

SSME 在欧洲的教学: Porto 和 Masaryk 大学的一个联合硕士培养计划

SSME Education in Europe: A Proposal for a Joint Master Degree between University of Porto and Masaryk University

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Abstract: Service Science, Engineering and Management (SSME) is emerging as a new discipline and several universities have been evolving or creating courses/programs to educate for the needs of the service fields of the economy. The University of Porto started in 2007 a master program in Service Engineering and Management, and Masaryk University started in 2008 a program in Service Science, Management, and Engineering. Both programs concentrate on services that are supported by technology, in particular information and communication technologies. This paper presents a summary of both programs and a proposal for a joint 2 year master program involving the two universities that is expected to start in 2010. Students in this program will take courses in the two universities, and lecturers will be involved in joint research projects. Individual students will have a semester research or applied project in a European service organization, being supervised by a lecturer or a researcher from each universities. It is expected that graduates will understand technological, organizational and cultural aspects of the diverse businesses in a wide European context and will be ready for service requirements of this century.

Key words: curricula; service science; master programme; education

1 Introduction

The services sector develops and implements systems that help businesses, governments and other organizations improve what they do, and innovate. Services currently account for over 70 percent of the USA, European and Japanese economies^[1] and this percentage is growing as organizations invent new business opportunities by building more efficient systems, streamlining business processes, in particular by embracing the Internet, mobile phones and other self service technologies^[2].

The infusion of technology has deeply changed the service environment. People can now interact with businesses and other organizations through diverse forms of technology-facilitated contact. This environment creates new challenges for service providers and produces changes in the economy and society.

These changes also challenge universities that are used to provide a sound and focused scientific basis to the education and training of students. Dealing with technology based services requires adding multidisciplinary competences and varied skills to the educational

process.

Several universities are evolving their current education programmes or creating new ones to respond to the technology based service economy challenge.

FEUP, the Faculty of Engineering of the University of Porto, Portugal, has started a master program in Services Engineering and Management, MESG (Mestrado em Engenharia de Serviços e Gestão, in Portuguese): MES G@FEUP in 2007.

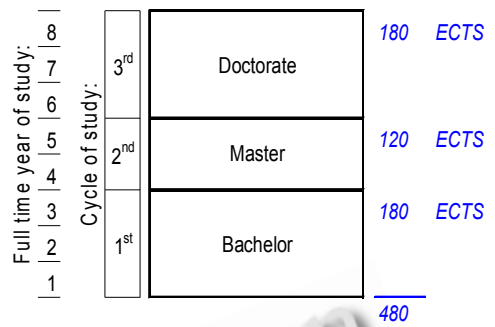
FIMU, the Faculty of Informatics of the Masaryk University, Czech Republic, has started a master program in Service Science, Management, and Engineering, SSME: SSME@FIMU in 2008.

Although all graduates of these programmes need to share some basic science curricula, and need technical expertise in some engineering/informatics disciplines (e.g.:civil, mechanical, information systems or computing), more emphasis must be placed in the service systems, in understanding the way people interact with them, and in creativity focused on innovation.

The design of the new service science based master programmes originating at FEUP and FIMU has been oriented by the European Bologna framework. They aim at educating professionally recognized graduates in a European context. In order to stress the European dimension, students and staff from both universities have been using the ERASMUS Programme (ec.europa.eu/education).

European Bologna framework and ERASMUS programme

Like most schools in Europe, FEUP and FIMU have evolved their degree structure in accordance with the Bologna Framework^[3] and the Lisbon Recognition Convention. Figure 1 shows the degree models that are being followed. Master degrees are granted after two years of full time successful study, on top of Bachelor degrees in engineering/informatics sciences. This is equivalent to 120 ECTS, about 3200 hours of study effort from each student (see for instance Bologna Documents in www.eurashe.eu, the European Association of Institutions in Higher Education).



