

**towards Open Source Software adoption and dissemination
tOSSad**

Contract No 015981

1st F/OSS Curriculum Workshop Report

D11

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Abbreviations

F/OSS: Free/Open Source Software

tOSSad: towards Open Source Software adoption and dissemination

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1. “The Open Source for Education in Europe” Conference and the WP4 workshop on “F/OSS Curriculum Development”

The First Workshop of tOSSad WP4 on F/OSS Curriculum Development was held on 14-15 November 2005 in Heerlen, the Netherlands, in the context of the Open Source for Education in Europe” Conference.

This document describes the First Workshop on F/OSS Curriculum Development and is the 1st deliverable of work package 4 of tOSSad (towards Open Source Software adoption and dissemination) project. This document has been compiled by WP4 members.

The main scope of Work package 4 is to increase the F/OSS adoption in education, particularly in high schools between grades 10-12 and in universities (year 1-4). It aims to spread an understanding of how F/OSS culture can be an attractive alternative in terms of cost, quality and reliability. F/OSS is presented as a secure software solution. F/OSS is shown to be of value in terms of community, democratization, and human-rights.

Europe can achieve great benefit from open source software revolution; one of the key paths towards this revolution is education.

1.1. The Open Source for Education in Europe conference

The Open Source for Education in Europe conference was about the growing phenomenon of Open Source for education. It covered Open Source Software, Open Knowledge initiatives and moved towards Open Science and the free publication and sharing of research and learning materials. More generally, the use of Information and Communication Technologies (ICT) in education provision was recognised and explored. Learners can be involved in improving F/OSS software and content making it possible to take an approach which sees education as the process of supporting learners in joining a community of practice. A loose ‘community’ of educational institutes already exists which supports the exchange of ideas and concepts. Thus, the basis of an F/OSS community is already in place. The aims of the Conference were both to provide a platform for exchanging knowledge and experience and to provide a forum for research in this area.

The conference focused on a number of major issues in Open Source in education in Europe including open standards for e-learning, open contents and open source tools.

About 120 people attended the conference, coming from Universities, Public Administrations, Private Organizations, F/OSS Associations, Research Centers and some Intermediate Schools.

The participants came from many different parts of Europe, Canada and both North and South America.

The focus of the conference was centered on 4 main themes:

1. Open Standards, Architectures and Applications
2. Sustainability Strategies - Managing Open Source
3. Open Content - Issues and Implications
4. Learning with Open Source

These themes were supported by practice sessions consisting of demonstrations and a Hands on Lab.

The submitted papers numbered about 60 (including invited papers). Topics covered were F/OSS, Learning, Teaching, e-learning, OS Platforms and Learning Tools.

During the conference participants were able to share information, to talk with others about their experiences, create new relationships and strengthen contacts with colleagues. The conference was viewed as very successful. Participants were seen to be active and engaged throughout the conference. The conference was widely reported by many leading F/OSS websites and raised much discussion and comment within the education and F/OSS blogosphere.

During the Conference, the leader of WP4, Michele Marchesi of University of Cagliari (UCA) presented a paper on the tOSSad project and more specifically Curriculum Development within Work package 4, thus disseminating knowledge about tOSSad (see Annex II).

1.2. The conference session on “Open Content - Issues and Implications”

In this section we report an account of conference session 2.3 on “Open Content - Issues and Implications”, held on Monday 14 November, 13:30-15:30. This session focused on subjects related to the tOSSad project, particularly those regarding Workpackage 4.

The presentations given at the session are summarized below:

1.2.1. Presentation made by Mr. Wim Westera - OTEC, Open University of the Netherlands “Openness as an evolutionary determinant of human existence ”

Summary

The pursuit of the ‘openness’ of software, of content and other affairs surpasses the simple idea of making products available and accessible to users free of charge. Rather than financial, economical, or technical arguments the open source movement strongly expresses the moral aspects of open source, whilst referring to the equality of individuals and their right to equal opportunities and access to resources.

The open source movement opposes established economic forces and expresses an ideological and revolutionary doctrine. The open source movement shares similarities with pressure groups, political factions and other movements that advocate fundamental changes in the *status quo*.

