



Brainstorming document

Project Title	Multichannel Adaptive System Training for micro, small and medium Enterprises
Project Acronym	MASTER
Grant Agreement Number	2010-1-PL1-LEO05-11470
Deliverable Type	Report
Deliverable Number	2
Date of Delivery	31.03.2011
Author(s)	Rene Wenzel, Adrian Kachelmaier, Ligia Pasqualin (FH JOANNEUM)
Editor	Rene Wenzel, Adrian Kachelmaier, Ligia Pasqualin (FH JOANNEUM)
Related Work Package	WP1
Availability of Deliverable	Internal Document,

Table of Contents

1.	General Discussion Points	3
•	2. TrainsME (MERIG)	4
•	2.1 Summary of the Project	4
•	2.2 Aims and Ideas of this Project	5
•	2.3 Important Results (Products, Deliverables) that may be transferred	6
•	2.4 Relevance of this Project for the MASTER project	7
•	3. Studio (Corvinno)	9
•	3.1 Summary of the Project	9
•	3.2 Aims and Ideas of this Project	10
•	3.3 Important Results (Products, Deliverables) that may be transferred	11
•	3.4 Relevance of this Project for the MASTER project	15
•	4. ContSens (Corvinno)	17
•	4.1 Summary of the Project	17
•	4.2 Aims and Ideas of this Project	17
•	4.3 Important Results (Products, Deliverables) that may be transferred	18
•	4.4 Relevance of this Project for the MASTER project	19
•	5. Other projects (presented by Jozefina Osovka)	21
•	6. Conclusion	24

1. General Discussion Points

In the general discussion two major issues were discussed. Firstly, the consortium has discussed which target group we would like to address. Moreover it was discussed if the consortium should focus on a specific sector. The conclusion of this discussion was that this point was left open until it is known which material to be implemented in the learning tools.

Secondly it was discussed which content to be included in the learning tool. Thereby Mr. SSOIPP mentioned that many Polish SMEs have a lack of information and knowledge about internationalisation of their companies. Innova raised the point that the budget of the project is limited and therefore the consortium should rather adopt material that is already used in other projects of the consortium partners.

As a conclusion the consortium agreed on following.

1. We need to focus on the methodologies and contents which already exist and where the rights are in possession of one or more consortium members. In the discussion of being utilized in the MASTER learning platform were INCO by FH JOANNEUM, Strategy Train by MERIG and TrainSME by MERIG. Later Mr. Aleksander Bakowski suggested – in an e-mail conversation – to use content of TrainSME and Strategy Train, if possible.
2. Additional content can focus on the topic of internationalization of Polish SMEs, which nowadays is crucial for many SMEs. In an e-mail conversation of the consortium after the meeting Mr. Aleksander Bakowski mentioned that this topic can be covered by internationalization components which are partly developed by Kozminski University.
3. The content of the training courses defined during WP1 will be put on the platform which was already in use in the STUDIO project by CORVINNO and will be adapted to needs of Polish SMEs.

- **2. TrainSME (MERIG)**
- **2.1 Summary of the Project**

Notes from KoM – Presentation; Johann, 17022011

Title		Start (Year)	Duration
TrainSME		2004	30 Months
Programme	Co-Ordinator and Partners	Target Group	
LdV	MERIG, 9 partners	Managers and HR Managers (1), Consultants and Trainers (2), Secondary TG: Employees	
Webpage	www.trainsme.net		

The project TrainSME addresses the problems of the SMEs by aiming to improve the vocational training system in small and micro enterprises by providing innovative and feasible tools for the assessment of training needs and raising awareness about the changes and challenges throughout training. These models were applied, tested and evaluated by serving as basis for pilot training actions in different countries. Selected tools will be elaborated as web based assessment application and all tools, models and guidelines will be compiled in a handbook. The results of the project are tools for needs assessment and models for the establishment of “needs oriented vocational training”. Selected needs assessment tools will be provided as online applications and tested in the pilot studies. As a compendium a handbook on the assessment and implementation of vocational training needs in small and micro enterprises will be provided. It will include detailed analyses of existing models and their strength and weaknesses, vocational training needs assessment tools for managers and employees and guidelines for the realization of needs oriented vocational training focusing on the specific situation of small and micro enterprises. The handbook will be available in printed form as well as on a web platform in the final stage of the project.

