

# Interoperability building of distance learning systems within the iCamp project

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*Abstract:* - The paper addresses the main activities and findings of an EU based initiative for provision of interoperability of distance learning systems in the enlarged EU. The initiative named iCamp<sup>1</sup> is based on the current research results in several finished and on-going projects such as the Network of Excellence in Professional Learning - PROLEARN. As several surveys of the eLearning market have shown the abundance of eLearning systems that are difficult to be interconnected and used in various environment the need for system interoperability rose. The problem of interconnectivity is especially important for learning resource repositories intended for the widest audience in Europe and worldwide. The paper provides a short insight into the technical, pedagogical and collaborative learning approaches taken within the iCamp initiative.

*Key-Words:* - distance learning, interoperability, learning systems and tools

## 1 Introduction

The development within the last few years has brought to light many different eLearning systems and as a result the current eLearning market is populated with tools and platforms that support different types of learning communities. The tools enable services such as learning management, content management and communication. Open source tools in the area of technology enhanced learning are gaining more and more reputation and had a high uptake in the last years, especially in the countries where educational resources are relatively scarce such as in the NMS (new EU Member States that joined EU in 2004) and AC (Associated Countries to the EU) within Europe. However, the main problem is still present: the systems lack interoperability, especially when different segments of a complex eLearning environment are being put together. The current standardization work is trying to overcome the interoperability problems, however the up-to-date results are addressing the current problems only to a minor extend. The approach taken by the SQI (Simple Query Interface) has started to provide some solutions of the problem and connect different systems [5]. So far, the efforts within the initiatives are mainly concentrated on the querying of learning resources.

Another problem identified in current eLearning practices is the lack of proper validation

of the pedagogical goals to be achieved when technology-enhanced learning systems are used. It is well known that the ease of use of the learning environment and its tools (user-friendliness and usability) and the localization in many languages are important aspects for the success of the learning process. The adaptation of the learning resource delivery to the learner and/or community preferences (technical, pedagogical), the integration and interaction of the different collaborative software tools such as blogs and distributed document sharing following innovative pedagogical models and constructivist learning theories still need much more attention and research. When analyzing the current eLearning situation at universities in the old and the new member states of the EU one of the most striking facts is the very diverse usage of platforms and tools. This is considered to be a result of the competing environment. We are aware, that there is not one single solution for all different needs in the learning process. However, this current diversity again points to the before mentioned problem of interoperability.

In this paper we present a new initiative funded by the EU that is addressing all these issues. The initiative is realized through collaboration within the project under the 6<sup>th</sup> Framework Programme. The project iCamp that was recently launched is run by a consortium consisting of 10 European partners.

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<sup>1</sup> This work was supported in part by the EU IST iCamp project.

## 2 iCamp initiative

The iCamp initiative is oriented towards the development of integration patterns that will help the building of a virtual collaboration environment required for specific educational purpose. In order to do so the following parts of the iCamp Space, which is an open virtual learning environment consisting of a network of learning tools, platforms and repositories, were identified:

- iCamp Interoperability & Collaboration Patterns: description of the patterns and an open source code enabling connecting to the iCamp Space;
- iCamp Building Blocks: a portfolio of constructivist learning tools;
- iCamp Models: validated pedagogical models for scaffolding for self-directed and self-organized learning, social networking and collaborating;
- iCamp Best Practise: experiences gained and validated by trials in various universities across Europe.

The design of an iCamp Space is user and pedagogy driven, and is based on requirements derived from the adopted pedagogical models. The iCamp Space will support networking of a set of specific distributed learning repositories, digital libraries and learning management systems from different sources with comparable capabilities and enhanced functionalities. Data and services will be defined and linked in such a way that enables the use of the technology not for display purposes only, but also for automation, integration and reuse of data and services across various applications. This will facilitate a personalized access to the learning resources and interaction with peer learners. The iCamp Space is expected to foster collaboration between the learners and creation of strong social links.