This presentation investigates how the transfer of ‘openness’ from the domain of culture to the domain of technology can be explained and understood. It strove to reveal the motives and implications of open technologies by reference to the fundamental dependence of human society upon technology, and by investigating the evolutionary benefits of ‘openness’ for human society and existence.

1.2.2. Presentation made by Mrs. Stefanie Panke and Mr. Christian Kohls - Knowledge Media Research Center, “Collaborative Development Strategies for Open Source – Involving the Users’ Perspective”

Summary

The presentation was about a collaborative development strategy for open source software which tackles the development process from multiple perspectives; integrating technological, conceptional and task-oriented considerations.

The development of the portal www.e-teaching.org, involving many stakeholders with diverse characteristics and backgrounds, served as a case study. In particular, the authors described the creation of the editorial infrastructure based on the open source content management system Zope/Plone.

On the one hand, they analysed the history of the technological genesis and on the other hand they outlined the further implementation, focussing on the design of community features, e.g. a weblog component. As a theoretical framework, they applied insights from the German research tradition “Technikgenese” as well as findings from the field of social informatics. The authors claimed that their experience of involving the end-users into the development process can be transferred and applied to other open source projects.

1.2.3. Presentation made by Prof. Michele Marchesi - DIEE, University of Cagliari, “Helping to develop an Open Source Curriculum: the case of tOSSad E.U. funded project”

Summary

This presentation detailed the objectives and the activities of the tOSSad project in the development of an Open Source Curriculum.

tOSSad (towards Open Source Software adoption and dissemination) is a Coordination Action funded in the context of 6th E.U. Framework Programme. The main objective of the project is to start integrating and exploiting already formed methodologies, strategies, skills and technologies within the F/OSS domain to assist governmental bodies, educational institutions and SMEs to share research results, establish synergies, build partnerships and innovate in an enlarged Europe.

One of the workpackages of the project, WP4, aims to develop a F/OSS curriculum. The initial attention is directed to courses that could be offered to high schools and university computer, science/computer and engineering departments. The tOSSad workgroup discusses and elaborates on the content inventory. It is proposing various course topics and a master curriculum. This activity is undertaken in cooperation with many similar initiatives and projects undertaken in Europe. The presentation described and discussed in detail the ideas and experiences of tOSSad WP4.

1.2.4. Presentation made by Mrs. Riina Vuorikari - European Schoolnet and Mr. Karl Sarnow - EUN, “Open Content and Source: European Schoolnet Riding the Wave”

Summary

European Schoolnet, a network of 25 European Ministries of Education, holds a central role in promoting the use of ICTs in European schools. ICTs are viewed as a tool rather than as a goal. The use of ICT is considered with respect to both the context of its use and to the content delivered. This presentation explored four main areas where EUN and its partners are catching the wave.

Firstly, the area of open content: European Schoolnet has taken up the call by authorities to work towards a lawful use of digital content and takes steps to ensure that copyright is given and held by lawful means.

This, of course, is within the context of openness and open content. The most recent service provides a federated search throughout educational content repositories. EUN offers tools to select the level of digital rights management that best fits user’s needs in terms of intellectual property protection and supports available DRM standards like ODRL and Creative Commons licences. European Schoolnet supports the use of CC licenses within its services and has implemented an interface for its users to choose an option of CC license for the resources that they submit to various EUN projects.

Secondly, Xplora, a project coordinated by European Schoolnet on the promotion of science education in European schools is taking a stance

towards the true nature of science - sharing what you have, i.e open source educational software for science.

Thirdly, some European Schoolnet partners, such as Kennisnet in the Netherlands and the Ministry of Education in Flanders in Belgium have explicit roles in promoting the use of open source software as an alternative choice for schools. A review on a selection of European Schoolnet's partners acting upon this challenge was provided.

Lastly, European Schoolnet also produces "Special Reports" for policy makers and shapers in the field of e-learning. A short review of the latest reports was given in the presentation. The issues touch upon the use of open standards for the development of virtual learning environments, a report about "Why European schools need open source and open content" and lastly a report highlighting the obstacles that e-learning could face if software patents (i.e. the directive on Computer Implemented Inventions) are passed.