The TG were managers of small and micro – companies, up to HR managers in these companies (usually that was the same person). There was no specific

sector involved but the focus was more on people who do not have education in these companies (e.g. small manufacturing companies, family run, and management is not a discipline but you are the manager because you are the head of the family). Further Trainers and consultants were a TG in the way that they could use the products. In the end, the employee of course stands behind HRM and HRD (HR Development). Hence the employee always is the secondary, accompanying TG.

TrainSME is not a learning platform, but rather a self-assessment platform including learning material, self-assessment and other tools. Also many checklists are included, guidelines to different kinds of appraisal interviews etc.

• **2.2 Aims and Ideas of this Project**

The Idea was to close the lack in HRM in small and micro – companies. An important part of the project was the literature research, but the more important source was a close collaboration with companies.

The project TrainSME addressed the problems of the SMEs by aiming to improve the vocational training system in small and micro enterprises by providing innovative and accessible tools for the assessment of training needs and raising awareness about the changes and challenges throughout trainings.

TrainSME aimed at the improvement of the vocational training system in small and micro enterprises. The project elaborated and adapted tools for the assessment of vocational training needs in small and specifically micro enterprises and models for the creation of training programs which are meeting the needs of employees and enterprises and support innovation processes. The results of the project were assessment tools (Web, CD) and a compendium on the assessment of vocational training needs and the implementation of new tools in small and micro enterprises.

A main focus aside from producing the products was to raise awareness and to make companies aware that help is available and to see that there are information and assessment tools available.

- **2.3 Important Results (Products, Deliverables) that may be transferred**

One main output of the project is the so-called TrainSME Toolkit. This instrument provides tools for the assessment of training needs in small enterprises.

The TrainSME Toolkit includes general needs assessment questionnaires, which can depict the differences between the current skills of an employee or a job position and the ones that will be needed in the future; more generic assessment instruments addressing organisational issues of enterprises; guidelines for qualitative analyses of training needs through employee interviews as well as additional documentation and background texts.

Vocational training needs assessment in enterprises is a complex issue which is covering a broad range of issues from assessing the educational backgrounds of workforce in relation to their job descriptions to issues of corporate strategy. The TrainSME Toolkit attempts to provide a holistic answer and to offer background information, tools and guidelines of how to find starting points to address the challenges of training needs assessment.

Therefore the TrainSME Toolkit offers two interactive tools, where inputs are matched automatically:

- 1. Organisational profiling:**

The idea behind this interactive tool is to provide an instrument to quickly assess if/how a target competence profile is matching with an actual or current profile. Around 30 questions have been selected for this quick assessment tool, addressing generic technical, methodological, communicative and social competences and skills. To fill in this questionnaire takes less than 10 minutes. The tool will beside the analysis of the current and target profile recommend checklists, articles and background information provided the toolkit and introduces additional

European funded projects that have been working in these fields of interest.

2. Individual competence profiling:

The idea behind this tool is to provide an instrument to quickly assess the vocational training situation in an enterprise in general. Questions related to four subjects will be asked. It takes about 20 minutes to fill in the questionnaire. The interactive questionnaire for the diagnosis and optimisation of operational development of competence includes an interpretation and recommendation section as well as some background and additional information providing recommendations for further reading.

Both tools highlight general needs under the restriction that inputs for profiling are made openly, honestly and reflectively.

The TrainSME Toolkit also offers access to

1. different additional “theoretical” background information, articles and general comments,
2. information about how to perform an appraisal interview,
3. several good practice examples, and
4. a glossary explaining terms and references.

• 2.4 Relevance of this Project for the MASTER project

The assessment tools worked very well and were perceived as very helpful tools for small enterprises.

Additionally identified issues that came up during the duration of the project could also be relevant for the MASTER project. These issues were:

- Involvement of small enterprises within the consortium: Small enterprises served as a kind of the pre-pilot testing partners. The produced material was given to these companies for first review before the pilot courses were introduced.

