to get a notification when someone enters the area.

ILS also provides a number of basic services related to user's geographical location, such as geocoding and reverse geocoding of location, mapping of

requested QoS to suitable and available positioning method, monitoring user locations and triggering on geographical events and emergency related services.

Policies and privacy is enforced using the Location XDMS, being a component of the ILS. The XCAP interface on ILS can also be used with a Shared XDM, to use common groups and a common repository function for lists and policies.

The location can be presented either as a longitude, latitude, altitude or as a street address, according to IETF GeoPriv PIDF-LO. A Work Item standardizing the SIP interface for location in IMS and IP networks is started in OMA and is lead by Ericsson.

THE LOCAL SYSTEM DESIGN (WORK PACKAGE 3) HAS ALSO BEEN COMPLETED.

The salient aspects of the systems implemented at the University of Plovdiv, Corvinno Technology Transfer Centre, London Metropolitan University and Ericsson/Giunti are:

ERICSSON/GIUNTI

Mobile communication technologies are rapidly evolving to include local area wireless connections using Wi-Fi, Third Generation (3G) mobile technology, Worldwide Interoperability for Microwave Access (WiMAX) and related mobile computing devices such as smart phones, Pocket PCs, tablet PCs, and various Personal Data Assistants (PDAs) handheld devices.

The development software proposed for use in this project – eXact Mobile - enables access to an LMS with mobile UMTS, Wi-Fi and GPRS devices. This allows the learner to access Learning Objects and learning paths specifically customized for the available peripherals and for the location of access.

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 e-learning 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).

In order to satisfy the requirements of the CONTSSENS project, Giunti Labs and Ericsson have conducted a detailed investigation into the technologies and methodologies that could be used for content development. This should include the option to use different systems which are still under definition, for example IMS technology.

As mentioned in the General System Design, IMS is still being rolled out across mobile networks worldwide, in particular the IMS Location Server (ILS) is not due for release until Q1 2009. Consequently the first phase of development work will focus on existing GSM/WCDMA networks and GPS .

The partners' solution for CONTSSENS is a Java™ 2 Platform, Micro Edition application based on the graphic library LWUIT: this is a UI library bundled together with applications and it helps content developers in creating compelling and consistent Java™ 2 ME applications. LWUIT supports visual components and other UI features such as theming, transitions, animation and more.

The partners have developed eXact GEO, a customized solution not only able to locate the position of the user but also to provide on demand the list of contents related to the items located around the user.

eXactGEO is based on Java™ 2 Platform, Micro Edition (J2ME™) technology that provides a robust, flexible environment for applications running on mobile and other embedded devices such as mobile phones, personal digital assistants (PDAs), TV set-top boxes, and printers. Applications based on Java ME are portable across many devices, yet leverage each device's native capabilities and from a market analysis conducted in Giunti Labs, it is clear that the most of the devices support J2ME technology.

LONDON METROPOLITAN UNIVERSITY

London Metropolitan University 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: We have GPS technology to pinpoint our location, we have satellite images and 3D maps of almost every relevant place in the world and we have the web that contains information about most of the places in the world. 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. Mediascapes 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 process of creating a Mediascape involves a number of distinct stages:

Initially a high resolution map is imported into the authoring environment. Descriptive metadata is then added to the mediascape. This map is georeferenced in situ before it is imported and then active zones can be layered over the map. Work package training in the form of text and images (html), audio, video and flash objects can then be imported into each zone. Scripted behaviours (what logic will be applied to the media delivery) are also assigned to each zone. After simulated testing, the mediascape is packaged up ready for distribution and download.

The process of launching the packaged mediascape in the field is as follows:
from front screen of the device go to Start – programs – mscape player.

Choose Mediascape: in this example *Grove_tour3*

The initial view shows the map of the area of investigation. This is the area containing all the zones and associated course material:



The bottom left hand corner is the GPS signal box (the mountain with the question mark) – when it is green you have GPS and you are ready to go.

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The QR code 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 we recently 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

UNIVERSITY OF PLOVDIV

AT THE UNIVERSITY OF PLOVDIV WORK PACKAGE 3 (LOCAL SYSTEM DESIGN) WAS CARRIED OUT AS FOLLOWS:

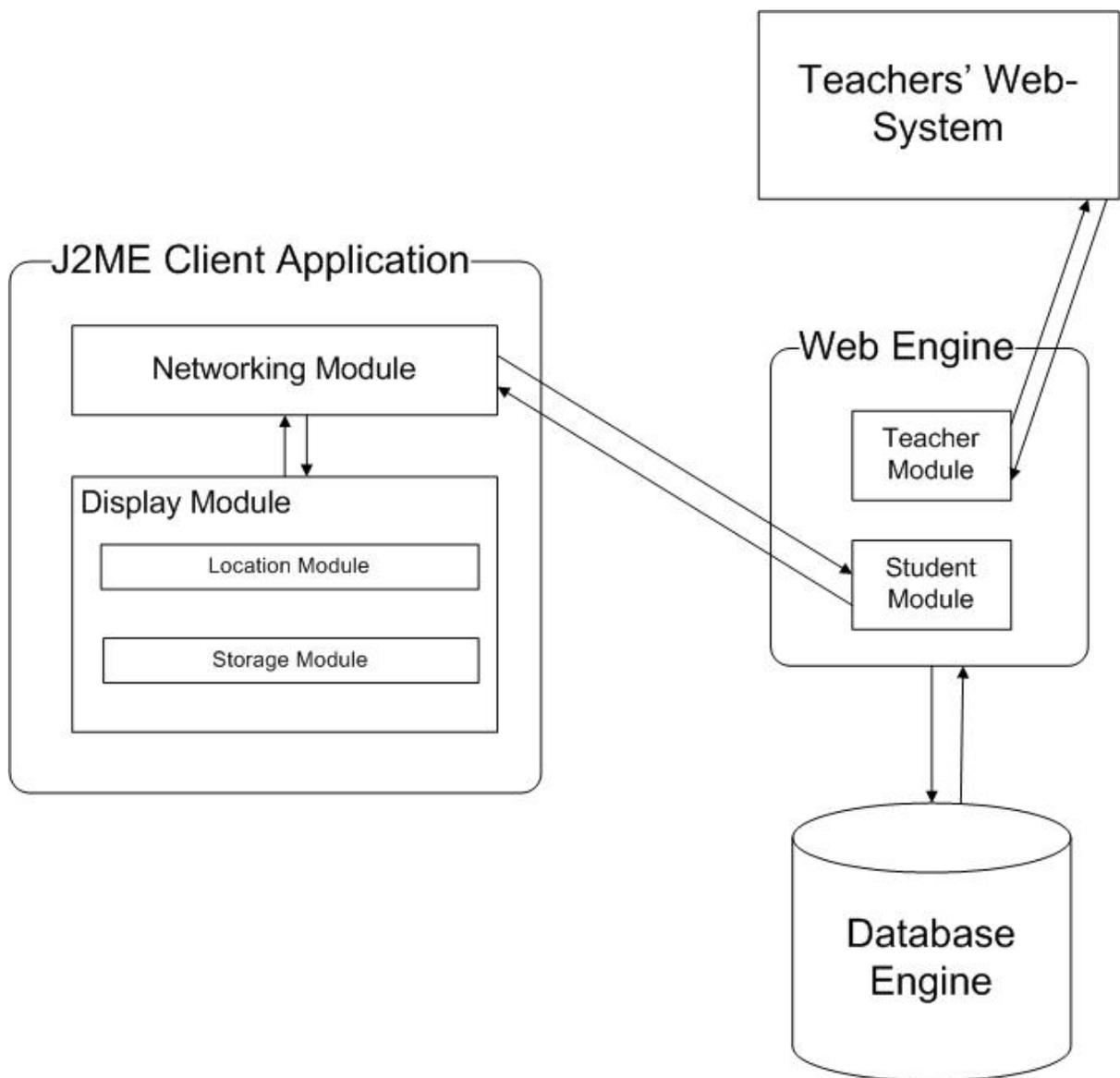
mDIPSEIL v2 **Local System Design**

- Main Modules of the mDIPSEIL v2 system
- Determine the Device Position using GPS
- Usage of the GPS Coordinates 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

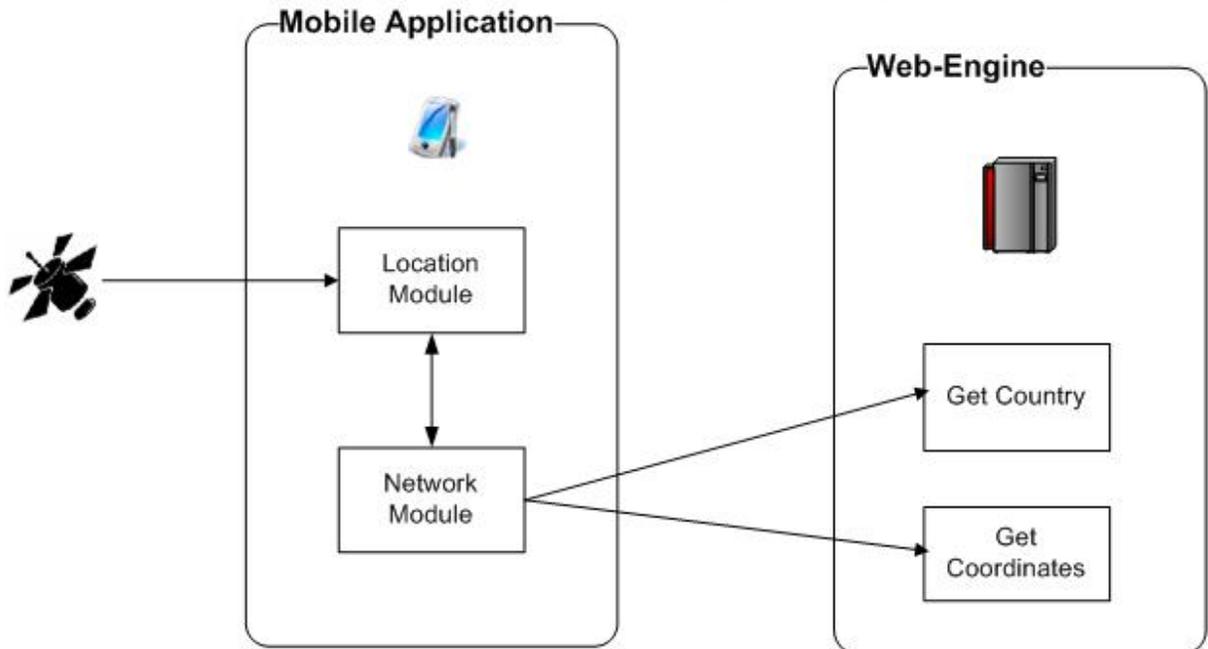
The mDIPSEIL v2 Mobile Learning Management System (MLMS) consists of three main, dependable from each other modules: a J2ME client application, which must be downloaded and installed to the client's (student's) phone; Database Engine – such as MySQL, for storing the educational data; a Web-Engine - such 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 coordinates 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 case 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 coordinates. For one minute the application process sleeps. This one minute is needed for the device to startup and take the coordinates. 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. Coordinates 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 warnings. 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.



Usage of the GPS Coordinates in the System

If there is already a determined position in the memory, there are two features of mDIPSEIL v2, which can use it. The first one hides all tasks, which aren't determined for these coordinates, or said another way – shows only tasks which are configured by the teacher for them. For example if a student needs to study a task about some building, and the teacher has properly configured the task for the coordinates of this building, the student may go next to it, and use the described feature to “isolate” only this task. This is a great feature for developing location based tasks. After the learner selects this feature from the task menu in the J2ME application, it connects to the Web-Engine using HTTP and passes it its coordinates. In the Web-Engine there is a module called “Get Coordinates”, whose only function is to search the whole database and “isolate” the tasks for the given coordinates. The new results are again passed to the client application using HTTP.

