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## **PROJECT INTER-COUNTRIES RESEARCH FOR MANUFACTURING ADVANCEMENT (IRMA)**

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### ■ **Abstract:**

The project *Inter-countries Research for Manufacturing Advancement (IRMA)* is focused to the realization of a research and comparative analysis in the 27 European Union's member states, aimed at promotion of excellence and efficiency of the instruction in higher education institutions. The IRMA project is research on the manufacturing engineering field, taken into consideration its high level of innovation and fast changes in requirements that students must possess, in order to be adapt and competitive on the labour market. The objectives of the IRMA project is to innovate and to improve educational systems of technical universities at European level, in order to offer to students a competitive environment based on innovative teaching methods, instruments and contents.

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### ■ **Keywords:**

*Lifelong Learning Programme, research in manufacturing*

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### ■ **INTRODUCTION**

The international project *Inter-countries Research for Manufacturing Advancement (IRMA)*, co-financed within the *Lifelong Learning Programme*, consists in realisation of a 2-years *Research-Comparative Analysis in the 27 European Union's Member States*, aimed at the promoting excellence, efficiency and fairness of the instruction in Higher Education Institutes within the *Manufacturing Engineering* sector. The above sector was selected since it is supposed to contain a high level of innovation and quickly-changing requirements that students should possess in order to adapt themselves and be competitive in the labour market.

The *Research Analysis* involves three Interfaces: *Enterprises, Universities, and "Intermediary" Institutions (Incubators, Technological Poles,*

*Academic Spin-off, Institutional Agencies)*. The analysis focuses on the following activities:

- to understand what competences and knowledge are demanded by Enterprises,
- to understand what competences and knowledge are supplied by Universities,
- to understand what competences and knowledge are spread by Intermediaries.

Duration of the IRMA Project is 24 months (01/01/2008 – 31/12/2009) and is carried out in the following phases:

- 1.] Preparation and Design of Project ICT instruments.
- 2.] Research Analysis Realisation.
- 3.] Realization of Quality, Evaluation and Validation Plan.
- 4.] Dissemination.
- 5.] Exploitation.

The data are collected through a web questionnaire, specific for every one of the three Interfaces, and put in a Data Base created on a Portal. The following criteria are compared at the European level, as declared within the Project IRMA:

qualitative and innovation level of teaching in the higher education, quantitative level of students, causes/rate of scholastic defection, preventive actions for scholastic defection, European mobility, occupational way out, skills and competences management, obstacles to access/change/transfer to another faculty, e-learning services [1].

The analysis allows a detailed comparison among various Universities that have the opportunity to exchange best practice and innovative elements existing in their own educational systems. The above-mentioned database – including all gathered data through web questionnaires – will be available on the Lifelong Learning Manufacturing Portal - LLMP. The Portal is used during the project realisation, and most of all, after its end as a place where to communicate and to exchange information and knowledge about manufacturing in an “open logic”.

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**■ PARTNERS IN THE IRMA PROJECT**

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*Partner 1 - Project applicant and beneficiary: The Faculty of Manufacturing Technologies of the Technical University of Košice with a seat in Prešov was established in 1992. Tradition of university technical education in Prešov started in 1979 by branch of the Faculty of Mechanical Engineering of TU of Košice. Despite its short existence, the Faculty of Manufacturing Technologies has built up a firm position among the faculties of technical universities in Slovakia. More than 1600 students study at the faculty in various forms of studies and each year more than a hundred students are graduated from the faculty [3]. Role of the Faculty of Manufacturing Technologies in the project: Project Strategy Guidelines preparation (detailed planning) in EN language, preparation proposal for detailed economic planning among partners, specification of equipment (purchased from the project budget), preparation of draft Analysis Format proposal, establishment of communication and administrative system,*

*definition of requirements specification for the LLP on manufacturing, project management.*

*Partner 2 - Project coordinator: Gruppo CS Torino (Italy) is a small enterprise that belongs to Gruppo CS, a company that deals with consulting, education and training at national and international level, through structures located in different Italian areas, including a local office abroad strategically situated in Bratislava. Gruppo CS training activities (traditional and distance Learning) are the realization of: longlife learning courses for employed persons of the about 2000 companies of his consortium; higher education courses, projects and training activities in the field of high technical superior education and training courses realized in cooperation with intermediate schools, educational agencies and universities, European projects in various fields such as education, ICT, long distance work, etc. Role of the Gruppo CS in the project: management and coordination, TSCC meetings, preparation and design project, research and analysis, evaluation, dissemination, exploitation.*

*Partner 3 – University of Oulu (Finland) is one of the largest universities in Finland with an exceptionally wide academic base. Internationally pioneering research is conducted as a collaboration of different disciplines. The University cooperates closely with industry and commerce, and has broad connections with hundreds of international research and educational institutions. Six faculties and their departments form a multi-disciplinary academic community that enables diversified studies based on multifaceted research. Role of the University of Oulu in the project: participation on TSCC meetings, preparation and design project ICT, research and analysis, quality, evaluation, validation, dissemination, exploitation.*

