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### EASTWEB: BUILDING AN INTEGRATED LEADING EURO-ASIAN HIGHER EDUCATION AND RESEARCH COMMUNITY IN THE FIELD OF THE SEMANTIC WEB

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# **EASTWEB: building an integrated leading Euro-Asian higher education and research community in the field of the Semantic WEB**

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**Abstract.** Based on the experience of the EC funded project EASTWEB, a project involving Universities from Italy (main partner), Austria, Ireland, Poland, China, India and Thailand, we describe a set of on going and planned collaboration activities. We highlight what we see the major advantages but also the difficulties in carrying out such a program.

**Keywords:** Semantic Web, Education

## **1 Introduction**

The EASTWEB project is an initiative concerned with teaching and fostering research in the area of the Semantic Web. In particular, its aim is to build an integrated leading Euro-Asian high education and research community in such area. The project, whose duration is 36 months, was recently approved by the EU in the framework of the Asia-Link programme.

The choice of Semantic Web as the core topic is motivated by the fact that it is currently one of the most promising research fields in Computer Science worldwide. The core idea of the Semantic Web is to make the meaning of the vast amount of data on the World Wide Web available to machine processing and thus intelligent queries and really helpful Internet agents. In a nutshell, the Semantic Web has the potential to be the next generation of the Web and to significantly change our daily life by lowering the barriers for accessing services and large volumes of information.

Semantic Web as the emerged multidisciplinary field in computer science, information science, web technology, and social science has recently become an active area. The idea of Semantic Web has met a growing enthusiasm of researchers and developers world-wide, both in academia and in industry. These efforts are aimed at capturing the semantics of digital content of all sorts and origins, and at devising ways of acting sensibly upon the formal knowledge representations thus gained. The

Semantic Web has the potential to significantly change our daily life by lowering the barriers for accessing services and improve the exploitation of the large volumes of information that nowadays people and companies have access to, but most of the time are not able to use entirely.

Education and research in the Semantic Web have been taken place in various European and American universities, institutes and industries (including large companies and SMEs). European research has already demonstrated its global leadership in this field within large-scale EU-funded projects, like OntoWeb<sup>1</sup>, dip<sup>2</sup>, SEKT<sup>3</sup>, and KnowledgeWeb<sup>4</sup>, numerous publications, and work (e.g. the OIL language) that directly shaped core W3C standards (e.g. the Web Ontology Language OWL<sup>5</sup>). In Asia instead, Semantic Web is relatively new to most people. Many universities in Asia offer some courses in Semantic Web. However the overall research and education activities in most Asian institutions are still in their early stages. On the other hand, Asia is a big potential market for Internet and Web related application due to the fast development of the economy and to the number of potential end users. A joint collaboration between Europe and Asia on Semantic Web is strategic to the development of successful real world applications. Education plays a major role in this scenario.

The EASTWEB project aims at promoting and supporting educational activity in such context.

## 2 The EASTWEB consortium

The EASTWEB consortium is composed of four EU universities and one EU research institution (as associate partner) leading in IT education and research and in the specific Semantic Web area, three high quality Asian outreaching units, and one university in Hong Kong, as an associate partner.

The European partners (University of Trento, Italy, University of Innsbruck, Austria, University of Galway, Ireland and University of Economics Poznan, Poland, and the associated partner ITC-IRST, Trento, Italy) are among the leading institutes in the Semantic Web. The participating institutes in Asia cover South East Asia (India and Thailand) and China (mainland China and Hong Kong).

India, represented by the Tata Institute of Fundamental Research (TIFR), has a strong and fast development in software engineering and software industry. TIFR holds an excellent track in the graduate education and research in Computer Science.