The second feature of the client application, which uses the GPS coordinates shows only tasks which are specified for the given country. Or other way said, the student may hide all tasks, which are in other languages (of course if properly configured by the teachers). Again after selecting this feature the client application passes its coordinates to the Web-Engine, which this time

executes its “Get Country” module. It searches the database for countries which cover this position and after that shows only tasks, which are configured for it. For example a person finds himself in Spain and he wants to see only courses in Spanish. By selecting this second feature of the application he will get only list with all tasks specified for Spain. Of course if there are some tasks in English or German for example, but again configured by the teachers for Spain, they will also be shown.

Structure of the Educational Content

As DIPSEILv2 the mDIPSEIL v2 system has the standard IPSS-EE structure: courses, containing modules, containing tasks. In this new system a new level was integrated in this structure, called “Objects”. Objects are the building elements of the tasks. Objects can be: text, picture, sound or video. One task may have as many objects as the teacher want. One object can be used not only in one task, but in as many as there are in the system, not only in the same module or course, but also in others and by other teachers.

This brings the greatest power of the system – the sharing of objects. For example if one tutor has created a Module for “Electronic Design” and another wants to develop a task for “Operational Amplifiers”, he may use objects from the module. This has two positive sides: if the student has already made a task from the module, he will find the same objects in the new task and thus it will be easier for him to study them; the sharing of objects will save time and resources of the tutor, and saves also the time of the student, because the system is not overloaded with one and the same information, so it needs less time to search and use its database. For security reasons objects cannot be edited or deleted while they are assigned to a task.

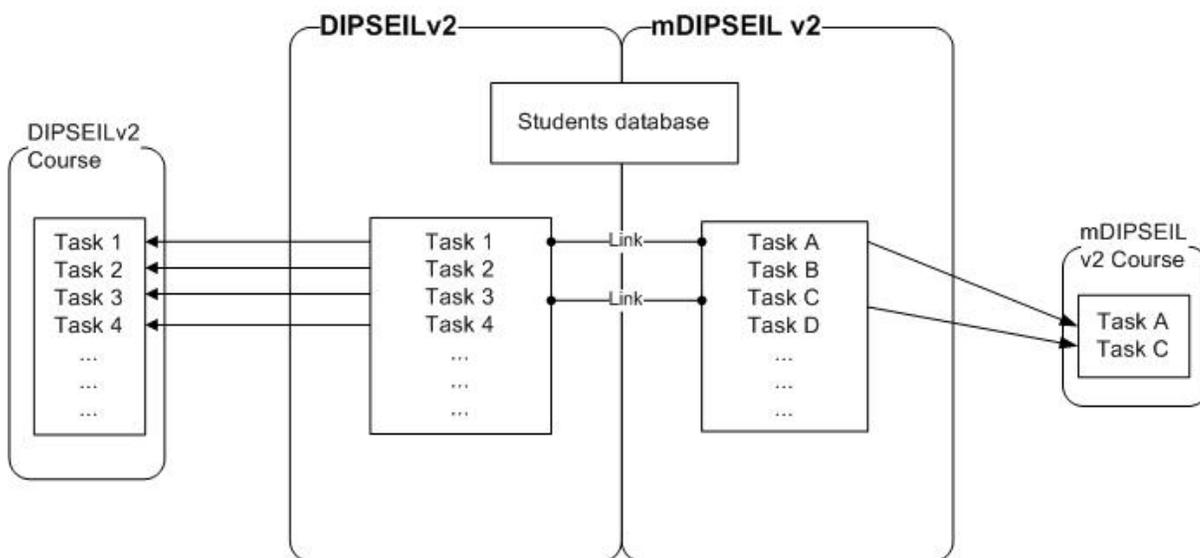
User Roles

In mDIPSEIL v2 there are two roles of persons – students and teachers. Teachers use a specially developed Web-System, which directly communicates with the Web-Engine, to upload educational content to the system. Using this Web-System they may create and/or delete courses, modules, tasks and objects, assign objects to tasks or remove assignments, but only for tasks created by them. They could also specify how objects are used inside of tasks. For proper view of educational content teachers must also specify coordinates for the tasks and/or country for the task. Tasks in mDIPSEIL v2 must be attached to tasks from DIPSEILv2, or else students won't be able to view them.

Students are actually the direct user of educational content through their mobile devices and thus the system is specially developed for them. In order to use the system, they must download and install a JAR file to their phones.

Integration with DIPSEILv2

mDIPSEIL v2 is closely integrated with DIPSEILv2. In order students to be able to enter the mobile system, they must have a valid registration to the web-based system. mDIPSEIL v2 does not have its own database with students. In the DIPSEILv2 system, students normally build their own courses from all available tasks on the system. This is stored in the database. The course of the student in the mobile system is automatically built from all tasks in mDIPSEIL v2, which are “attached” or linked with the selected in the DIPSEILv2. For example if we have selected four tasks in DIPSEILv2 and three of them have attached mobile tasks, then only these three are shown to the learner in the mobile system. If there are no attached tasks, then none are shown. To which DIPSEILv2 task, the mobile task is attached is controlled by the teacher.



Developing Educational Content by Teachers

With the new mDIPSEIL v2 system creating, editing and viewing tasks has never been easier. Teachers are the persons, who create tasks. A valid registration with an e-mail and password is needed, in order a teacher to login the system. The system administrator must be contacted, if a new teacher should be added. After the teacher has entered the system, he sees a tree view with all his courses, modules and tasks. On the top of the window, there is a toolbar, which offers all the possible functionalities on this screen – add or remove an element from the structure, edit a task or logout.

The first step for the new teacher is to create new courses, modules and tasks. Basically on this screen he creates the main structure of his courses. After clicking the “Create” button, on the right of the window a creation form will be shown. Step-by-step he must enter: what structure type he wants to create (course, module or task), then type the title of the element. In case he

chooses module, he must point a course to be added to, and if he chooses task, he must select course and module. The elements of the tree on the left have radio buttons in front of them – by selecting one of the element and clicking on the “Delete” button, this element will be deleted. Deleting a whole course will also delete all its modules and tasks. The third button from the toolbar is the “Edit task” button. Only tasks could be edited and trying to edit another element will result in an error.