2. The Workshop of WorkPackage 4

2.1. Preparation and execution

The aim of the WP4 work group was to gather information, to discuss and elaborate on F/OSS training needs and to investigate existing F/OSS courses and curricula in order to provide more effective F/OSS courses for students in high school at grade 10-12 and university students (year 1-4).

More specifically, the following were the activities and discussions planned for the workshop:

- Analyzing and discussing the present initiatives for a F/OSS Curriculum Development, both in high school and universities.
- Analyzing the first results of a questionnaire about industry needs developed by the tOSSad project and the planning of further data gathering.
- Planning further activities in cooperation with other existing initiatives on F/OSS Curriculum Development.
- Focusing and planning the subsequent WP4 activities on specific curricula and course syllabi.

The WP4 work group includes technology coordinators, curriculum planners, instructional technologists, teachers and personnel with technical training in the Linux operating system and other F/OSS applications. It aims to support and disseminate the utilization of F/OSS technology in education and to promote the critical technology and career competencies that the computer industry increasingly demands.

During the planning phase of the workshop, WP4 partners decided to invite some prominent speakers to give talks and raise the discussion level of the workshop.

The workshop was divided into two main sessions: the first session was public, held on November 15 within the context of the host conference; the second session was held on November 16 and was attended by tOSSad partners only.

The invited talks were given during the first session, and were followed by a deep and thorough discussion on curriculum development topics. The second session continued the discussion amongst the tOSSad members and was used to organize future work group activities.

2.2. The Session of November 15

This session was held just after the main conference, in parallel with two other workshops, and saw the participation of about 25 people.

The session started with an initial welcome to workshop participants, including a short presentation of the tOSSad project and the WP4 aims and objectives, given by Michele Marchesi of University of Cagliari.

The second speaker was Stuart Yeates of OSS Watch, Oxford University, who talked about the Experience of OSS Watch Advisory Service and its use by Universities. Here the focus was on how to spread knowledge of F/OSS among universities, having as a starting point the actual usage of F/OSS applications within universities, and not directly starting with courses and curricula on F/OSS. In fact, when F/OSS is successfully used inside universities, it is easier to introduce course and curricula about it.

A problem is represented by the Microsoft branding: because MS is a well-known product, many teachers and students prefer to use it exclusively. A related issue is how to organize ECDL courses using not only Microsoft products, but also F/OSS products, such as Open Office.

Another key issue is the interoperability of various e-portfolios between institutions.. A solution might be the construction of a specific framework to share everything about certification and content. An English company is presently working on it.

An interesting site to visit is <http://www.openforumeurope.org>, and its link on OS Academy. The latter site includes the final report of the OGC's 'Open Source Software Trials in Government' which underlines that F/OSS is a viable and credible alternative to proprietary software, as recent studies in Europe centered on costs saving and security have reported.

A final issue is the need to define the value of F/OSS certifications, and related content. This would greatly help universities and teaching organizations to understand the needs of their users, both full-time students and professionals, and consequently define course syllabi and related certifications.

The second invited talk was given by Graham Attwell, of the Kownet, on "Pedagogy and F/OSS – how do people learn about open source" . His presentation was focused on the importance of providing formal education on F/OSS topics in Schools and Universities, so that people can trust F/OSS software and can rely on reliable accreditations and widespread competences about F/OSS.

An important issue is the scarcity of technical personnel knowledgeable in F/OSS. For instance, it is very difficult to find skilled F/OSS software developers and F/OSS system administrators. This is hindering the adoption of F/OSS software.

Knownet performed a survey about how Open Source knowledge is obtained by University personnel, and discovered that the majority of F/OSS skills are self-taught by people who have to use it at work, or by those who are attracted to within the F/OSS environment.

Then, Riina Vuorikari of European Schoolnet presented a review of the use of F/OSS for education in seven European countries. In fact, seven different European countries out of the 25 E.U. countries have initiatives in promoting F/OSS and open content. These countries are Belgium, Estonia, Ireland, Lithuania, the Netherlands, Slovenia and the United Kingdom.

These initiatives are based on the following actions:

- Awareness building.
- Analyzing and visibility studies to the development of educational software and Linux distros.
- Piloting and the rolling-out of open source software programs for schools.
- Investigating possibilities in the area of open content.