Some of the known learning tools and repositories that partners have brought into the initiative are:

- Learning and content management systems – Moodle, Plone, dotLearn, IVA, Course Online.
- Educational repositories - EducaNext and PROLEARN network of educational nodes; Universal Brokerage Platform (UBP) based repositories; EMDEL ([www.emdel.org](http://www.emdel.org)); EUDORA portal; LIEDM (Lithuanian Distance Education Network).
- Digital libraries – Central and Eastern European Online Library ([www.ceeol.com](http://www.ceeol.com)).
- Videoconference tools – VIPS (Interactive Video Presentation and Lecturing System);

ISABEL (not open source); Flashmeeting (not open source).

- Other synchronous & asynchronous communication tools – e-mail, messaging.
- Wiki – TikiWiki.
- Authoring tools - CDK (course development system from Kaunas University).
- Blogs – semantic blogging.

The selected tools will be adapted and integrated in the iCamp Space. The adaptation procedures underline the following functions and mechanisms to be supported within the space:

- Personalised search functions for peer learners and learning resources that most contribute to the learning need. The following issues are considered here: peer identification support, presence detection, and recommendation of peer learners. Queries are adapted to the learner profile (learning history, preferences and interests) and/or profile of a group. The basis for the personalised querying is taken from the recently finished project ELENA (Creating a Smart Space for Learning) [6].
- Mechanisms for decentralized sharing of experiences and reflection on the learning process and resources with other peer learners. While in the business environment many expertise sharing networks have flourished recently (e.g. openBC, LinkedIN), the educational community still lacks such environments. Current approaches of expertise sharing networks are based on centralized databases which have scalability issues. Novel solutions, such as blogs, are being investigated and integrated.
- Personal learner portfolios.

The iCamp Space is schematically presented on Fig.1.



Fig. 1: iCamp virtual learning space

### 3 iCamp technical approach

iCamp aims to make significant impact in the area of interoperability amongst open systems, tools and repositories designed for provision of eLearning environments. At the end of the project a sustainable infrastructure is planned to be implemented that will support collaboration and interaction processes in higher education across European universities. In order for this to happen, the iCamp consortium is working on the development of standardized application programming interfaces. The interfaces are based on LORI (Learning Object Repository Interoperability) and SQI (Simple Query Interface), as the SQI is widely adopted and used for connecting a variety of educational learning object repositories across Europe (and beyond). However, the evolving SQI network still lacks further development and support and this one of the iCamp tasks.

Easy participation and collaboration in the iCamp Space is enabled by the use of collaboration mechanisms, such as RSS feeds/aggregators, community management support tools, or tools for identification. The interaction between learners is enriched with new media (e.g., image, video, audio, text messaging). To achieve better user acceptance the integrated open source tools are localised in several languages (Slovene, Lithuanian, Estonian, Czech and Polish).

An important part of the iCamp Space is learning diaries that enable learners to express their thoughts, understanding of the learning material and to generate new ideas. The appropriateness of blogs for these purposes, the relatively new knowledge sharing technology, which enable easy publishing of the diaries, will be investigated as well. Blogs enhance the traditional learning log facilitating self-directed learning and together with the collaborative elements of the system will promote social constructivism [1]. Despite the dramatic increase in blog popularity, blog adoption in the higher education sector is still neglectable. Empirical research is needed for identification of the best methods to use blogs, such as best frequency of required blog updates, peer involvement in the blogs or blogs that provide in the same time text, audio and video. The iCamp technical approach includes the blogging tool iBlog that enables learners to obtain mentorship from either tutors or from peer learners.