Viewing and Studying Educational Content by Students

In order to view the newly developed tasks, the student must download the mDIPSEILv2.jar file from the main site of the system. That is an installable Java Archive file – it must be transferred to the device using a computer-to-device connection like USB cable or Bluetooth. Another way to do this is directly download the file to the phone using its web browser and some kind of data connection. Once the file is downloaded and installed, a new icon will show up in the “Applications” folder of the phone. At the first time it is executed, it will start its initialization process – determine type of phone and locate the device using GPS. Is the phone advanced or not, depends on two criteria –first it must support the 3GP video format, and second its internet connection should be faster than 80 kbps.

SCORM

Sharable Content Object Reference Model (SCORM) is a collection of standards and specifications for web-based e-learning. It defines communications between client side content and a host system called the run-time environment (commonly a function of a learning management system). SCORM also defines how content may be packaged into a transferable ZIP file.

SCORM is a specification of the Advanced Distributed Learning (ADL) Initiative, which comes out of the Office of the United States Secretary of Defense.

SCORM 2004 introduces a complex idea called sequencing, which is a set of rules that specify the order in which a learner may experience content objects. The standard uses XML, and it is based on the results of work done by AICC (CBT), IMS Global, IEEE, and Ariadne.

SCORM will be integrated in the mDIPSEIL v2 system in late 2008. The most important part from a task is the “Task-specific training”, that’s why it will be packaged as a SCORM ZIP file ready to be transferred to another SCORM-supported system. Every object, which is referenced as part of the “Task-specific training” will be included in the archive.

IPSS_EE Learning Objects

IPSS_EE Learning Objects fits Wiley's definition, "any digital resource that can be reused to support learning". IPSS_EE_LOs are certainly designed to support learning. More specifically, they support learning in a performance-centered environment by providing necessary materials in an easy-to-access format. IPSS_EE_LOs are reusable. Most immediately, they will be reused project after project for the duration of each MBA cohort. Designers use subsets of the objects in other IPSS_EE, the students use the learning object library to create own courses. IPSS_EE_LOs are digital. In fact, because of the distributed nature of the program and our desire for easy maintenance, our learning objects are exclusively Web-based.

Task-specific training reduces preliminary training by helping the user to learn while performing the task. This type of *training is learner-centred* because the learner asks for help when he needs it to perform a task, and the help gives him the specific information that (s) he requests.

IPSS_EE_LO contains specific advice on performing tasks. The advice is usually provided by an *expert system*. Instructions how to perform and how to use the software are automated tools for task performance – they are most helpful when a supported task involves the use of *specific software*.

IPSS_EE_LO presentation allows the learner to perform the task using the text fields, executive files, simulation activities etc. Links provide access to all IPSS_EE_LO elements, defined in the content structure, that help the learner to perform the task – task-specific training, instructions, reference information, software for task performance and expert advices for problems and trouble shootings. Each of these parts is presented in a new window, opened on a working environment. The rationale behind this is:

- to allow learners to access the elements of IPSS_EE_LO quickly;
- learners generally see themselves as on a work place;
- the learner doesn't loose the assumption that the main goal is to perform the task and the links are used to increase the quality of this performance.

WORK PACKAGE 3. LOCAL SYSTEM DESIGN AT THE CORVINUS UNIVERSITY OF BUDAPEST

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 time 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.

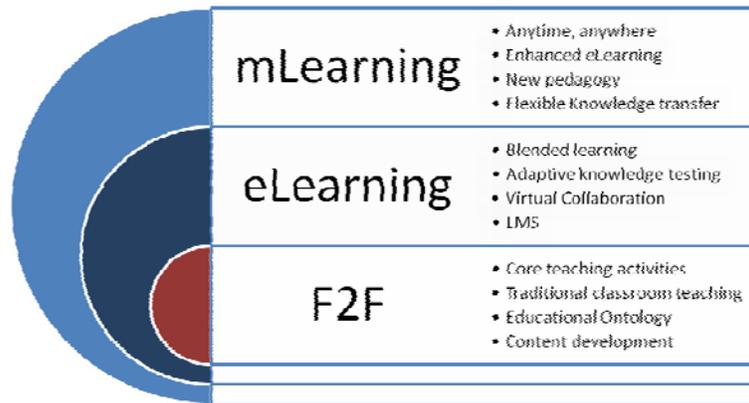


Figure 1: Service Portfolio of Corvinus University

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.

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

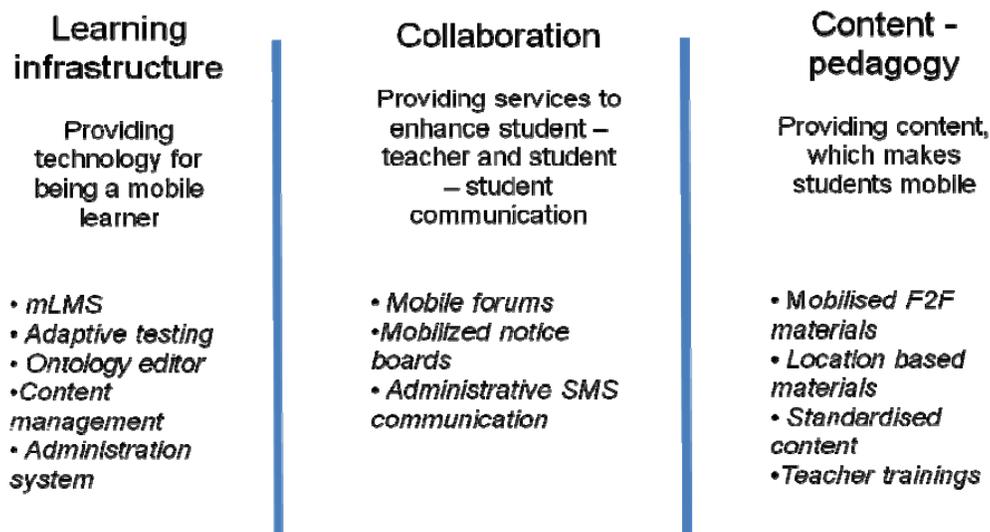


Figure 2: Aspects of Mobile Learning at the Corvinus University of Budapest

STUDIO – ONTOLOGY DRIVEN LEARNING ENVIRONMENT

Motivation background

Accordingly 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.