China, who participates with Jilin University and the associate partner University of Science & Technology in Hong Kong, is now one of the fast growing countries in the world. The huge amount of potential internet users existing in this country has stimulated the boom in internet related education and industry. The Semantic Web, being the next generation Web, will have a major impact in the country and the

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<sup>1</sup> <http://www.ontoweb.org/>

<sup>2</sup> <http://dip.semanticweb.org/>

<sup>3</sup> <http://www.sekt-project.com/>

<sup>4</sup> <http://knowledgeweb.semanticweb.org/>

<sup>5</sup> <http://www.w3.org/TR/owl-features/>

surrounding regions. Moreover, it will provide a major test-bed of potential semantic applications as well as relevant issues related to the extension of state-of-the-art semantic models and tools in a different culture. The Chinese partner, Jilin University, is one of the largest Universities in China.

Thailand, represented by AIT, has already active research on Semantic Web (AIT is one of the few groups leading Semantic Web research in Asia) and they were interested in extending their collaboration with leading Semantic Web institutions in Europe. Moreover, they can become an important dissemination center in Asia.

These Asian partners are among the best performance institutions in Asia and have strong expertise in areas related or overlapping with the Semantic Web.

By participating to this project, the involved European countries (Italy, Austria, Ireland and Poland) intend to:

- enhance knowledge and expertise exchange between Europe and Asia to further strengthen the social and cultural connection between the two regions.
- foster future industrial collaboration between two regions. Asia is an important and critical market. This project aims to combine specialized and top level knowledge in the specific research area with competitive and highly trained human resources. Moreover, the students involved in EASTWEB training activities, who will undertake a professional career, will bring a detailed knowledge of European-Asian cultural issues and will be able to draw on this knowledge and on the contacts they have made.
- contribute to European/Asian cooperation in general. EASTWEB will help building personal lasting relations between academic staff, future middle and top management, intellectual and policy leaders on both sides. This will be achieved also through promoting cultural courses (language, history and social aspects) in the training programs offered to the trained human resources (Master students, PhD students and young researchers/faculty).

### **3 Structure and actions of the project**

The project comprises three main actions:

- (1) Human resources development: joint teaching and supervision of master and doctorate students; integration and collaboration among senior and young faculty; training the next generation of IT educators as well as of IT enterprises management.
- (2) Distance Learning and Knowledge Management platform: to support activities during and also after the end of the project;
- (3) Networking: the project will foster the interaction among universities and companies in Europe and Asia in the field of Semantic Web.

The third action is about assisting efficiently the creation, evolution and sustainability of global networks of academic institutions and enterprises. These networks must be capable to transfer the most recent and promising developments in IT to markets, society and people in the large. We shall not further discuss here this last actions, being it at the margin of the focus of the Semantic Web Education and Training workshop where this paper is presented. In the following we shall therefore discuss in more depth only the first two actions.

### 3.1 Human resources development

Direct target groups are graduate students (both Master and PhD) and faculty staff. EASTWEB will establish:

- an interleaved (“sandwich”) international master program on the Semantic Web;
- an international doctorate program on the Semantic Web;
- a senior and young faculty exchange programs,

The main action is not only an exchange of students, but also involves exchanging senior and young faculty so as to further strengthen the creation of a common research community as well as prepare the new generation of future IT educators.

The project will involve approximately 150 persons: 24 Master students from Asian Universities will take courses and participate to supervised research activities in Europe. About 47 PhD students will be trained under a joint research supervision schema (Asian students in Europe, and a smaller number of European students in Asia). PhD students will also take participate to related Summer schools. The EASTWEB project will provide support for longer term mobility for European and Asian students and for shorter term mobility of the senior and young faculty. 24 young faculties will be trained abroad, both on teaching and on research, and about 60 scholars will visit the consortium Universities: they will be involved in teaching activities as well as the networking activities to disseminate and exploit the cooperation results.

The short-term goal is the establishment of an interleaved (“sandwich”) international master and PhD program. The medium term goal, to be achieved within the scope of the project, is the organization of double degree programs between the participating institutions, wherever feasible. The long term goal will be the creation of a sustainable long-term exchanging and training program by bridging EASTWEB educational activities with active European projects, such as the Erasmus Mundus<sup>6</sup>, and institutions, such as the European Academy for Semantic Web Education (EASE) [5]. In the early phase of the project the students will participate in supervised programs, while at a later stage they will participate in specific double degree programs.