In the Netherlands in 2004, the Ministry of the Flemish Community, Education department, issued an action plan on the use of open source software as an alternative choice for schools. In 2005 a large campaign to introduce F/OSS in Flemish schools aiming to highlight its educational possibilities was launched. The Ministry also produced a practical guide for the use of F/OSS and open educational tools with descriptions of a number of interesting open source applications. The Ministry also provides Klasement, an educational portal featuring an educational tools database for teachers, headmasters and ICT co-ordinators. In this database, you can find didactic sheets on the use of educational freeware and open content based on the primary education curriculum topics, including the book "ICT on the menu". The scenarios are a helpful means to make the ICT integration in primary education more concrete. Similar initiatives are also planned for secondary schools.

In Estonia, the Tiger Leap Foundation operates on behalf of the government to develop F/OSS learning platforms and tools. There is an ongoing OpenOffice translation initiative funded by the Estonian government, and all future educational content will be based on the Creative Commons license.

In Estonia, Slovenia, Lithuania and Extremadura (Spain) some educational authorities have shown interest in the development of or the localization of their own Linux distributions.

In the UK, a thorough evaluation of F/OSS in schools was performed by BECTA (British Educational Communication and Technology Agency). This attempted to assess how well the F/OSS approach works, compared with proprietary offerings, in supporting delivery of the school curriculum and administration. In particular, a TCO analysis of using F/OSS within school environments against that of non-open-source solutions was performed and examples of successful F/OSS implementations were presented.

In Lithuania, in 2004, a state level study made proposals about F/OSS in an attempt to ensure the adaptation and localization of general purpose open source software at the state level. It highlighted how the promotion and support for open source software could help solve the problem of the legality of software. The study recommended the use of both commercial and F/OSS software in teaching and to take action to assure the quality of localization. A course on localization of software for some students specializing in information technologies and philology was proposed.

Finally, Riina talked about ongoing F/OSS awareness campaigns and roll-out. In the Netherlands there is the program “Open source and open standards in education” (OSS in het onderwijs). In Slovenia the Ministry of Education and Sport focuses on providing basic tools, didactic tools and promoting open source for teachers, headmasters, and pedagogical specialists. In Ireland, the National Center for Technology in Education promotes the usage of StarOffice for all schools.

These invited presentations sparked a debate on F/OSS adoption in European schools and on possible curricula and certifications. It was highlighted that each country has a different system and approach. In some countries, such as Turkey, the programs are developed and enforced by the Ministry, and the introduction of F/OSS courses would be a long and difficult process. In other countries, such as the Netherlands, individual schools are much more empowered in the choice of course material and syllabi.

The participants also discussed the topic of a master university curricula on F/OSS. In Italy, the universities of Pisa and Bologna are already giving one-year masters on F/OSS. In Spain, a similar course has been offered by the Open University of Catalonia since 2003.

2.3. The Session of November 16

The session of November 16 was centered on F/OSS adoption in the different countries of tOSSad partners, national regulations and dispositions, learning communities and different curricula for different targets.

This session was attended by tOSSad partners. It started with three presentations and continued as a workshop where the current status of the work package, and the future work were discussed and planned.

The first presentation was given by Al Harris, the Knownet, about a survey Knownet performed in Wales on small and medium enterprises and F/OSS. He suggested that, before discussing and planning courses and syllabi on F/OSS, it is necessary understand how people in SMEs use computers and what is the strategy they follow to learn to use F/OSS. This survey highlighted that people commonly use the Internet as a learning instrument, using a kind of “retrieval navigation” carried out using a Web search engine (like Google), searching for information and downloading relevant documents. Another key source of information is an informal net of mutual-help based on mutual collaborations between colleagues. People learn and modify their use of computers together.

It is necessary to clearly establish the differences between professional certifications (to obtain a certification you have to follow a specific course) and degree certificates (to obtain it you have to follow a specific School), determining which of the two is the best and the most suitable for specific needs. Based on this analysis, it is necessary to define the different curricula for both professional certifications and degree certificates, giving specific subjects, references and syllabi.