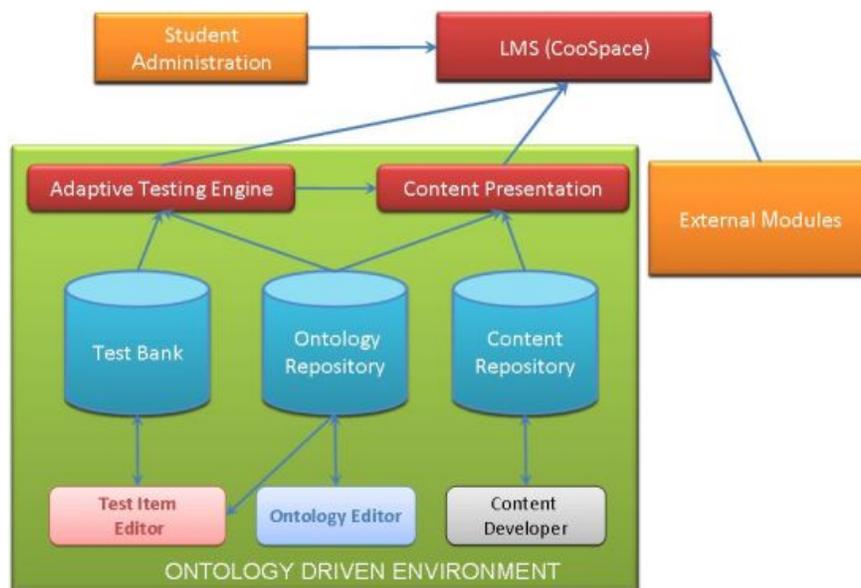


Figure 3: Corvinus Mobile Learning Infrastructure

COOSPACE MLMS

The significance of information society lays 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 being collected. (These are the various contents in HTML and WML versions) The rest of the material was assigned to the additional lecture notes section. Students, who were logging in 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.

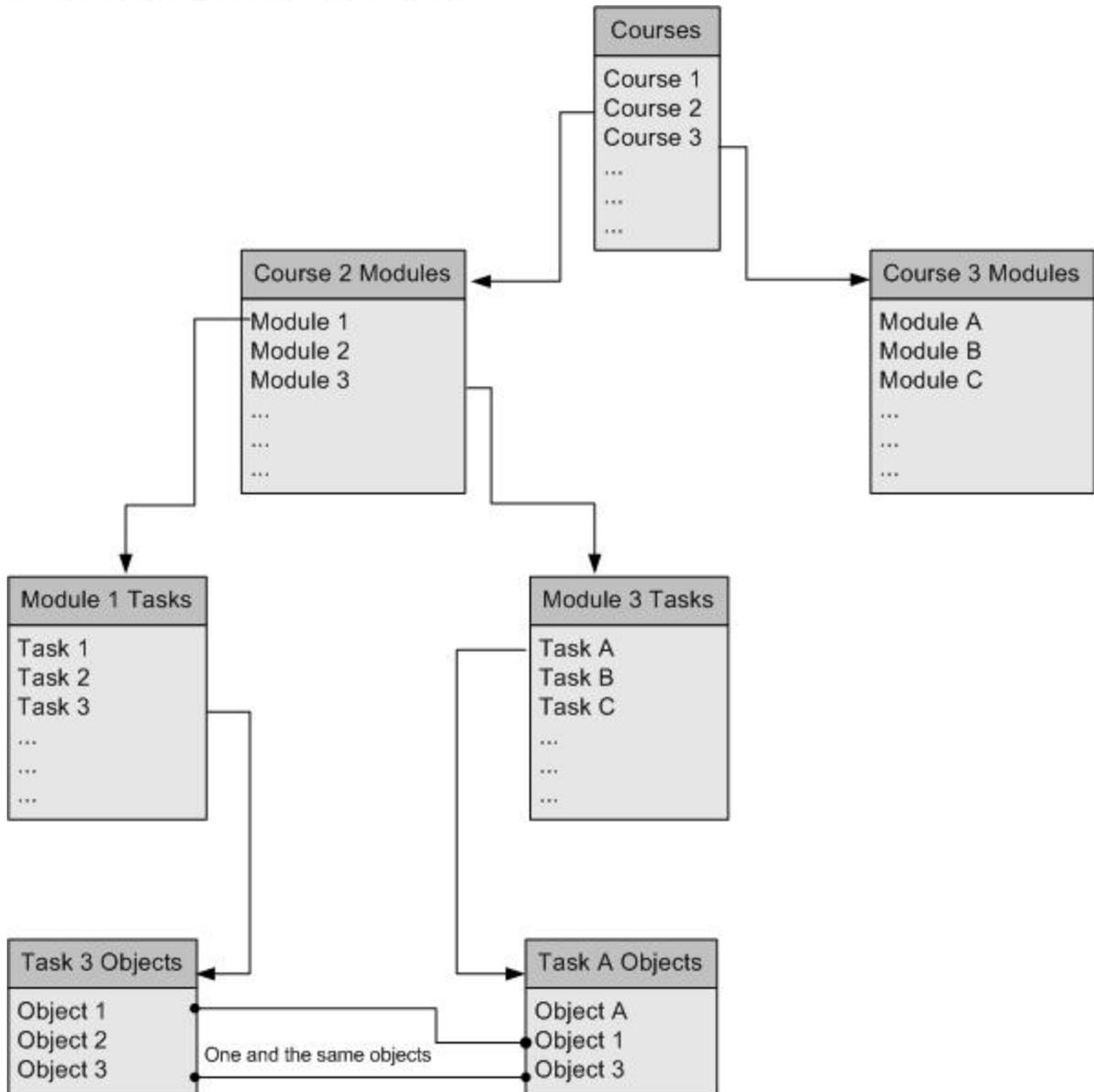
In case the WAP browser of the mobile phone is not capable to access the website. We recommended the students to use the Opera Mini browser, which is a free internet browser application for wide range of mobile phones. This Java based browser runs on almost all commonly used devices. The downloading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

WORK PACKAGE 4 ‘TASK BASED TRAINING USING LOCATION AND CONTEXT SENSITIVE TECHNOLOGIES’ HAS BEEN SUCCESSFULLY COMPLETED AT THE UNIVERSITY OF PLOVDIV, BULGARIA THUS:

The title of the course

“Analogue Electronics” for the third year students from the “Physic Engineering” speciality, Physic Faculty, Plovdiv University, Bulgaria

Structure of the Educational Content



This is the standard IPSS-EE structure: courses, containing modules, containing tasks. In mDIPSEIL a new level was integrated in this structure, called “Objects”. Objects are the building elements of the tasks. Objects can

be: text, picture, sound or video. One task may have as many objects as the teacher want. One object can be used not only in one task, but in as many as there are in the system, not only in the same module or course, but also in others and by other teachers. This brings the greatest power of the system – the sharing of objects. For example if one tutor has created a Module for “Electronic Design” and another wants to develop a task for “Operational Amplifiers”, he may use objects from the module. This has two positive sides: if the student has already made a task from the module, he will find the same objects in the new task and thus it will be easier for him to study them; the sharing of objects will save time and resources of the tutor, and saves also the time of the student, because the system is not overloaded with one and the same information, so it needs less time to search and use its database. For security reasons objects cannot be edited or deleted while they are assigned to a task.

In mDIPSEIL v2 there are two roles of persons – students and teachers. Teachers use a specially developed Web-System, which directly communicates with the Web-Engine, to upload educational content to the system. Using this Web-System they may create and/or delete courses, modules, tasks and objects, assign objects to tasks or remove assignments, but only for tasks created by them. They could also specify how objects are used inside of tasks. For proper view of educational content teachers must also specify coordinates for the tasks and/or country for the task.

Students are actually the direct user of educational content through their mobile devices and thus the system is specially developed for them. In order to use the system, they must download and install a JAR file to their phones. Students are identified with unique e-mail and password from the DIPSEIL v2 system. Once logged in, they may view all tasks, which they have chosen or use the special positioning features to show only specific tasks. Students are presented with the educational content using the standard IPSS-EE Learning objects – the simply organized menu in the task screen allows them to browse through “Task Description”, “Task-specific Training” and so on. According to the specification of their phone and its features they may view advanced content (such as video or sound), or else they will only see text and images.

Course content

Module 1 Passive circuits

Task1 Resonance of a series RLC circuit

Task description: For the resonance circuit shown on the figure make the following:

1. Draw the schematic using Orcad 9.2

2. Make simulation using the built-in SPICE and find the Frequency Response of the series resonance circuit.
3. Find the quality factor Q

The content is in two languages – English and Bulgarian, for two types of phones – advanced (with audio and video) and older (only with pictures and text)

Module 2 Semiconductors

Task2 I-V of PN diode

Task description: For the circuit shown on Figure make the following:

1. Draw the schematic using Orcad 9.2
2. Make simulation using the built-in SPICE and find ON voltage, where the diode starts to conduct. The analysis type must be DC SWEEP.

Sweep Variable:

Voltage Source: V1

Sweep type: Linear

Start Value: - 0.2 V

End Value: 1V

Increment: 0.01V.

The content is in two languages – English and Bulgarian, for two types of phones – advanced (with audio and video) and older (only with pictures and text).

AT LONDON METROPOLITAN UNIVERSITY WORK PACKAGE 4 WAS CARRIED OUT THUS:

Product using location and context sensitive technologies – the training of urban design professionals.

Eden Grove is situated within the immediate locale of London Metropolitan University, North campus. The work package relates to the university's continuing mission of connecting with the local community and bridging the gap between formal and informal learning as a continuum of activities (Cook et al 2008). This is the area from which many of the students are drawn. It is an area steeped in social and cultural heritage, as "Cities are very much the crucibles of cultural juxtaposition, fusion, hybridization and syncretism" (Sheller and Urry 2006: 14).

The work package will enrich the students' knowledge and understanding of urban education in a meaningful context by using mobile learning technologies to immerse deeply into one particular urban setting, namely Eden Grove and Georges Road in Holloway, London, N7 from 1850 until the present day. The use of a historical perspective will demonstrate continuation, change and causation

and enable a better understanding of both contemporary and future urban contexts.

Rationale for undertaking the work package

The work package will explore how schools are signifiers of both urban change and continuity of education policy and practice in one inner city locale. It will explore urbanism and urbanisation by examining the flows of diverse peoples within urban space and infrastructures (Castells 1996). Since 19th century there has been a big influence of religious schools in the area. The significance of such schools has particularly been reflected in terms of academic achievement, ideologies and processes of social, cultural and geographical power.

Script segments from the actual mobile learning course;

Now look at the current Sacred Heart School. What sort of school is this now?

The school is built in an open style, giving each classroom some access to the playground. When do you think it was built? What does the architecture suggest about the educational approaches at that time in terms of health, cleanliness, modernisation and efficiency?

Task: Looking at the exterior of the school, what changes do you think have been made to the school recently? What effect do you think this has had on the environment and the education of the children?

Further down Georges Road on your left you will see Radford House, a five storey block of flats backing on to Hartnoll Street, which was built in 1929 and the smaller four-storied Hartnoll House for cheaper letting. What did these buildings replace and who was housed in them?

Task: Using the local maps and old photographs sketch the road layout of the area in the 19th century.

As you continue to walk down Georges Road you will come to St. James' School flats on the right hand side. This was an early attempt at change of use of a building as part of gentrification of the area.

Task: Compare the structure of this building with those you have seen earlier. Can you see where the different entrances for boys, girls and infants would have been? How has the architecture changed? Why do you think this is?

The student groups

Three different student groups took the mobile tour, 22 students in total. Groups 1 and 2 took the tour on the same day, and Group 3 took it a week later.

- Group 1 were 2nd year BA Education Studies students. There were 4 students and they worked in pairs.
- Group 2 were MA Education Studies students. There were 10 students in the group and they worked in 3s or 4s, but it was noted that students didn't stay within the same group throughout.
- Group 3 were BA Education Studies students. There were 8 students in the group. Initially they worked in pairs, but the GPS on one of the Advantage devices wouldn't run, so students had to double up with other groups and share devices.

Before the third group took the tour a week later, an adjustment was made to the mediascape which involved realigning the GPS coordinates with the map due a previous zone overlap.