In this framework, a very important activity will be the definition of a Master Curriculum on the Semantic Web, i.e. a reference curriculum for a Master program in Semantic Web that we will call “EASTWEB Master Program Blueprint”. The curriculum shall include basic courses in Computer Science, dedicated courses on Semantic Web related topics, and requirements for specialization courses focusing on ongoing research activities within the consortium. Harmonization among the different curricula will have to take place, so as to facilitate the mobility among institutions (which means, at least for master students, taking a subset of courses from their home university and a complementary subset from a foreign one). The credit system facilitates this task, but the real challenge is to create paths that are compliant with the regulations of both university, while keeping in mind the goal of offering a specialization on the Semantic Web.

Master and PhD programs will be integrated with and built on top of the existing programs in the participating academic institutions and will contains joint-teaching on fundamental courses, joint researching activities, and joint supervision on Theses. The

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<sup>6</sup> [http://ec.europa.eu/education/programmes/mundus/index\\_en.html](http://ec.europa.eu/education/programmes/mundus/index_en.html)

instruction language will be English. The aim is to improve their skills but also to cross-fertilize their culture by including specific cultural courses (language, history and social aspects) in the graduate training programs.

During the project, all interested EASTWEB Universities will start formal procedures to develop pair-wise Double Master Degree programs. These programs will allow (Asian and European) students to undertake a Master program visiting two Universities of the EASTWEB consortium, e.g., undertaking the first year in an Asian university and the second year in an European university (or *vice versa*), or visiting the second university in the central part of the Master program. At the end of the studies the students will receive a Double Degree from the two universities. We foresee setting up pair-wise Double Master Degree programs will during the third and final year of the project. Students will take part in these Double Master Degree programs starting from the year following the conclusion of the project.

The programs will make extensive use of a distance learning platform, tools and methodologies. Moreover, internship projects in both European and/or Asian enterprises will be an integral part of the Master and PhD programs and will be coupled to the networking activity (more in the specific activity below). In the PhD program, the focus will be the joint supervision of doctorate students.

### **3.2 Distance Learning and Knowledge Management platform**

To support the previous Human Resources Development activities, EASTWEB will explore, develop and extensively use new channels and supporting tools for knowledge sharing. The objective of the Distance Learning and Knowledge Management platform is to provide a coherent, re-usable and evolving body of knowledge to all involved target groups (direct and indirect).

A Knowledge Portal will be the basis for European and Asian collaboration activities after the end of the project, both within and outside the consortium. This activity is central to the project, in the sense that it will provide support to the other project activities.

The initial platform will consist of an extension of the existing eLearning platforms used within the European institutions. Such platform will be enriched with new education and research material produced by the partners along the project. It will include course material used in the master and doctorate programs but also further material such as presentations, papers, theses, prototypes developed within the partner institutions and links to other on-going initiatives in Europe and Asia. In particular, the eLearning portal will exploit the results for Semantic Web higher education and training built by the EU Knowledge Web Network of Excellence. The portal will integrate different tools, like systems for video-conferencing, and software supporting collaborative work. Some of the courses will also be recorded with the LODE system developed at the University of Trento [1,4]. Interactive whiteboards will be employed in some of the courses to record all the lecture's event that will take place on the whiteboard [2,3].

In a distributed environment, like the one envisaged in EASTWEB, actions must be taken to create conditions similar to the ones existing in a traditional setting where all

activities take place in a central place. The different kinds of activities can be classified as:

- Remote frontal teaching - Mostly unidirectional flow (frontal lectures, seminars)
- Remote cooperation - Bidirectional informal (e.g. peer cooperation, group work, interaction with tutors)
- Remote assessment - Bidirectional formal (e.g. exams, where identity and environment must be rigorously checked)

Supporting environments for educational management (e.g. statistics, management of joint study plans, students' careers, quality monitoring, certificates, etc.).

As the education and research material produced (within the project, as well as collected from related project) grows, issues relating to content and knowledge management will arise. In the second phase of the project, we will address such issues, evolving the eLearning platform into a Knowledge Portal for Semantic Web activities within and outside the consortium. In this way we want to provide a coherent, usable, sustainable and evolving body of knowledge to all involved target groups (direct and indirect), which will be the basis for European and Asian collaboration activities (both academic and industrial) after the end of the project.