*Partner 4 – Poznan University of Technology, Poznan (Poland) is one of the top rated research and educational institutions in Poland. The Faculty of Mechanical Engineering and Management (FMEM) was established in 1974. Now it is one of 9 Faculties of Poznan University of Technology. The FMEM mission is to provide graduate and undergraduate education and to conduct research in information and communication technologies. Our curriculum provides students with a superb background for careers in an increasingly technological society. Role of the Poznan University of Technology in*

*the project: participation on TSCC meetings, preparation and design project ICT, research and analysis, quality, evaluation, validation, dissemination, exploitation.*

*Partner 5 – North University of Baia Mare (Romania) has been functioning since 1990 has the following main domains (majors) undergraduate studies: Industrial Engineering, Mechanical Engineering, Economic Engineering, Computers and Information Technology, Electronics and Telecommunications. The Faculty coordinates the fundamental research activity, ensures the students' fundamental training in every major, takes part in the higher education entrance examination, closes research contracts with specialists from Romania or from abroad. Role of the North University of Baia Mare in the project: participation on TSCC meetings, preparation and design project ICT, research and analysis, quality, evaluation, validation, dissemination, exploitation.*

*Partner 6 – Balear de Desarrollo y Formación, Palma (Spain) is an ICT research and development, training and consultancy company. BDF collaborates with organisations and institutions involved in R & D, adult education and training, employment etc., contributing to the building of the Knowledge Society by developing innovative adult education, lifelong learning, training and IT systems, programmes, products, services and methodologies. Role of the BDF in the project: participation on TSCC meetings, preparation and design project ICT, research and analysis, quality, evaluation, validation, dissemination, exploitation.*

*Partner 7 – Studio TEOS, Milan (Italy) was founded in 1982 carried on activities of research for the University of Milan. Studio TEOS deals with projects and consulting in ICT field with particular reference to Internet communication, e-Learning and workgroup, and has specific expertise and experience in: design and development of applications and portals that organize services and digital objects coming from distributed and heterogeneous repositories, use of the new technologies in the organizational processes and training systems. Role of the Studio TEOS in the project: participation on TSCC meetings, preparation and design project ICT, research and analysis,*

*quality, evaluation, validation, dissemination, exploitation.*

*Partner 8 – CAD-Up International s.r.o. Prešov (Slovakia) has been founded in 1994. The main activities are oriented for support CAD/CAM/PLM products and engineering projects for machinery companies in Slovakia - especially for mould producers, special tools producers. The firm is well known among CAD/CAM users from machinery and furniture industry, among educational institutions for providing education knowledge and skills of e-learning and web based courses both in Slovakia and Czech Republic. The experienced sale and engineering teams provide the support all our customers needs. Role of the CAD-Up International in the project: participation on TSCC meetings, preparation and design project ICT, research and analysis, quality, evaluation, validation, dissemination, exploitation [4].*

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#### ■ MAIN TASKS OF THE IRMA PROJECT

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*The IRMA project consists in the realization of a Research/Comparative Analysis in the 27 European Union's Member States. The objective of the IRMA is the promotion of excellence, efficiency and fairness of the instruction in Higher Education Institutes, or in other words of access and students' retention in Higher Education. In our opinion excellence refers to the quality and to the level (or capacity) of innovation of the Higher Education's teaching system (contents, methods, technologies used, services provided to students, etc.), efficiency is due to the correspondence among skills and competences provided by Universities and those required by Enterprises and equity can be evaluated thanks to the Equal Opportunities given to students independently from social, cultural, religious and economical factors.*

*The Research is circumscribed to a specific field, the Manufacturing Engineering and is realized involving three Interfaces: Universities, Enterprises and "Intermediary" Institutions (Enterprises Incubators, Technological Poles, Academic Spin-off, Institutional Agencies), with the purpose to understand which are competences and knowledge demanded from Enterprises, which are competences and knowledge supplied from Universities and the competences and knowledge spreaded from Intermediaries [7].*

The project wants to support the introduction of reforms in the educational and training system and to improve the investments in the human capital of Universities, that is to say Students, giving them new instruments and knowledge coherent with the competences demanded from the economy of knowledge, focusing on the state of the art of the way of teaching Manufacturing Engineering in the European Universities.

The goal of Inter-countries Research for Manufacturing Advancement (IRMA) project is, through the research of manufacturing advancement education analysis, to analyze, accelerate and enhance the ability of the education sector to capitalise on the emergence of a powerful information infrastructure on manufacturing advancement. The key components of projects approach are:

- 1.] through selected indicators to conduct the research on current status in education, research and training on manufacturing technologies,
- 2.] research the manufacturing engineering advancement education based on multilateral approach,
- 3.] use of web- based multi language platform to highlight the progress and results increasing the visibility of the research,
- 4.] manufacturing operation scheduling derived from the operation specifications.