It is important to remember the differences between learning and training; the first one is the process of learning which involves students and a teacher. The second one is the process of training someone to perform something; it requires the involvement of students, teachers and others all having specific roles in the training process. There is a strong differentiation between Vocation Education Training and Higher Education processes.

Enn Õunapuu, Technical University of Tallin, gave a talk on “e-learning and F/OSS teaching”, starting from a brief presentation of main learning theories and dealing with their consequences on e-learning tools, content and mechanisms. Then, he discussed how e-learning might be useful for F/OSS teaching.

Selahattin Kuru, IOTA and Isik University of Istanbul, presented the design of a survey for determining F/OSS training needs. This had been sent to WP4 partners to be commented upon and upgraded. This questionnaire has been designed to evaluate the training needs in Free/Open Source Software to guide the development of the F/OSS curriculum. The questionnaire incorporates aspects of the individual (trainee characteristics, etc), the organizational and the task oriented requirements of training. Its aims are to document the needs of the audiences for training and to inform and guide the analysis phase for instructional systems design. When a new system is to be designed (as in this particular case), audiences must be analyzed to assure all their needs are met and their preferred modes of training are considered. Questionnaires are primary instruments for quantitative analyzes of this kind.

The main focus of the discussion was then centred on:

- Needs analysis and learning material
- Target group(s)
- Structure of curriculum
- Testing and evaluating the curriculum

2.3.1. Needs analysis and learning material

Communities of practice foster learning and are considered to offer a supporting and encouraging environment to learners. In F/OSS the concept of “community” is well established. F/OSS communities encourage learning; they increase and help knowledge through different tools like forums, mailing lists, instant messengers, developers' and users' lists, and so on. In fact, the “true” way of gaining a deep knowledge of F/OSS applications is through active participation in their respective developer and users communities.

However, not everyone needs such a deep knowledge. End users just need to know how to start the application, to use it for their needs and to solve common issues that might arise. IT managers need knowledge about business, economic, legal and technical aspects of F/OSS. IT professionals need a deeper understanding of the applications, and are candidate to be taught on how to become a part of the F/OSS communities. A F/OSS curriculum must analyse and address all these needs, starting from basic competences upward.

As regards learning material, we need a way to help teachers and students to navigate the huge amount of teaching material available on the Internet. Here the issue is not to produce further material but to use expert aggregation to present structured reading lists to make the best of that which is already available. A related issue is that of open content: clearly, a course on F/OSS should be, of itself, freely available.

2.3.2. Target groups

Besides determining the training needs, another key prerequisite to developing a F/OSS curriculum is to discover and define the target organizations and professional figures. Moreover, since different professional figures might be targeted, with various backgrounds and culture, the work group must decide to individuate the main targets and choose accordingly.

Possible target teaching organizations are:

- Universities
- High Schools
- Industrial/professional Training Organizations
- Vocational Schools

As regards target learners, they are:

- ICT professionals
- Business consultant & stakeholders (able to develop a Business Plan based on F/OSS Business Model)
- University students in computer science and computer engineering
- University students in other topics, who need minimal ICT / F/OSS knowledge
- ICT users, who need minimal ICT / F/OSS knowledge

2.3.3. Structure of curriculum and testing and evaluating the curriculum

The discussion highlighted the relative characteristics of private certifications and university degrees. Private certifications are usually expensive and cover any subject which is required by the market; university degrees cover a much broader field, take much longer to obtain and do not react quickly to market needs.

Among others, the following points were discussed:

- the need that institutions increase the use of Open Source products, to be used in conjunction with branded products;
- the need to know what kind of skills are needed for F/OSS, in cooperation with companies interested in spreading F/OSS, such as Novell, IBM, HP and others;
- the need to find key documents, and translate them for developing countries;
- the opportunity of spreading OpenECDL;

- the issue of e-portfolios and of career certification; some partners advocate that the concept of skills is old-fashioned, and now we're going to talk of competences;

It was highlighted that much interesting information can be found in the Web sites:

- <http://www.openforumeurope.org>
- <http://www.opensourceacademy.gov.uk>
- <http://del.icio.us/alharris/tossad>

The partners also talked about informal learning, as it happens in SMEs, versus the SCORM and the Personal Learning Landscape.

