An MSc Programme in Open Source Information Systems

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Summary. This paper outlines the rationale and programme of the MSc. Programme in Open Source Information Systems to be started in at İstanbul Bilgi University, Social Science Institute, Turkey. The programme proposes a Masters of Science degree in Information Systems with an emphasized focus on Open Source Systems. A fundamental goal of this programme is to create a MSc degree which students will wish to pursue, which will be well regarded by industry and recognized by the relevant research institutes.

1 Introduction

Open Source Computing is a unique technological phenomenon of the 21st century. As the research and business opportunities in this field unfold, the need for education programs become more visible. This work presents a draft for the MSc program which provides a study path that accepts students from various backgrounds and career focuses.

It is evident that there has been growing interest in study of open source systems. Open Source modules, courses, and degrees in some higher eduction programs show that students are also becoming more interested in the topic[1]. In addition, open source phenomenon has been the focus of many researches for last four-five years.

Experiences and discussions elsewhere[2, 3] hints us the necessity to combine technical, social and business aspects of open source computing in a multidisciplinary framework which is expected to enable graduates of this programme gain a broad understanding of the issues and develop skills of their choice for various technical or managerial positions in e-commerce, software industry, public services, etc.[1] Thus, the focus of the program is not solely on

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[1]It is noteworthy to follow discussions of MoLOS, which is a European group interested in the design and implementation of postgraduate studies on OSS. All materials produced by the group and mail list archives are available for public access. For further information please see http://www.nongnu.org/masterlibre/.

FOSS as a software technology, rather as a contextualized phenomenon. In other words, it is not solely limited to the aspects, such as, how to administer and use FOSS products.

Within this framework, we have deployed a two-year graduate level program presented below. The abbreviation FOSS is used throughout for 'Free Open Source Software, in accordance with EU terminology of the field.

2 Some of the Relevant Graduate Level Courses, Programmes and Research Centers

It is necessary to give a brief review of existing graduate level courses, degrees, focus of research centers on FOSS. The range of course offerings on FOSS varies from a single term seminars to a full degree in Masters of Science.

2.1 Graduate Level Courses

Open Source Software Engineering Course at the Department of Computer Science at the University Victoria, CA

University of Victoria offers a graduate course in open source software engineering at the Department of Computer Science[2]. The course introduces students FOSS research area and aims to unveil the aspects of the FOSS so that they can make a contribution to it. As such, the course provides an overview of FOSS, intellectual property and software licenses, the communities around FOSS, software engineering practices in major FOSS projects, the economics of FOSS, and FOSS in industry[1].

This single course offering gives its graduate students an opportunity to examine FOSS itself, its history, its tenets and merits, methods, and other abstract aspects rather than focusing on relatively more technical aspects.

Open Source Systems Course at School of Informatics, City University Londan, UK

The City University of London offers an Open Source Systems as an elective module within School of Informatics[3].

The module aims to evaluate the usefulness of open source systems to solve real world problems, by drawing upon known case studies. The course suggests a critical analysis of the open source software development process, its opportunities and problems in developing IT systems. To compare and to contrast open and closed source software development the module refers to established opportunities and difficulties in developing IT systems. In addition, proposed module aims to assess open source systems from the legal, ethical and ideological perspectives.

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[2]http://www.csc.uvic.ca/
[3]http://www.soi.city.ac.uk/pgcourses/module_list.html

2.2 MSc Programmes

Some universities in United Kingdom, Italy, and Spain already offer or full Masters programmes in Open Source.

MSc in Open Source Systems, at Sheffield Hallam University, UK

In previous years Sheffield Hallam University proposed one year Masters programme in Open Source Systems. The programme offered a technical background in Software Engineering with an open source emphasis. The programme was targeting "people with a background in computing, science or engineering who want to start a career as independent consultants in open source solutions[4] However, the programme is currently inactive for the academic year 2005-2006.

MSc in Open Source Computing at University of Lincoln, UK

Department of Computing and Informatics at University of Lincoln offers one year full time programme towards a MSc degree in Open Source Computing.

The gradute students of the programme are expected to profess in a variety of open source business models, design methods, and technologies through planned practical experiences and implementation based research projects.

Offered courses within the programme is as follows[5]:

- Introduction to Open Source Software and OS Case Studies
- Object Oriented Design and Development (UML and Java)
- Advanced Software Engineering for the Internet
- Distributed Computing with Open Source components
- Project Preparation and Professional Issues
- Open Web Technologies and Service Development
- HCI, Multimedia, Graphics, and Human Factors in OS
- Open Source Business Models
- Project and Dissertation

The programme not only addresses the development of open source systems from the technical aspects but also targets to examine FOSS's wider impacts on society in terms of business models and social change.