Proposed research goals and methods can certainly be used to encourage education facilities and personnel to further explore topics on their own and take ownership of their learning and improve the overall procedures, goals and system of education. Also to encourage the sharing of information, knowledge, to secure the distribution of the top of the line data on manufacturing advancement education through the network.

For instance, the excellence of Universities and their capacity to advance the manufacturing technologies education could be analyzed/evaluated through the following topics of education conducted at the education facilities of interest [8]:

- Creative use of progressive tools for design phases using the modern tools with elements of artificial intelligence as strategic approaches for implementation of modern technologies. It will include the SW technologies (CAD/CAM/CAE/PDM/PLM),

optimization of product design focused on price and manufacturing costs, cooperation and out-sourcing on product design, modern CAPP systems and their implementation.

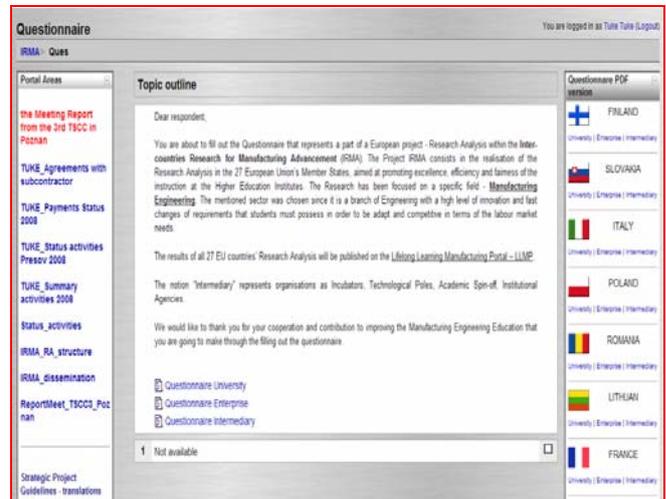


Fig. 1 The Lifelong Learning Manufacturing Portal - LLMP ([www.irmaproject.eu](http://www.irmaproject.eu))

- Use of sophisticated approaches during the production phases focused on new methods in organization and management of manufacturing processes, ERP, MRP systems, logistics, innovation of manufacturing tools, visualization of manufacturing management.
- Implementation of out-sourcing methods of manufacturing processes management. Out-sourcing decision making processes. Implementation phases of out-sourcing management.
- Environmental impacts of cutting edge manufacturing technologies. Environmental approaches of waste management.
- Nanotechnology in manufacturing processes. Development, testing and implementation of nanotechnology use in modern manufacturing processes focused on improvement of manufacturing process effectiveness. Environmental impact and risks of nanotechnology use in manufacturing.

All the data are collected through a web questionnaire, specific for every of the three interfaces, and put in a data base created on the Lifelong Learning Manufacturing Portal (LLMP), that are used as technological instrument to support the research.

The web-based platform is also enable best solutions for communications such as notices, updates, asynchronous and synchronous

discussion, and for content that is frequently updated or only becomes available during the actual project duration. Web based platform allows the direct connection between partners conducting the research on modern information on manufacturing advancement education directly, covering the whole network of partner and non-partner countries [6].

The manufacturing advancement education research is concentrated on analysis, processing, comparative analysis and distribution of the results up to the education personnel, decision makers and stakeholders. Project life-time is underlined by the necessity of conducting research, analysis of current status of manufacturing technologies education, interviews, distribution and analysis of the questionnaires and automatic data collection. The creation of database is executed continuously and should was finished until February 2009. Duration of the project is also dictated by the requirements of impact evaluation and analysis due to the certain period of time to judge the outcome of the research results implementation into the practice.

#### ■ CONCLUSION

Inter-countries Research for Manufacturing Advancement will bring long-term advantages to manufacturing technologies education personnel and decision makers especially in high-quality learning content and applications which allow quick and profitable transfer of research results to the practice. It will improve quality of manufacturing technologies education system and its adaptability to the quickly changing requirements of the manufacturing industry in broad area of knowledge and skills. Life time learning provides the advantage of skills improvement and enhancement which will certainly impact the abilities education systems to better fulfil the assigned tasks. Manufacturing companies are globalizing and expanding worldwide and are outsourcing functions and activities with different requirements. Therefore education of manufacturing technologies is important in this context.

The discipline of Manufacturing Engineering is evolving rapidly to meet the needs of manufacturing industries. It is important for the

development of the discipline to define a common basis for communication and to strengthen networks among educators. This the only way we can fully realize the benefits of the diversity in the discipline that exist nationally and internationally. The IRMA Project is an opportunity for manufacturing educators to address issues related to global shifts in manufacturing, shifts in jobs, pollution, international trade, and international manufacturing.

#### ■ ACKNOWLEDGMENT

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