- Time spending: A main point of criticism was that managers do not have time to read so much. Maybe a more modular setup would have been the solution.
- Provided tools too general. When focusing on a specific sector the information provided by the employed tools might be too general, but the goal was to bring people to see that there is something and see that there is potential to improve in certain fields of operation.
- Guidance of the users: The user guide hence was a very important implementation. The guide was divided into two parts: "Getting Started" for new users and "Manual for professionals" for experienced users.

- **3. Studio (Corvinno)**
- **3.1 Summary of the Project**

Studio has been an initiative of the Corvinno Technology Transfer Center which is an ontology driven e-learning environment using adaptive test method offering customized learning materials for users to bridge over knowledge gaps. For this reason it might be called an ontology based knowledge gap discovery system.

The ontology method as the basic pillar of the whole Studio concept helps to summarize complex curricula through the main connections of knowledge areas and provides a backbone of the domain specific content. Based on this feature Studio is an appropriate tool to explore the augmented reality with using context sensitivity.

Studio provides electronic learning support in the traditional Higher and Vocational Education and Training. Besides the formal training it can be used also in different specific non-formal or informal trainings regarding individual requirements. It is also a good solution to capture the organizational knowledge which has specific characteristics:

- To capture the characteristics of the professional knowledge areas
- Organization specific customization
- Expansion of the content in the given ontology
- Flexible knowledge transfer and customization for each user
- The knowledge transfer is well understood and well measured

It is a stable, well-functioning ontology based e-learning system tested by more than 300 students. The demo version was tested by a wide audience on the Flexilab (Living Lab) portal. Based on the users' feedback it is continually developing from the beginning of the test period until nowadays.

• **3.2 Aims and Ideas of this Project**

The main aim was to establish a learning system which exploits the advantages of the electronic environment (exploiting the flexibility and mobility) through different mobile devices by employing innovative and modern technologies. The idea of Studio came from the higher education experiences to give an electronic learning tool for the students/ users improving and testing their knowledge in a given learning area. Our goal was to find a solution which gives a feedback from the students' knowledge level and provided a support in exploring missing knowledge areas of students in the frame of an electronic learning environment in order to help them to complement their educational deficiencies.

The knowledge areas which were mentioned before are related to a specific domain defined in advance. The domain is modelled having assumed the concept which determines the relations and main connections between knowledge areas. In our case this model is the ontology.

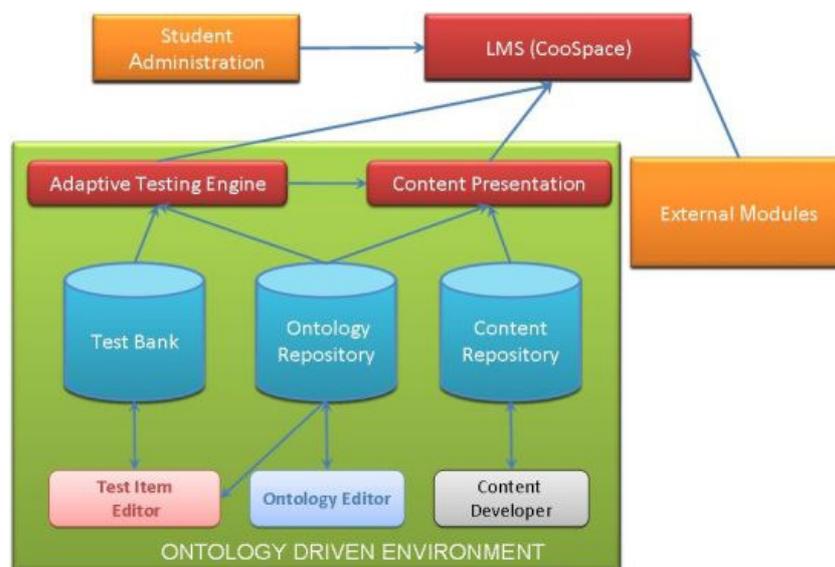
The logic behind the ontology based learning solution is manifold. Firstly, it provides a clear concept model and hierarchy to the learners. The rich and expandable content serves for the purpose of knowledge transfer. Secondly, not only the finished product is interesting but the course of development is meaningful. That is setting up the ontology is, in other words, in case of SMEs the articulation and organization of the domain related explicit and tacit knowledge. Formulating the concept model is the most interesting part of knowledge elicitation and it is the main area of customization. Thirdly, the customized training facility is adequate not only in geographical dimensions but it is also dynamic in the sense of the changing needs of the individuals.