ECTS - European Credit Transfer System
60 ECTS correspond to one year full time of study

Fig.1 Academic degree configurations under the European Bologna framework

2 Common Perspectives of Both Master Programs

FEUP and FIMU aim at educating professionals, in the following sense:

[We are] concerned with provision of the academic foundation knowledge and developing the corresponding skills that will lead our graduates to become ‘professional’ engineers. Professional engineers are those who are required to provide leadership, be innovative in their approach to engineering tasks and undertake design, research and critical investigations at the highest levels^[4].

Engineering education at FEUP

FEUP is one of the largest and most prestigious research engineering schools in Portugal. It goes back to the Nautical School, set up in Porto in the 18th century, and has currently over 6000 students. Most of its lecturers and researchers have doctorates and are involved in projects in cooperation with other national and international organizations, in particular some of the authors were involved in service research^[5,6].

Master education at FIMU

Masaryk University is the second largest university in the Czech Republic. The Faculty of Informatics has more than 2400 students and offers a wide range of study programmes at Bachelor, Master and Doctoral level. A high standard of teaching is combined with in depth scientific research. Academic and research staff have achieved significant successes internationally in many areas of informatics, such as Concurrent and Distributed Computing,

Database Systems, Computer and Communication Security, Machine Learning, Data Mining and Natural Language Processing (<http://fi.muni.cz/about>).

Concept of T-shaped professional

The two successfully established master programmes SSME@FIMU and MESG@FEUP aim to educate and train so-called “T-shaped” professionals^[7]. The structure of the curricula corresponds also to this perspective. The SSME@FIMU and MESG@FEUP connect the informatics and engineering profession to a multidisciplinary overview of domains. Graduates of these master programmes have to be able to actively incorporate themselves into the service economy and have to have solid knowledge of management, marketing and some practical skills in relevant areas of psychology or sociology.

A “T-shaped” professional is a person with a varied mix of skills as described in Ref.[8]:

“The need for T-shaped skills surfaces anywhere problem solving is required across different deep functional knowledge bases or at the juncture of such deep knowledge with an application area. People possessing these skills are able to shape their knowledge to fit the problem at hand rather than insist that their problems appear in a particular, recognizable form. Given their wide experience in applying functional knowledge, they are capable of convergent, synergistic thinking.”

When designing the curricula, the concept of “T-shaped” professional was applied as follows (see Fig.2)^[7].

The vertical leg stands for solid and deep knowledge in informatics, engineering or other scientific domain. Such knowledge is meant as a prerequisite for SSME@FIMU and MESG@FEUP and it is supposed to be mostly gained through first cycle of studies.

The crossbar of “T” letter represents a wide range of a multidisciplinary span, in which students are educated in SSME@FIMU and MESG@FEUP. Students will gain knowledge of concepts of various domains and will be capable to interact with specialists from these domains. They will be capable to apply their knowledge across situations. The stress in training is put on collaboration in conceiving, designing, implementing and operating

service systems (CDIO)^[9].

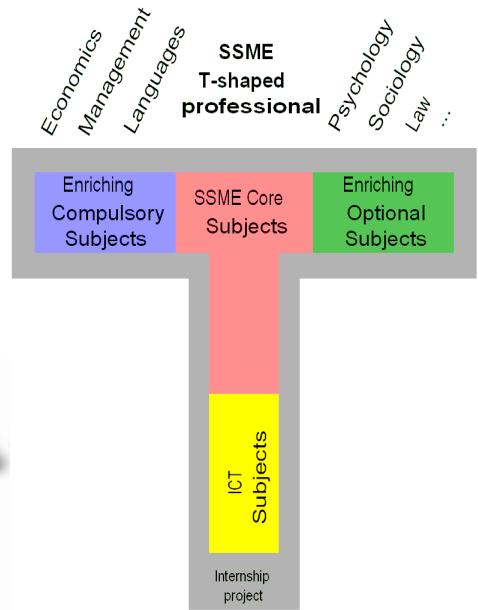


Fig.2 Concept of “T-shaped” professional

All students graduating at the end of the 2nd cycle of studies are required to produce a Master Thesis. This thesis results from the involvement in a research project or from an internship project under supervision from FEUP or FIMU.