Also of note is that we experienced some technical problems with this group, namely that the GPS did not function as well as it had previously, and the GPS system wouldn't work on one of the Advantage devices, meaning some students had to double up with other groups and share devices.

The photographs below were taken during the trials.



Students in Group 1 taking the mobile tour



Students in Group 3 during the mobile tour

It is confidently asserted that this sort of educational experience is unique to mobile learning. It cannot be achieved either by face-to-face education, or by distance education, or by e-learning.

AT CORVINNO TECHNOLOGY TRANSFER CENTRE WORK PACKAGE 4 WAS COMPLETED AS FOLLOWS:

Application description

Course type

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.

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 for the public.

Develop environment and development process

The application has been developed with Flash 8 extended with Flash Lite 2.1 update. The Flash 8 does not include GPS gateway that is why we used Kunerilite 0.9.7.1. The Kunerilite works like a Flash extension and provides access to the GPS functions, so we could programmatically use the GPS.

The development process was the following:

1. Collecting course data (Text, Pictures and GPS coordinates)
2. Put the course data into a standard XML data file, and upload to the server
3. Create the application in Flash
 - a. Create connection to the XML data stored on server
 - b. Display the XML data in hierarchical structure (menu system)
 - c. Call Google Maps to visualize the GPS coordinates
 - d. Create connection to GPS using Kunerilite plug-in
 - e. Display real time GPS coordinates (latitude and longitude)
 - f. Display phone details (battery level, signal strength)
 - g. Create automatic distance calculation from *actual position* and *course data position*
 - h. Display the places
4. Test the application in *showcase application* (see version) without GPS
5. Test the *full version application* in the city

Versions

There are two main versions of the final application. The final version number of the application is 1.0.

1. Showcase application

The showcase version of the application requires no GPS, and works all devices which can run Flash Lite 2.0¹. The showcase application simulates a GPS coordinate within Budapest and uses it as reference point.

2. Full version application

The full version application uses inbuilt or Bluetooth connected GPS, and requires Nokia S60 mobile device². This configuration can read the real time GPS coordinates, and uses these as reference points.

Installation

Showcase application

1. Connect your mobile device to your PC
2. Run your device manager application (e.g. Nokia PC Suite)
3. Install Flash Lite on your mobile device (If it is not installed yet or the version is older then 2.0. Recently bought devices have pre installed Flash Lite plug-in). You can find the install packages on the Adobe Flash Lite site.
4. Copy *doorhandle.swf* on your mobile phone.
5. You can start application with opening the *doorhandle.swf*

Full version application

1. Connect your mobile device to your PC
2. Run Nokia PC Suite
3. Install *doorhandle.sis* on your mobile device
4. Replace the *.swf* file with *doorhandle.swf*

Application properties

The application uses online connection to call the course data, and the map pictures. The application was optimized for 240x320 pixel screen size; in other screens the application tries to resize the content.

As mentioned the course data is stored in XML files, so the framework can easily access the required data. The core framework has created with Flash Lite, which is optimized Flash for mobile devices.

The application has intuitive design, and the users can easily browse in the course data. For browsing the users can use the basic navigation buttons, the bottom line texts provide more information about the navigation.

¹ The list of Flash Lite capable devices are in appendix

² The list of appropriate devices are in appendix

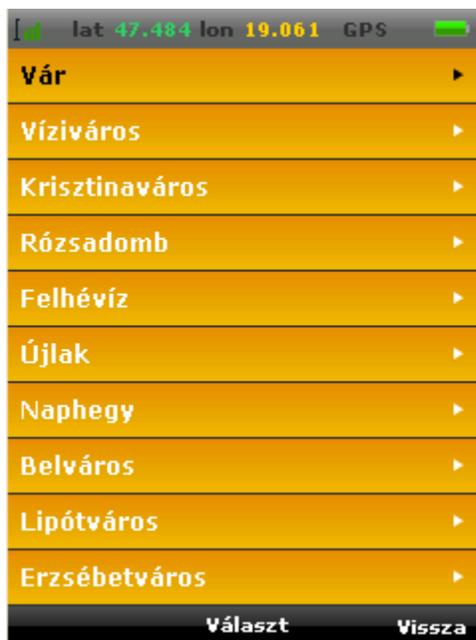


Figure 1 Door handle course categories according to course data file

See more screens at the end of this document.

Features

The key features of the application:

- Hierarchical sorted content (the mobile learning content was sorted in several folders, it helps to easily understand the structure of the learning material)
- Server side stored learning content (we can easily update the learning material and upload the changes, no need to update the mobile application on the client side)
- XML based content format
 - Multi language support
 - Easy update menu and content
- Google maps support (the places are showed with static Google maps)
- Distance calculator (there is inbuilt distance calculator, it calculates the distance from a coordinate, and draws the shortest way to the desired place)
- Multi place support (the users can observe more places on one map)

Application screens

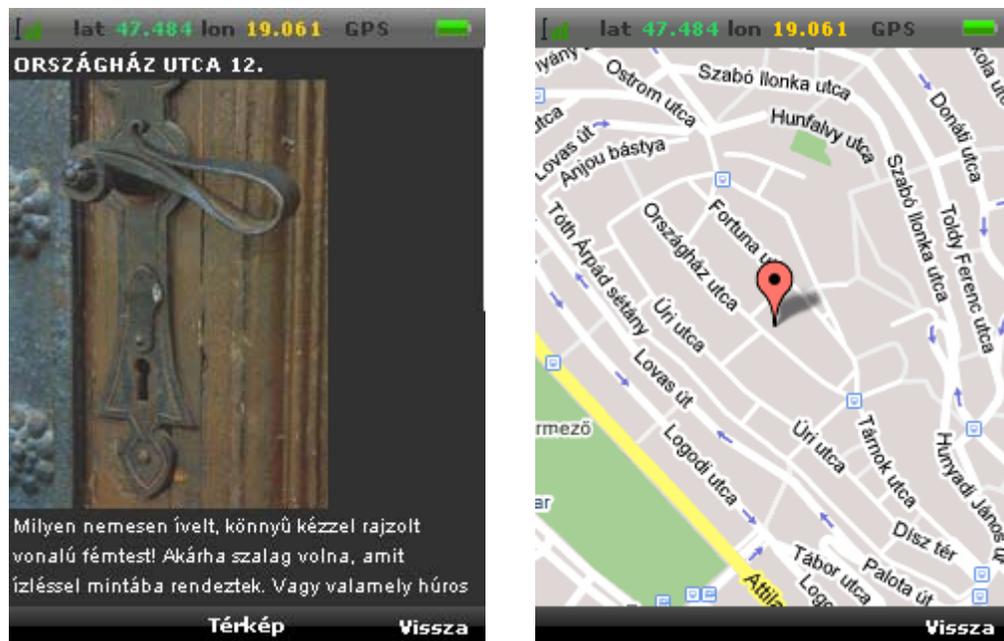


Figure 2 Course content and assigned geographical place to content



Figure 3 Nearest content (calculated distance in km), and route between your actual position and the selected content position