During the Studio implementation it was also an important aspect whether students access the system easily, understand and apply complex concepts and other teaching materials.

- **3.3 Important Results (Products, Deliverables) that may be transferred**

Learning Infrastructure

Learning infrastructure actively supports the full learning cycle, independently from its form (e.g. workstation- or mobile learning). The user logs into the system throughout a Learning Management System, where the given teaching materials are implemented and accessible for studying. The LMS is directly connected to the ontology-driven environment. This environment consists of the Adaptive Testing Engine, the Content Presentation tool, the Ontology Repository and the Content Repository — these are the two major pillars of the solution —, the Test Bank and some additional support tools.



Ontology editor meets all of the following requirements:

- Extensible – The training system has to meet the labor markets requirements, so it will require constant maintenance and development.
- Treatment of high volume data – Even one curriculum may consist of several hundred ontology elements, like knowledge areas, basic concepts, theorems etc. So the modelling of all the curricula of a given training program will require even greater capacity.

- Interoperability – This learning management solution includes several different systems and applications. So it must be ensured that all part, even including the ontology, can easily and efficiently communicate with each other.
- User friendly interface.

Content Authoring

The ontology provides the underlying structure of the domain and subdomain specific learning materials. Additional content is attached to this structure. This way, all subsystems of the Ontology-based Authoring Environment should be integrated with the ontology layer.

Repository

The central element of content development and management is the Repository. This component stores every content element that can be useful in composing a curriculum. Its content can be an image, an article, short texts like a useful paragraph or a famous quote or even audio and video materials. The role of the Content Repository is to store and manage these content elements while maintaining a rich set of metadata describing the contained elements. Each content element can be described with Dublin Core metadata (ISO, 2003) and other useful descriptors, like tags or categories. This rich description enables that stored elements can be easily found and retrieved by curriculum developers.

Test Bank

A potential method for driving through the content is the multiple choice test (MCQ). In order to provide adequate support for knowledge testing several theoretical foundations and conceptions must be laid down concerning the structure of test bank and test items as well. One pillar of the testing system is the set of test questions. Accordingly all test questions must have the following characteristics:

- All questions must be connected to one and only one knowledge element or knowledge area in the ontology. On the other hand a knowledge

element or knowledge area may have more than one relating test question. This way the Test Bank is structured by the Domain Ontology.

- All questions should be weighted according to their difficulty.
- Test questions will be provided in the form of multiple-choice questions.

The Test Bank does not form an integral part of the ontology. This means that questions do not have to form a part of the ontology if we want to represent correctly a given curriculum.

Packaging

During this step the curriculum material is packed in a SCORM-compatible package that can be deployed in a learning management system, like Coospace or Moodle. The question set can also be packaged and deployed in the Adaptive Testing Engine that provides the necessary facilities to execute and evaluate the tests. The ontology itself is present in each package, however, in a different form. In the SCORM package, the structure is originated from the ontology; and it is an integral part of the test package, since execution of the tests heavily relies on the underlying ontology structure.

Adaptive Testing Engine and Approach

The only task that must be accomplished before starting the construction of the adaptive testing system is to lay down the main principles of our own adaptive testing methodology and work out its process. Adaptive testing is not a new methodology and despite the fact that it has many advantages compared to traditional testing, its application is not widespread yet. Our research has focused on the computerized form of adaptive testing; whose main characteristics – independently from the methodological approach – are the following:

- The test can be taken at the time convenient to the trainee; there is no need for mass or group-administered testing, thus saving on physical space.
- As each test is tailored to a trainee, no two tests need be identical for any two trainees which minimize the possibility of copying.
- Questions are presented on a computer screen one at a time.

- Once a trainee keys in and confirms his answer, he is not able to change it.
- The trainee is not allowed to skip questions nor is he allowed to return to a question which he has confirmed his answer to previously.
- The trainee must answer the current question in order to proceed onto the next one.