Technological instruments for allowing remote cooperation will be put in place. They will include standardized synchronous and asynchronous communication tools that can be scaled accordingly to the available bandwidth. Synchronous tools include multi-user textual chat, multi-user audio chat, video conference, remote application/desktop sharing. Asynchronous tools include moderated mailing lists, forums, bulletin boards.

In the second phase of the project, on top of the collected and produced material as well as on top of the gathered practical experience, EASTWEB will evolve the eLearning platform into a Knowledge Portal for Semantic Web activities within and outside the consortium. For instance, efforts will be made during the project to provide semantic indexing of the study material that will be produced by recording lectures and whiteboard events.

We want to provide a coherent, usable, sustainable and evolving body of knowledge to all involved target groups (direct and indirect). This will be the basis for European and Asian collaboration activities (both academic and industrial) after the end of the project.

In summary, the short-term goal is to use and validate the platform supporting both the Master and PhD programs. The medium term goal is to establish a Knowledge Portal Semantic Web activities within and outside the consortium. The long term goal of these actions is to provide a coherent, sustainable and evolving body of knowledge to all direct and indirect target groups.

### **3 Discussion**

The initiative has a number of obvious advantages:

1) By exchanging students in the level of Master and PhD, the program will increase the quality of the students in the target groups. Although most of the target groups in



the consortium already have good reputation in education and research in Computer Science locally, the exchange program can further strengthen their leading positions in the local regions.

2) By training young researchers in Europe and Asia, it will increase the teaching and research quality of the target groups. The program of training young teaching and research staff from the target groups includes joining the European teaching activities, face to face discussion and training with the European teaching staff, participation to the research program of the leading European groups (including the internal and EU funded projects), taking leadership in some research or teaching initiatives, joining the supervision activities for Master student level and so on. The enhanced experience will further strengthen the leading positions of the target groups locally.

3) By disseminating the activities and the joint research and education results, it can bring the industrial attention to the academic target groups. These activities not only disseminate research and education results to broader audience, but make also industries aware of the groups. With the fast development of the Semantic Web and the increasing economic and marketing demands for such technologies, the chance for potential industrial collaboration with the target groups is high.

4) By setting up the long-term collaboration after the end of the funding, it can strengthen the leading position of the target groups in Asia. The EU funding will last only for 3 years, so EASTWEB will have to create the momentum necessary to sustain new activities. This will be done by exploiting the infrastructure (e.g. the EASTWEB Portal) and human relations developed during the project, but also by making this objective a very high priority in the project applications that the partners will make to their reference funding agencies.

On the other hand, there are a number of difficulties and risks connected with the project.

a) The presence of different education systems will require the development of a common pattern of reference. At present Asian countries and educational systems are more USA oriented. The multifaceted situation in Europe education could become a challenge in this respect, both for Asian and European institutions. On the other hand, the same multifaceted situation could provide a more appropriate framework to the Asian cultural diversity at large. Moreover, the different education systems will need to be adjusted in order to promote mobility, comparison of curricula and to allow an easier credit transfer and recognition. Such action may prove very difficult due to different local regulations and constraints, and special effort, creativity and a good degree of flexibility will be needed to overcome such hurdle.

b) Although the working language will be English, the different native languages and related sociological and economical cultures, will have to be addressed in order to achieve the project. Students will have to take awareness on local languages and culture.

c) Many European students are keen to spend part of their formation visiting other European or North-American countries. However, fewer are considering the opportunity to visit Asian countries while completing their formation (especially in technological disciplines). In such rapidly changing world, this attitude will probably change in a few years, but for now it might be a hurdle in finding a suitable number of candidates.

d) High cost of life in Europe. The high living expense in Europe will limit the number of Asian students and young researcher/faculty involved in the project. The EASTWEB consortium will have to explore additional financial support from universities, local enterprises and local administrations to support both living and travel costs involved in the mobility scheme.

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