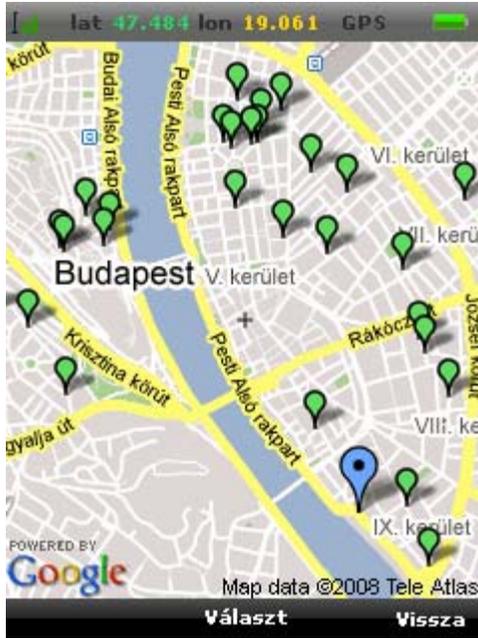


Figure 4 Learning content positions in the city with your actual position

4. Partnerships

Ericsson and Giunti Labs of Sestri Levante in Italy are two leading European companies in the field of wireless technologies. The European commission in its documentation is justly proud of Europe's world leadership in the rapidly developing and centrally important field of wireless technologies.

Ericsson Education Ireland has led a wide range of European Commission mobile learning projects including *From e-learning to m-Learning* (2000), *Mobile learning: the next generation of learning* (2003), *The incorporation on mobile learning into mainstream education and training* (2005) and *The role of mobile learning in European education and training* (2006).

Giunti Labs was the contracting partner in the ground-breaking €8.000.000 IST mobile learning project *MOBILearn*.

In this project Ericsson and Giunti combined in the creation and design of the General System Design for the project on which the whole project is based. This is presented as a 43 page technical document on the project website. In Year 2 of the project Ericsson and Giunti will continue their cooperation in the production of mobile learning courseware.

The University of Plovdiv in Southern Bulgaria is a leading player in the field of mobile learning in Europe and the contracting partner in the Lifelong Learning Programme mobile learning project *Mobile Performance Support System for Vocational education and Training (mPSS)*. It has built a mobile version of its proprietary Learning Management System (LMS) Dipseil called mobile Dipseil.

Corvinno Technology Transfer Centre is a foundation of the Corvinus University of Budapest which has participated in a wide range of European Commission mobile learning projects and has gone a long way to incorporating mobile learning into its mainstream education and training.

The European Consortium for the Learning Organisation (ECLo) is a Belgium-based consortium which is in charge of project dissemination, quality control and the Special Interest Group (SIG). It has a named listing of 1500 business and learning contacts from which it selects 500 contacts for this project.

Most of the partners have worked together on previous European Commission projects and in this project have worked in total harmony throughout, with deep respect for the competence of the other partners and a willingness to cooperate on project activities well beyond the required levels.

5. Plans for the Future

In Year 2 of the project the following work will be undertaken:

Work package 5 Art Gallery and Museum Education. This work will entail the development of context sensitive and location sensitive course materials in the field of Art Gallery and Museum Education, the teaching of the course materials to students at the institutions, the distribution of questionnaires to the students who have studied the mobile learning materials, the collection and analysis of data from the questionnaires and the writing and publication of reports from the data.

Work package 6 Use of context sensitive technologies in mobile learning. All the partners have successfully developed mobile learning courseware in the past that is not context or location sensitive. The plan is for the partners to redevelop these materials with context sensitive characteristics and then again to proceed to the teaching of the course materials to students at the institutions, the distribution of questionnaires to the students who have studied the mobile learning materials, the collection and analysis of data from the questionnaires and the writing and publication of reports from the data.

Work package 7 Use of context sensitive technologies in language learning. The values of context sensitive and location sensitive courseware in language learning are clear and the partners will combine to produce mobile learning materials for language learning that are context sensitive and then proceed to teaching of the course materials to students at the institutions, the distribution of questionnaires to the students who have studied the mobile learning materials, the collection and analysis of data from the questionnaires and the writing and publication of reports from the data.

In Year 2 ECLO will continue with the development of the dissemination and valorisation plan for the project which they commenced in Year 1. This will include the development of a portal website on this new and innovative form of education, the continuation of communications to the project Special Interest Group (about 500 in number), the publication of papers in the European online journals and the presentation of papers on the project at international conferences, the promotion of the results of the project to industrial partners, mainly by Ericsson and Giunti.

In Year 2 the project's Quality and Evaluation Plan will be continued. This is a two tiered process with internal evaluation being the responsibility of the project Board of Management and the External evaluation and the External Evaluation Report for the project Final Report being handled by the Dun Laoghaire Institute of Art, Design and Technology.

In Year 2 of the project the Exploitation Plan will be continued. This will have a major focus on the use of the courseware and products of the project with students in actual study situations so that the project results can be exploited in actual educational settings the distribution of questionnaires to the students who

have studied the mobile learning materials, the collection and analysis of data from the questionnaires and the writing and publication of reports from the data.

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.

This 20 page document highlights the major proposals of these EU declarations and shows how the CONTSENS project addresses them.

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 ensuring 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 CONSENS 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.