The selection of each question and the decision to stop the test are dynamically controlled by the answers of the trainee. A methodology of adaptive testing has been elaborated that provides help in determining the knowledge level of the student with asking as few questions as possible.

External Modules

Before the recent ontology-based content development several electronic content packages have already been created, which are still in use. These materials were mainly accessible from traditional VLEs, and only some of them were available in formats suitable for use with mobile devices. The format and the type of these items are varying. These materials together with other explanatory applications are connected to the mLMS as external modules and available for download for the latest mobile, smartphones.

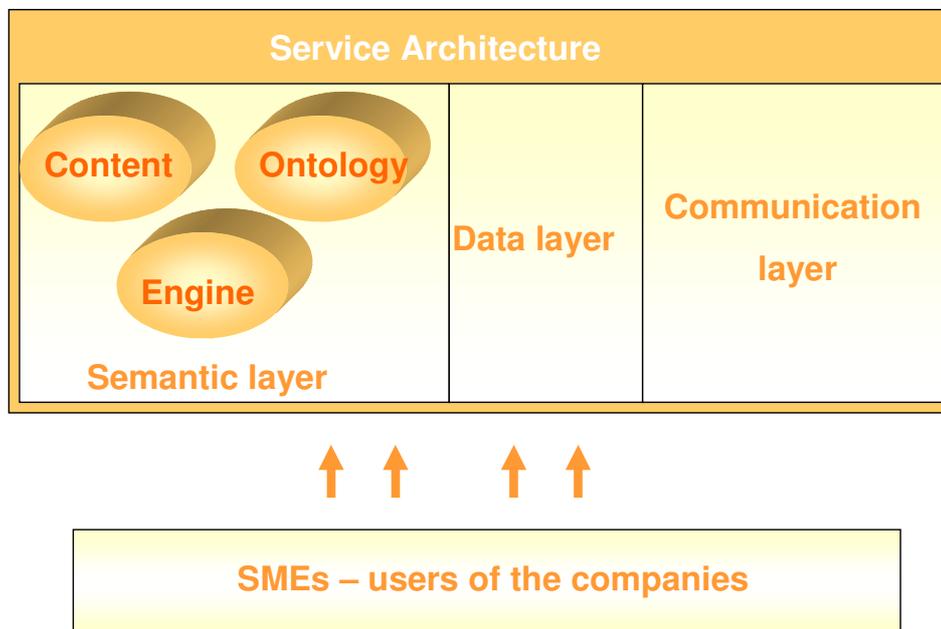
Mobilized content delivery system (user perspective)

Trainees, 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. They can also download documents, which are not assigned to the Mobile Learning Space, but probably they cannot open and read all these documents, however this might be possible with some of the latest handheld devices. All materials are also accessible via the normal internet interface. PDAs, smartphones with Wireless LAN function are capable to enter the LMS this way.

- **3.4 Relevance of this Project for the MASTER project**

Implementation the whole infrastructure as a web application:

- Creation of conceptual (ontology model) system for a given domain
- Creation of content management solution structured by the conceptual system (structured through knowledge areas)
- To set up an engine which relates to the given knowledge representation



Development milestones

1. Knowledge representation: Ontology drafting

Built on the SMEs' needs analysis the knowledge areas and their relations can be described in formal logic language with using ontology model.

2. Content development

Aim of this part is the content development addressing each intersections/nodes of the ontology. In the first step the meta-level concept is defined. According to

the SMEs' needs the content should be assigned to each knowledge area. In this step the content has to be discovered and generated for each knowledge area. Content can be a text and / or multimedia format, latter is useful to visualize the learning materials. The ontology itself has no redundancy at all, although the learning material content might contain certain level overlapping, in a healthy extent.

Note: Maintenance and continuous updating of contents are needed for a well-functioned knowledge management solution.

3. Testing and Validation

Engine of the content management system: In this part an effective engine of the content management should be developed. The first step to do this is the system validation. The system functionalities are based on above-mentioned specified needs which are built on the requirement of the knowledge management.