International Masters Programme in Free Software, Open University, Catalonia

The Open University of Catalonia (Universitat Oberta de Catalunya) offers an International Master programme in Free Software. The master programme

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[4] See http://www2.shu.ac.uk/prospectus/op_pglookup1.cfm?id_num=CMS030
[5] See http://www.lincoln.ac.uk/home/courses/dci/postgraduate/open_source/index.asp

that has began in 2003, offers a distance education of the degree using the Internet as the basis of the academic activity[3].

This master degree targets to cover and examine various aspects related to the FOSS technology, such as philosophy and the history of the FOSS movement, GNU/Linux, computer networking, web management, database management, software development, laws and licenses, etc. The programme offers four different sub-tracks. The student can choose one of these four possible specializations:

- Network and Systems Administration: Focuses on configuration and administration of network services, and security in GNU/Linux.
- Software Development: Focuses on design and development applications with FOSS tools, such as different virtual cooperative environments for FOSS programming.
- Web and e-Business Administration: Focuses the components of widely used FOSS web servers and their possibilities, along with management of related data base management systems with web interfaces.
- Information Systems Management: Focuses on managerial and strategy development aspects of FOSS adoption. For instance, this sub-track aims examines the alternatives to proprietary systems, investigates the legal and exploitation aspects related to FOSS and analyzes practical implantation cases of FOSS platforms.
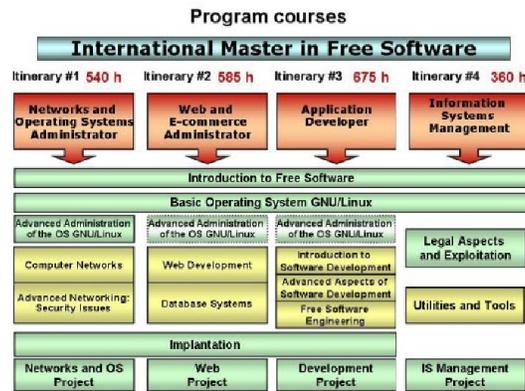

Fig. 1. Open University of Catalonia FOSS Master Programme Design

Fig.1 highlights the details of distant FOSS Programme design offered by Open University of Catalonia.

Masters in Free Software and Open Source, University of Bologna, Italy

University of Bologna offers a full Masters programme on FOSS. Along with software engineering aspects of FOSS, the program also offers courses on Intellectual Proprietary Right management in FOSS [6].

Masters in Open Source Software Management, University of Pisa, Italy

Department of Informatics at University of Pisa offers a full Masters degree in Open Source Software Management. This multi-disciplinary Masters degree is composed of courses offered by four different departments:

- Department of Informatics
- Department of Corporate Economy
- Department of Economics
- Institute of Trade and Marketing

2.3 Research Centers and Groups

A large number of universities around globe offer PhD seminars or readings on FOSS; run MSc thesis, PhD projects; and encourage academic studies on various aspects of FOSS at established active research centers or groups. Hereby, we will shortly mention only a few of them.

Open Source Software Development at University of California, Irvine, USA

Institute for Software Research at University of California has a research center focused on Open Source Software development. The center "focuses on empirically-based studies of the processes, practices, and communities that develop open source software. Ethnographic and virtual ethnographic research methods are employed in the field studies of open source software development[7] communities.

Research Project on the Free/Open Source Software (F/OSS) Development Phenomenon, Univeristy of Notre Dame, USA

A research group at University of Notre Dame runs a long run research project on FOSS development phenomenon and examine the pattern of growth exhibited by FOSS projects over time. Their approach is primarily based upon

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[6]See http://www.unibo.it/Portale/Master/Master+Universitari/2004+2005/Tecnologia+del+Software.htm
[7]Please see 'http://www.isr.uci.edu/research-open-source.html' for studies and fruitful publications of the center

social network analysis methodology to derive conceptual models of the FOSS phenomenon[8].

Open Source Research Community, MIT, USA

The MIT Open Source Research Community is basically driven by a group of researchers at MIT Sloan School of Management. The research group mainly investigates FOSS collective development phenomenon as a breakthrough innovation process. The group also maintains database of research papers on FOSS, discussion forums, and news portal on FOSS academic activities [9].