Large scale deployment of open learning environments requires privacy, security and intellectual property rights issues to be addressed. Privacy is the right of individuals to determine for

themselves when, how, and to what extent information about them is communicated to the others. Certain artefacts within the virtual learning environment for university students, especially learner personal data, are privacy sensible and need to be adequately protected. Learners have to provide explicit consent for the collection of their data, they have to be informed at the moment of collection of personal data or if data is transferred, and they must be able to check the quality of their provided data [3].

iCamp allows learners to selectively share their artefacts and knowledge (for example in different communities or groups) and control the visibility of their sensitive artefacts, such as portfolios, learner diaries, profiles (personal data) and annotations. A learner is able to open parts of his learning diary to every learner, while on the other side restrict some parts only to himself, a study group or just his mentor. Integrated educational tools and resource repositories handle and protect personal data in an adequate manner. Privacy provision is especially challenging for collaboration and personalisation services, where sensitive learner profile fragments are exchanged between users and educational nodes. In considering privacy iCamp is addressing two issues: the learner's privacy preferences and the educational nodes' privacy policies. Integration of privacy-enhancing technologies that protect learner's privacy is also planned [4].

Digital rights management plays a crucial role in order to support users in preserving intellectual property rights on the artefacts they have provided. iCamp is addressing the types of licences appropriate for open learning environments that foster collaboration and creation of strong social links. Learners can provide access and terms of use for their artefacts, for example the learning resource document copyright status, identification of holder rights, or provision of guidance on attribution and reuse. Creative Common Licenses and ODRL (Open digital rights language) is the starting point in provision of these characteristic of the learning network

An additional focus of iCamp is the support of social interaction and collaboration. These prospective enhancements cause two effects. First, heterogeneous systems (including for instance learning management systems, collaboration workspaces, community solutions, and resource repositories) are integrated into one distributed open learning environment via standardised interfaces. Second, the networking functionalities are further deeply integrated into the existing, often isolated

educational applications. The focus is on the interoperability amongst open source collaboration systems which is especially relevant when looking at the systems already in use by the universities in the NMS and AC. The integration patterns developed in iCamp make it easy to connect to the iCamp Space and to implement the virtual collaboration tools that are required for specific educational purpose.

#### **4 iCamp integration and validation scenarios**

In learning, information is usually constructed from social interaction and from interacting with knowledge artefacts. With respect to IT-environment, this usually involves supporting the learner's interactions throughout all phases of a typical learning life-cycle, including identification of knowledge gaps, needs and desires, assistance in matching these with potential collaboration partners and available services & resources, supporting interaction (including access and utilisation), and facilitate (self- and peer-) assessment and evaluation to ensure success in learning. Social interaction across institutions that help the learning-life cycle is currently very limited, and resource and service offers are – inaccessibly – hidden in the deep educational web space. There is a need interoperability of involved eLearning systems to address this challenge and to create the necessary exchange infrastructure for seamless integration of heterogeneous systems and tools without replacing them by unique and unified system. As widely accepted by the relevant professional audience, interoperability can be defined as the ability to transfer and use information in a uniform and efficient manner across multiple organisations and information technology systems. In order this to be accomplished in a space composed of different systems a standardized SQI tool is needed enabling smooth interaction with the services and systems involved.

Simple Query Interface (SQI) enabling distributed querying in a variety of repositories has been developed in the context of the EU IST FP5 ELENA project (<http://www.elena-project.org>), where several iCamp partners participated, and in collaboration with additional external partners. The SQI was accepted by CEN/ISSS workshop on Learning Technologies in June 2005 and has recently become an official CEN/ISSS Workshop Agreement. A set of heterogeneous educational nodes and networks have already been connected in ELENA by means of SQI. The network includes

nodes such as the learning brokerage system EducaNext [7], a gateway to Amazon.com, a commercial learning management system CLIX, a German educational network ULI Campus, and course providers and learning resources catalogues in Austria and Germany, e.g. Knowledgebay, LASON and Seminarshop. The network is being further extended in the frame of the iCamp project and PROLEARN Network of Excellence on Professional Learning from the 6th Framework Program of EU [8] by connecting some of the best known repositories in Europe such as ARIADNE [2]. Reference implementations for emerging and yet uncovered cases are planned to be provided. Moreover, existing standards (like SQI) will be enhanced in order to become compatible with the constructivist models developed by the iCamp consortium.