- **4. ContSens (Corvinno)**

- **4.1 Summary of the Project**

The ContSens - 'Using wireless technologies for context sensitive education and training' project was born under the Lifelong Learning Programme umbrella. Its main goal was to design context and location sensitive materials based on several mobile technology platforms. It addressed the needs and constraints of mobile learning as a new sector of education and training provision and bringing it to a new level. The needs and constraints focused on the universal availability of sophisticated communications devices of almost every student in every EU country and the lack of education and training provision on them.

The main target group consisted of students from Budapest, London, Plovdiv, and Dublin, who were open to try out the developed software, eLearning exporters and stakeholders who were interested in influence of mobile technologies for teaching and learning, in both formal and informal ways. The software in the project based on – among others - Android technology solution.

- **4.2 Aims and Ideas of this Project**

The most innovative form of mobile learning was the production of context sensitive and location based courseware which was the focus of the just-ended ContSens project in which Corvinno, University of Plovdiv, London Metropolitan University, Ericsson, DEI, and Guinti Lab were partners. This project used mobile learning technologies like NFC, RFID, Mediascapes, QR codes and GPS to produce courseware in areas that face-to-face education, distance education and e-learning cannot do, or cannot do as well as mobile learning.

The concrete aims and objectives of the ContSens were 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 almost every student in every EU country carries and uses constantly – except in education.

The learning materials reflected to those domains which have significant location features and/or context sensitivity. The location sensitivity is very frequent in the agriculture, infrastructure and architecture domains. The solutions necessarily contains more than one information/knowledge layer. This is from where the implementation receives the complexity and high level usability. Both the location definition and the context sensitivity need sophisticated but different technology to be applied. The implementation technology variations give the special flavour of this type of development. Location determination can base on processing GPS signals or the mobile cell towers' signals. The other dimension whether it is augmented reality or any other type of context driven information retrieval, assume a strong and efficient drill down tool.

In a further development stage the standalone solution can be replaced by a networked solution (network is used above the communication layer sense). There are several architectural combinations including the 3A layer, 3-tiers or MVC architecture which open a new perspective in the mobile middleware design.

- ***4.3 Important Results (Products, Deliverables) that may be transferred***

The project main results were represented through scenarios which focused on the following topics:

- Task based training using location and context sensitive technologies
- Art Gallery and Museum Education
- Use of context sensitive technologies in mobile learning
- Use of context sensitive technologies in language learning

The project outcome which can be transferred to the MASTER is partly some customizable content partly the content developing methodology. Beside of the two there are plenty of technology implementation suggestions. From implementation point of view the difficulties come from either the size of the

screen or data access, data storage and transmission speed bottleneck. This is why the selection of domain is so important, because the very narrow domain may cause serious constraints in usability, the very wide domain can lead to significant operational deficiency. The project technology background gives a solid and well-tested solution in order to avoid dimensional dangers.

• **4.4 Relevance of this Project for the MASTER project**

The mobile learning by definition fits better to informal and non-formal learning. These two types of learning are very important from the LLP paradigm but even more important to the SMEs who lack generally in capital for investing in learning and training. The mobile learning with the extension in the scope is particularly valuable for them, mainly because of the on the job training character.

SME training with ContSens technology implications easily combines the training and process improvement, productivity improvement activities.

The scope of ContSens consisted of content development and delivery mechanisms including context and location sensitive approaches.

Content development consists of content selection (no context-free content), differentiation between content and 'content container' (for example there are several application types: tourism, games, logistics).

In case of the training material development the developer should be independent from the traditional, taxonomy based education methodology which is entirely not applicable because of neglecting the following training approaches:

- the situation is important
- the focus is on multiple participants
- the combinative skills are important

The next innovation, in this project, was the use of Augmented Reality as a technology available for the most of the citizens. Augmented Reality is a term for a live view of a physical real-world environment whose elements are augmented by virtual computer-generated imagery. Artificial information about the environment and the objects in it can be stored and retrieved as an information layer on top of the real world view.