3 Key Features

Deriving upon existing programmes and courses it has been foreseen that for the developed program to be attractive, the students those will graduate from the programme should acquire qualifications which will provide them recognition in both academy and industry. Within this perspective the proposed programme offers a curriculum which goes far beyond the scope of conventional computer science and software engineering Masters degrees. It aims to propose a multi-facet understanding of licensing and copyright law, FOSS business models, socio-political reasoning for FOSS, which of all can provide a basis for both academy and industry.

The developed multi-disciplinary MSc degree in Open Source Information Systems combines following distinct ingredients within the body of offered curriculum:

- Technology Infrastructure Management: Choose, configure and administer network services, operating system and user software. This requires making informed choices when choosing hardware and software regarding continuity and reliability of services, understanding of network concepts and security, and problem solving skills for this kind of problems.
- Software Engineering: Design and develop applications with FOSS tools and methodology, know strategic choices in FOSS code re-usability, understand and deploy cooperative environments for FOSS development.
- Information Systems Management: Know issues regarding legal aspects of different licenses for software and information, make strategic choices for information system technical superstructure, and deploy flexible teamwork methodologies within FOSS business model.

The mode of study will keep the very tenet of the self learning practice of the FOSS community, where people usually acquire and share knowledge by visiting different web pages and discussing in forums, etc.

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[8]For details please visit http://www.nd.edu/ oss/
[9]http://opensource.mit.edu/

It is deemed that offered program should keep the flexibility for both as a professional skill development programme and as an intermediary research programme providing background towards more elaborate PhD studies within this intrinsically multi-disciplinary field. Proposed program opts to offer a non-thesis master degree, where each student is expected to either to initiate and support or contribute an existing FOSS project within their masters project. This very principle of FOSS the 'contribution' back to the community will also be embodied within the practical courses. Thus, it will also allow the students to experience open source development process.

While introducing FOSS in a Master program, we are aware of the fact that a broad multi-disciplinary curriculum is necessitated, which means a discontinuous break from conventional expectations of an MSc degree. Besides, even though, the benefits of FOSS articulated from its practices and philosophy will rigorously demonstrated within the programme, the programme will also seek the avoidance of monoculturalism in technology; as FOSS itself inherently is not part of a dominant monoculture and is not even a monoculture to itself. For instance, the forking practices in FOSS projects are a technology of flexibility and differentiation.

The programme expects both computer professionals and new graduates from various technical background, who want to acquire managerial skills in Information Systems with an expertise in FOSS, and non-technical professionals and students such as from Economics, Political Science, IT Law, and Business Administration who want to develop FOSS technical skills along with its managerial and business aspects. The programme also expects students who want pursue a PhD study in a relevant field. In short, the programme does not strictly prerequisites who should enroll but rather what should be acquired by graduation.

4 Courses and Curriculum

4.1 Courses

The programme offers both newly developed courses, and some relevant graduate level Business Information Systems courses, which of all are already being delivered at the university:

- *OSIS 501 Essential GNU/Linux Usage and Administration*: Open source software systems have different characteristics than closed systems in terms of how they interact with the user and how approaches to administration. This applied course aims to introduce students to methods of evaluating rich choices that are exposed by open source systems to users and administrators, in addition to basic principles and practice of data processing and system management. Upon successful completion of this module, students will be able to use GNU/Linux systems and additional software for office

needs and various data processing scenarios, and apply essential system security and administration practices on these systems.

- *OSIS 502 Network and Operating System Management*: Open systems and e-commerce applications require careful implementation of security policies. Additionally, in single or multi-office businesses which rely on computer and network technology, computer networks must be deployed heavily and managed securely, in addition to installation of operating system infrastructure suitable for business processes involved. Subject of this course is equipment, operating system, superstructure software, and application methodology under network integration and security perspective. Necessary mechanisms and policy variants suitable for these mechanisms are covered in an applied manner.
- *OSIS 503 Software Development Using Open Source Tools and Methodology I*: Open source covers both a specific type of licensing and consequent development methodology, and a great number of highly accessible software packages. This course covers basics of using these software, methods and usage patterns, for software development and management/monitoring of the development process.
- *OSIS 504 Software Development Using Open Source Tools and Methodology II*: This course takes subjects covered in the first part further, by deploying more extensive and realistic practice of software development processes.
- *OSIS 505 Social Aspects of Open Source Systems and Public Policy Development*: Open source approach is regarded as a methodology which promotes innovation, accessibility and free competition in inter-organizational processes. This course explores social perceptions and sectoral influences of licensing, and introduces students to open source approaches for promoting development in sectoral, regional or higher levels, by utilizing relevant case studies.
- *OSIS 506 E-business System Development and Infrastructure Management*: E-business and e-government systems have distinct requirements in terms of security, service continuity and compatibility. This course covers strategies and practices for developing, scaling and sustaining e-business systems by using existing open source software base. Upon completion of the course students should demonstrate practical performance in choosing, installing, customizing, monitoring and maintaining software in relevant scenarios.
- *OSIS 507 Legal Aspects of Software and Information Licenses*: Just like their commercial counterparts restricting use of software and information for protecting rights to appropriate, public licenses place restrictions to guarantee free-flow of information and an open and continuous productive activity. This course takes on the similarities and differences of the two licenses in terms of how they relate to productive activity, and introduces students to legal consequences and possible conflicts arising from these licenses with case studies.