Related to this project, there has to be an official agreement between faculty and the selected business partner. Specific goal of such agreement is to identify and register needs of the partner and agree on a topic of the student’s project. Outputs of the project have to bring an added-value for the business partner to make him interested in cooperation with the university. Student’s progress is monitored and guaranteed by supervisor from university and also from the business partner. Regular meetings of these three parties are hold.

Key factors in services

Service engineers and managers should be able to fully understand the science and technology required for providing technology based services to real people, in a way that generates value. This is in fact consistent with the required skills that a service scientist needs^[10].

Both curricula emphasize these three key factors in services. The key factors increase the fundamental relevance of the following components in the education of service professionals and are summarized in Figure 3:

New technologies (i.e., ability to design, understand and evaluate innovative technologies and processes).

New interaction modes or services (i.e., understand user and customer needs and be able to meet requirements and quality expectations).

New business models (i.e., leadership and management capacity to meet stakeholder interests and the demand for organization flexibility, effectiveness and accountability).

A comparison of content between SSME@FIMU and MESG@FEUP according to the key factors is shown in Fig.4.

Graduates of SSME@FIMU and MESG@FEUP are expected to be immediately productive and able to contribute from the very beginning when entering positions that require smart orientation in problems together with an overview of the ICT/engineering domain and beyond.

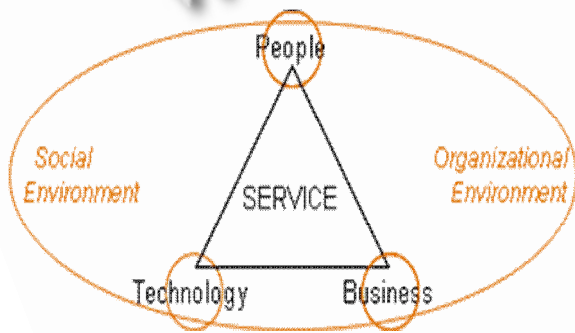


Fig.3 Three faces of Service relevant for SSM E@FIMU and MESG@FEUP

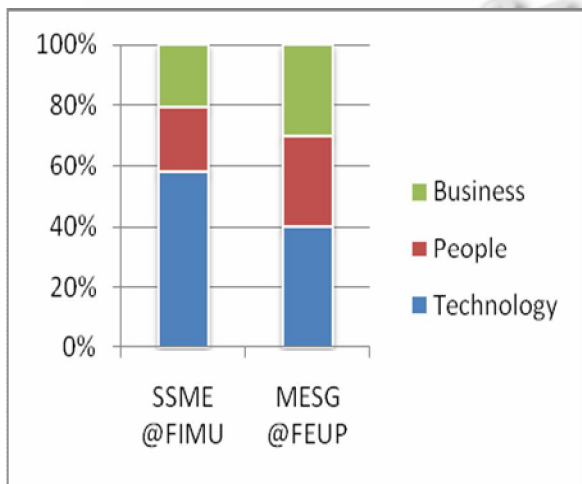


Fig.4 Content of programmes according to the key factors in services

3 The MESG MSc at the Faculty of Engineering of the University of Porto

The MESG MSc was approved by the Portuguese government in 2007 and started in September of that year with 18 students. This master programme is intended for students who want to extend their specific technical knowledge from a bachelor or master level in science, engineering or even economics and acquire multidisciplinary competences in the engineering and management of technology based service systems.

The master program can be taught in English, although currently all 50 students attending it are fluent in Portuguese.

MESG@FEUP Curricula Structure

The MESG program has core and optional courses, and a final project with a dissertation, as may be seen in Fig.6. Courses can be classified in the following scientific components1:

- ICT–Information and Communication Technologies.
- PSA – Psychology, Sociology and Arts.
- OMM – Operations, Management and Marketing.