It is well known that most of the metadata of the learning resources are publicly available enabling an easy search through the repositories. However, some parts of the metadata may be restricted or be different for different users, for example price of a learning resource. EducaNext, one of the most known educational repositories contains resources that are in majority publicly available. However, few of them are visible to specific communities, institutions, groups or individual learners only. Learners who are interested in those have to log-in first to the specified educational node (in this case to EducaNext node) and get access to the metadata if they are authorized by the system. The second problem is the booking management and access to the booked resources. Learners expect seamless access to the resources they are entitled to use, without the use of different usernames and passwords at each of the repositories. The SQI extension within iCamp will enable the authenticated federated search of multiple repositories and digital libraries. Attribute-based credentials used in this service will facilitate the learner's privacy provision by use of system that is based not on user identity, but on other attributes, such as affiliation with a particular university.

The developed technology is planned to be validated in real-life environment. The project is planning several validation scenarios and one of them is presented in Table 1.

#### **5 Conclusion**

The iCamp consortium continues to extend one of the most important initiatives that has started as a joint effort amongst a group of European key

players in the technology enhanced learning, namely to provide interoperability amongst educational information systems via standardized application programming interfaces. In addition to the SQI extension this can be considered as major contribution of the iCamp project to the area of e-learning. Based on LORI, the SQI has been widely adopted. SQI today already connects a variety of educational learning object repositories across Europe (and beyond). However, the evolving SQI-based network still lacks support. The success of the learning environments besides technological objectives requires consideration of the pedagogical aspects. The pedagogical approach in iCamp starts from the constructivist learning theory with a focus on the learner and his way of constructing knowledge. The challenge that the R&D community is facing today regarding the existing learning environments is that they have been developed by following the transmission model of teaching and learning, where the information to be absorbed is transferred from experts to novices. Preparing learners to become independent and self-organized requires a facilitative rather than a didactic mode of instruction provided by the experts. The iCamp initiative emphasizes "social learning" to meet this pedagogical challenge. This implies a new role for the educators and peers as mediators and mentors. The approach taken in iCamp is based on these considerations and represents further contribution to the field.

The collaboration amongst students across countries which is part of the iCamp initiative implies cultural differences in learning and these have to be respected and supported by the technology of the learning environment. Diversity and localisation are also addressed in the iCamp model. In this context, a further analysis of emerging personal and collaborative web publishing practices such as Weblog authoring enabled within iCamp initiative is expected to provide insights into the codification and standardization of cross-cultural and cross-disciplinary social networking and information sharing in open, networked environments.

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Table 1: Validation scenario example

<b>Usage Scenario - #1 (Short, Single-mode) - Educator-centred Computer Supported Collaborative Learning</b>
<b>Actors:</b>
<ul style="list-style-type: none"> <li>• 40 Undergraduates from 4 different European universities; majoring in Social Sciences</li> <li>• 8 Lecturers and Instructors from Social Sciences of the 4 European universities</li> </ul>
<b>System:</b> First executable prototype of the Integrated iCamp Space (the network of tools, platforms and repositories)
<b>Curriculum/Course:</b> Research Design and Statistics for Social Sciences: Project-based Learning (12-week course unit)
<b>Activity:</b> Working on an international project entitled – <i>Cross-cultural comparisons of social sciences students' acceptance towards the use of new information and</i>