- *OSIS 508 Open Source Business Strategies*: Unlike protective licenses which aim to limit flow of information, public licenses are designed to guarantee its freedom. This has been the reason they have arisen from software market which relies on innovation at large scale, and was fit for the nature of this market. This course focuses on new business methodologies shaping around public licenses, within sectors such as Internet and software where inter-dependency of actors is quite high, and analyzes possibilities of applying these to more conventional business practices.
- *BUS 505 Research Methods*: The aim of this course is to develop understanding and skills for conducting qualitative research. Survey development, sample selection, data collection and analysis, use of information technology for research and presentation of results are among the subjects covered. Students will be introduced to information resources, qualitative and quantitative data collection methods, measurement and reliability, basics of information analysis, and reporting techniques.
- *BUS 542 Information Systems Management*: This course approaches information technologies from management perspective. Students are first introduced to New Economy and discuss its effects on society. After covering elements of organizational information architecture and inter-organizational systems, the course proceeds into data stores and their management, data mining, decision support, artificial intelligence and information management, organizational resource planning (ERP), supply chain management, customer relationship management. Finally system development methods, system installation and administration, and transformation management are covered under a decision making perspective. Throughout the course existing and developing technologies are studied for their effects on people and organizations.
- *OSIS 511-512 Masters Project I-II*: The aim of the project is to provide students a chance to practice in a subject of their choosing and apply research methods. While student research on their subject with a critical standing, they can develop analytical skills and and put the methods they have learned in other courses into practice.

4.2 Curriculum

The programme curriculum is given below. Note that the program is devised for a 15 week semester each in 3 hour seminar basis. That is each course has a length of 45 hours in total. In addition, a 50 hour customized intensive non-credit proprietary weekend seminars will be given at the beginning of the first semester to leverage the backgrounds of the incoming student groups.

- Semester 1: *OSIS 501; OSIS 503; BUS 505; BUS 542*.
- Semester 2: *OSIS 502; OSIS 504; OSIS 506; OSIS 508*.
- Semester 3: *OSIS 505; OSIS 507; OSIS 511*.
- Semester 4: *OSIS 512*.

Each student is expected to have a pass grade to earn 3 credits per course (30 credits in total for the degree), plus, they are expected to complete and present an acceptable two-semesters long non-credit Masters Project.

5 Summary and Future Directives

The programme proposes a Masters of Science degree in Information Systems with a emphasized focus on Open Source Information Systems.

The program aims to give its students a broad education and a range of technical and research skills, with an emphasis on Open Source, Open Standards, and Open Content. It presumes a student profile with a background in computing, science, engineering, or business management who wants to start either a career as an independent consultant in open source solutions, or who wants to pursue research towards a relevant PhD program.

Upon the launch, the program will seek to initiate or to adjoin a relevant European Masters Course consortium within Erasmus Mundus[10] programme. The language of conduct of the programme will be in English.

References

1. Daniel M. German, Experiences teaching a graduate course in Open Source Software Engineering, *Proc. of Open Educational Symposium of the 1st International Conference on Open Source Systems*, pp. 326–328. (2005)
2. P. Laird and S. Barrett, On the Dimensions and Issues of a F/OSS Curriculum, *Interim report of tOSSad Project (www.tossad.org) on FOSS Curricula Development*, (2006)
3. D. Megias, J. Serra, and R. Macau An International Master Programme in Free Software in the European Higher Education Space *Proc.of the First International Conference on Open Source Systems*, pp. 349–352. (2005)

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[10]Erasmus Mundus is the EU co-operation and mobility programme in the field of higher education which promotes the European Union as a centre of excellence in learning around the world. For further details, please visit http://europa.eu.int/comm/education/programmes/mundus/index_en.html