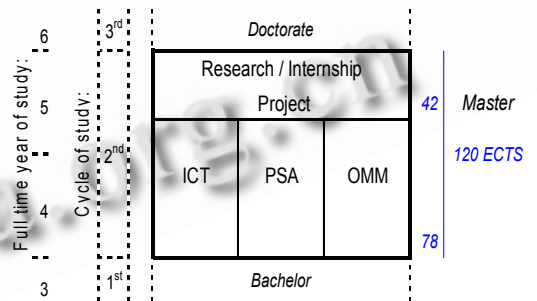


Fig.5 Main scientific components of MESG

These three scientific areas are involved in different percentages in the courses that are currently being offered by MESG. For some courses it is clear the main scientific area, such as Management (OMM) or Multimedia and New Services (ICT). But for others there is a mixture, e.g.: Human-Computer Interaction (ICT, PSA and OMM).

The final semester 30 ECTS project, leading to the Master dissertation, starts to be prepared with two courses, Introduction to Research Project (IRP) I & II.

While IRPI is a standard course on qualitative and quantitative methods for research, IRPII focus on

preparing the student for a particular research or internship project, with an agreed supervisor.

<i>1st Year - 1st Semester (September - January)</i>		ECTS
Management	core	6
Business Process Modeling	core	6
Information Systems		6
Organizational Behavior		6
Decision Support Systems		6
Human-Computer Interaction		6
Data Base Systems and Information Management		6
Creativity		6
<i>1st Year - 2nd Semester (March - July)</i>		
Service Operations Management and Logistics	core	6
Services Marketing	core	6
Introduction to Research Project I	core	6
Accounting and Financial Management		6
Requirements Engineering for Services		6
Multimedia and New Services		6
Human Resources Management		6
Cognitive Psychology		6
<i>2nd Year - 1st Semester (September - January)</i>		
New Service Development and Design	core	6
Introduction to Research Project II	core	6
Information Systems Architecture		6
Capital Budgeting		6
Enterprise Management Architecture		6
Corporate Strategy		6
Customer Relationship Management		6
Project Management Laboratory		6
E-Business Technologies		6
<i>2nd Year - 2nd Semester (March - July)</i>		
Dissertation - Research or Internship Project	core	30

Fig.6 Curricular structure of MESH

A student may also ask the scientific committee overseeing the MESH programme to take optional courses from any one offered at the University of Porto under the 120 ECTS limit for the two academic years.

4 The SSME MSc at the Faculty of Informatics of the Masaryk University

The SSME MSc was approved by Czech government in 2008 and started in October with 11 students. This programme is intended for students who want to extend their specific informatics knowledge from the bachelor level into both the multidisciplinary overview of management skills and service economy understanding, and gain a deep insight into the

informatics fundamentals of service system construction and service systems operation in business^[11]. The master program is taught in English.

SSME@FIMU Curricula Structure

The courses of the curricula are divided into the four main groups as shown in Fig.6) (<http://kirlab.fi.muni.cz/en:ssme/>):

1. SSME core subject
2. The Interim Project and the Master Thesis
3. Interdisciplinary SSME related courses
4. Arbitrary courses

SSME core subjects:

- 30% of a student workload (i.e. 36 ECTS); courses are mandatory.

Within this group of courses students will study main concepts of a service science and will knowledge about service systems, their modelling and management.

Courses in this group are aimed into four directions as follows: i) Services Fundamentals, ii) Analysis and Modelling, iii) Project Management, Leadership, and Teamwork, iv) Co-operation Skills. Examples of some SSME core courses are: Domain Understanding and Modelling, Business process modelling, Project Management and Service Lifecycle.

The Interim Project and the Master Thesis:

- 30% of a student workload (i.e. 36 ECTS) and are mandatory.

The Interim Project goes towards “building a bridge” between the practice and the academic sphere by letting students put to use his/her knowledge and skills gained so far from the studies by working on a service oriented project in the environment of an external business partner. It is strongly recommended the Master Thesis to be based on experiences gained through work on the Interim Project.