<p><i>communication technology (ICT) in university education</i></p>
<p><b>Input:</b></p> <ul style="list-style-type: none"> <li>• Learning resources on Technology Acceptance Models (TAM) and other related topics; electronic copies or links to these resources will be provided by the Lecturers and Instructors</li> <li>• Students' prior knowledge and skills in research methods, basic statistics, and educational technologies</li> </ul>
<p><b>Objective:</b> Fostering students' knowledge and skills in designing research studies and applying statistical methods</p>
<p><b>Task:</b> Lecturers and instructors of participating universities are required to compile a list of references to enable students to understand the topics of interest (see below)</p>
<p><b>Procedure &amp; Instruments:</b></p> <ul style="list-style-type: none"> <li>• Lecturers and instructors take turn to broadcast live lectures on the following topics: Technology Acceptance Models, Basic Research Method, Statistical analysis methods, Demonstration of the use of SPSS tool</li> <li>• Lecturers and instructors use iBlog to announce the schedule of the live lectures;</li> <li>• Lecturers and instructors make articles available to read electronically and use iBlog to provide an area to point students to useful resources as well as assigned readings, and discuss issues arising as part of a teaching and learning program;</li> <li>• Records of the live lectures will be uploaded to a learning resource repository and accessible to students;</li> <li>• Students are encouraged to maintain <i>Class blogs</i> and <i>Personal blogs</i>:             <ul style="list-style-type: none"> <li>◦ <i>Class-blogs</i> will be moderated by tutors and used by students to share ideas and experiences. <i>Class-blogs</i> are grouped at the <i>national</i> and <i>international</i> levels. Students are free to join any of the blogs;</li> <li>◦ <i>Personal blogs</i> will primarily be used by students as a tool to reflect on the topics of interest and to organize their own thoughts;</li> </ul> </li> <li>• Lecturers and instructors will have access to both <i>Class</i> and <i>Personal blogs</i>; they assess the students' thinking patterns and depth of understanding with reference to the contents of these blogs;</li> <li>• Lecturers and instructors set up their own <i>Educator-blog</i> to exchange their views and experiences about various aspects of this innovative teaching program. <i>Educator-blog</i> is not accessible to students;</li> <li>• A special-purpose blog known as <i>Tech-blog</i> is established by the students particularly for discussing issues related to the technical problems of deploying the tools in use. <i>Tech-blog</i> will be moderated by some technical experts;</li> <li>• Students of four national groups are required to develop a short questionnaire (and translate it in English, if necessary) by the end of 5<sup>th</sup> week to measure the acceptance and post it to <i>Educator-blog</i> and international <i>Class-blog</i> to collect feedback for revision. Students should send the revised questionnaire to <i>Educator-blog</i>; Lecturers and instructors will then merge the four questionnaires;</li> <li>• Students of four national groups are required to gather about twelve responses to the merged questionnaire by the 7<sup>th</sup> week through interviewing fellow students who are not involved in the project;</li> <li>• Students are required to post the raw data of the questionnaire responses to the international <i>Class-blog</i> and to analyse the data with the use of the statistical tool;</li> <li>• Students are required to produce a written report by the 10<sup>th</sup> week to answer the research question "<i>Are there any statistically significant differences in the level of acceptance towards the use of ICT in university education among the four national groups of students?</i>" Note that students should interpret the data with respect to their specific socio-cultural backgrounds;</li> <li>• Lecturers and instructors will give comments on the reports through the international <i>Class-blog</i>;</li> <li>• By the 12<sup>th</sup> week, a live educational activity will be held where teaching staff and students will share the experiences being gained through their participation in the virtual knowledge community enabled by the Integrated iCamp Space</li> </ul>
<p><b>Output:</b></p> <ul style="list-style-type: none"> <li>• Archives of Learning Resources</li> <li>• Blogs</li> <li>• Validation of the technology</li> </ul>
<p><b>System Support:</b></p> <ul style="list-style-type: none"> <li>• Access to Learning Resources</li> <li>• Support a shared web-based working space for the students to distribute the related documents and collaboratively develop the questionnaire and report</li> <li>• Public communication zone for student communication, online discussions and threaded documentation</li> <li>• Mentoring support by peer student via "iBlog"</li> <li>• Individual learning diary or personal private space via "iBlog" for students' thoughts and mentors' guidance</li> <li>• Support the translation of the questions into different languages</li> <li>• Provide statistical tools for data analyses</li> </ul>