- **5. Other projects (presented by Jozefina Osovska)**

Previous Polish projects, which could help to develop learning platform considering the MASTER project needs, are:

- **CLEM** project aimed to transfer a model of Clustered Learning Environment (CLE) – originally developed in Scotland and Finland – to small and medium enterprises, representatives of regional governments, development agencies, regional chambers of commerce in the three least developed regions in eastern and north-eastern Poland;

The objective of the project was to develop an innovative e-learning or blended learning training program focusing on cluster creation and development as an excellent and innovative stimulus of regional growth. CLEM project mainly focused on reviewing results of completed or on-going projects in the areas of knowledge sharing and learning in clusters in Finland and Scotland; defining a CLE model – an innovative approach to be synthesized from these experiences and transferred to Poland; establishing three clusters in the project regions or attracting existing clusters and inviting them to participate in the validation of the CLE model approach; validation (through a one year-long pilot) of CLE approach through training and moderating knowledge exchange within the three clusters and by stimulating SMEs to share their experiences through a virtual learning environment (VLE), disseminating best practices in the area of establishing a culture of lifelong learning as a means to support growth and sustainability in emerging clusters in the underdeveloped regions.

- The issue of the **SME.net.pl** project was to increase both - the propensity to train and develop the skills and competences of employees of SMEs as well as the awareness of skills necessary for using the internet as a business tool. Both priorities were emphasized in the regional strategic documents such as the Regional Innovation Strategies, the Regional Operational Programs as well as on the national level in the Strategy for Development of Poland 2007-2020

and the general guidelines of the Strategy for Development of Eastern Poland.

This project mainly aimed at:

- development of innovative blended learning content on e-business skills;
 - set-up of a virtual learning environment, where SMEs could be able to interact with trainers and other participants between classes;
 - validation of the quality of the training program through a pilot training of 72 representatives of SMEs in the three regions, in a 10-month long blended learning program;
 - evaluation of business impacts of training to show tangible benefits an intelligent use of the web can bring to a small or medium-sized businesses;
 - dissemination of results of the project to all organizations and institutions supporting development of entrepreneurship and innovation in the three respective regions.
- The Project **ECON IT** aimed to increase the contribution of business advisers as change agents, who facilitates the uptake of innovation and growth within their SME clients; The project focused on the quality of training available to business advisers, by carrying out a full assessment of training needs and developing an innovative training resource which blends real life learning, interaction and assessment, with online course content;

ECON IT tried to respond the needs to increase the number of business advisers undertaking training by creating an attractive training package. In order to ensure that ECON IT makes a lasting and valuable contribution to European VET, the project focused strongly on achieving improved collaboration between VET and business sectors.

ECON IT targeted business advisers. A secondary target group was clearly European small enterprises, which are going to receive better business support, and as a result are likely to display improved innovation, performance and growth. The key target sectors of the project were those organizations which are

playing a key role in the advancement of small business growth: enterprise agencies and SME support bodies, but also business incubators and business innovation centres (BICs), and business training institutions which bridge the business and educational divide; The market assessment, pilot testing and project evaluation was highly relevant to these bodies, but also important for public policy-makers, informing future policy and practice, and providing a platform for furthering discussion, understanding and co-operation between SMEs, business support providers, government, and education and training institutions.

• 6. Conclusion

During the Kick off Meeting the consortium had vivid discussions about what to use, how to implement and who to address. For this purpose six projects were outlined which can and shall influence the development of the learning and teaching platform of the MASTER project. In these projects different methodologies were employed:

- TrainSME provides a comprehensive and easy-to-use online self-assessment tool for a company and for employees.
- Studio's strengths are the flexibility of the system and the link between different knowledge areas depending on the knowledge of the user.
- ContSens offers an easy-to-use mobile learning platform which can be accessed quite easily.
- Other three Polish projects were considered important because they produced high-quality learning materials mainly based on a blended learning approach.
- Also the additional content-wise Strategy Train could satisfy the needs of Polish SMEs – together with content from TrainSME.

The needs analysis which will be conducted during the project will provide information about the requirements of the MASTER platform according to the needs of Polish SMEs, but bearing in mind that the consortium will use the above mentioned projects – especially the projects of MERIG and CORVINNO – as the base for this transfer of innovation.

Therefore the presentations will be inspiring for the development of the platform and form the foundation for adaptations and innovative solutions of the developed products.