Interdisciplinary SSME related courses:

- 20% of a student workload (i.e. 24 ECTS). These courses are facultative, with some limitations.

To fulfil the idea of “T-shape” professional, we have to be sure that students will be versed in across various

disciplines. That is why students are obligated to reach a certain minimal limit within each of following directions by choosing arbitrary courses. For every direction, there is a wide range for possible selection:

- Information technology (min. 8 ECTS, e.g. Enterprise information systems, ITIL, Service Oriented Architecture, Parallel and distributed computations, Human-Computer Interaction),
- Management and Economics (min. 8 ECTS, e.g. Management by competences, Marketing strategy in service business),
- Human oriented (min. 8 ECTS, e.g. Introduction to cognitive science, Logical analysis of natural language, Seminar on complex systems, Theatre performance)
- Work in faculty laboratories (facultative)

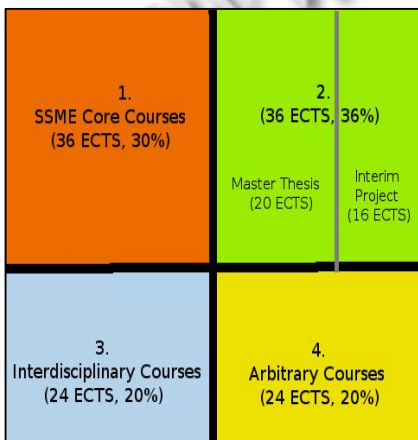


Fig.7 SSME@FIMU curricula structure

Arbitrary Courses:

Courses according to student's preferences have to be at least in amount of 20% of student's workload (i.e. 24 ECTS).

According to policy of Masaryk University, it is possible for student to select any course from offering of the whole University (not only from FI MU offering). Student of SSME@FIMU can use this workload for tuning his profile, either to study SSME in more detail or get even wider perspective.

5 The Proposed Exchange Process

The two master programmes presented are similar in

their objectives but allow diversified backgrounds in the past experience and know-how of students. These programmes are also open to students' particular needs and interests, accommodating different learning trajectories around some core components.

Currently students can also take advantage of the ERASMUS programme to do one or two semesters of study, fully recognized, in the other University. But during such process the student will only have one University degree. In order to let the student have a double or dual degree a proposal for a joint degree must be prepared and submitted to both Universities. From administrative point of view, this proposal will likely need to be validated by government agencies in both countries, and it may require special agreement on fees that students have to pay locally. However, from an academic point of view we propose the following in order to grant a double master diploma:

- 1) Agreement on process to select students for the double degree programme.
- 2) Each student needs to successfully finish 60 ECTS in each university, under MESH or SSME rules.
- 3) The internship or research project of each student needs to be supervised by lecturers from both universities.
- 4) The final exam committee needs to have at least one member from each university.

There are several possibilities for a student in this double degree programme, but each semester must take place full time in just one of the universities. However, it is possible that the internship project will take place in one or more locations, including an external organization.

6 Conclusions

This paper presented a summary of the MESH @FEUP and SSME@FIMU master programs, showing that they offer compatible learning trajectories for students. Bringing them together would enable a richer educational experience in a varied economic, cultural and social European setting. This could be an interesting

programme for European and other international students. European or global companies that value this kind of education could be involved as sponsors.

Moreover, both FEUP and FIMU are partners in the European ERASMUS project, “DELLIIS” (DEsigning Lifelong Learning for Innovation in Information Services Science) with Centre de Recherche Public Henri Tudor (Luxembourg), Open University of Catalonia and Technical University of Catalonia (Spain), University of Paris1 Panthéon-Sorbonne (France), University of Amsterdam (The Netherlands), University of Skövde (Sweden) and University of Geneva (Switzerland). It is expected that results from such project will help in creating guidelines for European programmes in Service Science. A joint programme between FEUP and FIMU could also be a starting point for a European multiple master degree in Service Science, Management, and Engineering with wide support and interest from governments and businesses.

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