The introduction of F/OSS in academic curricula is of paramount importance to ensure that there will no longer be psychological blocks for using Open Source and that it will qualify, at least in the same way, as closed source commercial solutions. The introduction of F/OSS curricula will go some way to encourage substantive increases in the number of technicians qualified in F/OSS.

In consideration of the above the participants were inclined to develop a F/OSS curriculum targeted to universities, at master degree level. Nevertheless professional certifications should be considered because they are often needed in business and because many customers of software developers require one or more certifications as mandatory.

All of these discussions highlighted the issues which should be considered in evaluating the proposed curricula.

2.4. Conclusions and future work

At the end of the discussion, all tOSSad WP4 partners decided a plan and a calendar of further activities, dividing the work according to the deliverables to be produced.

For each deliverable, both explicitly quoted in the tOSSad work plan, and implicitly needed for achieving WP4 goals, a development plan was devised, and responsibilities were assigned to partners.

The WP4 deliverables are reported in the following:

- D12-LinuxLab Report
- D16-Workshop Report
- D22-F/OSS Curriculum report:
- e-content and other material to support courses or course sections on F/OSS
- Report on the needs of industry

- Report on best F/OSS training methods
- Training program on F/OSS in education
- Dissemination Activities

3. LIST OF ANNEXES

Annex I: Workshop program

Annex II: Presentation of Michele Marchesi

4. Annex I – Workshop program

Open Source for Education in Europe Conference

Workshop on F/OSS Curriculum Development

Open Project meeting tOSSad – E.U. C.A. # 015981

Program

November 15 – 15:00 – 17:00

15:00	Michele Marchesi, University of Cagliari	Welcome to workshop, introduction to tOSSad project
15:10	Stephen Barrett, Trinity College, Dublin	What are the dimensions and the issues of a F/OSS curriculum
15:30	Stuart Yeates, OSS Watch, Oxford University	The Experience of OSS Watch Advisory Service and Its Use by Universities
16:05	Graham Attwell, the Kownet	Pedagogy and F/OSS – how do people learn about open source
16:30	Riina Vuorikari, European Schoolnet	A review of the use of F/OSS for education in seven European countries
16:45	Plenary	The next steps – developing European co-operation

November 15 – 17:30 – 19:00

17:30	tOSSad WP4 team	Technical meeting about WP4 activities, deliverables, cooperation tools and schedule
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November 16 – 9:30 – 14:00

9:30	Alan Harris, Knownet Ltd, Small and Medium Enterprises and F/OSS the results of a survey in Wales
09:50	Enn Õunapuu, Technical University of Tallin, e-learning and F/OSS teaching
10:10	Selahattin Kuru, Design of a survey for determining F/OSS training needs Designing the survey
10:30	Plenary - Discussion about the survey
10:50	Coffee break
11:20	Plenary - Steps in curriculum development: 1. Needs analysis 2. Target group(s) 3. Structure of curriculum 4. Developing learning material 5. Testing and evaluating the curriculum
12:10	Plenary - Developing a F/OSS laboratory
12:40	Plenary - Working together how should we collaborate; Developing European cooperation and networking
13:20	Plenary - Making our work visible how do we share and disseminate our work
13:40	Plenary - Review and conclusions

5. Annex II – Paper presented at Open Source for Education in Europe Conference

Helping to develop an Open Source Curriculum: the case of tOSSad E.U. funded project

The tOSSad WP4 Team: Graham Attwell, Stephen Barrett, Kaan Erkan, Selahattin Kuru, Michele Marchesi, Enn Õunapuu, Oleksandr Ulybin

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Abstract

In this paper we present the aims and the activities which are being carried on in the context of tOSSad project, to help develop an Open Source Curriculum.

tOSSad (towards Open Source Software adoption and dissemination) is a Coordination Action funded in the context of 6th E.U. Framework Programme. The main objective of the project is to start integrating and exploiting already formed methodologies, strategies, skills and technologies in F/OSS domain in order to help governmental bodies, educational institutions and SMEs to share research results, establish synergies, build partnerships and innovate in an enlarged Europe.

One of the work packages of the project, WP4, aims to develop an OS curriculum. The initial attention is directed to courses that could be offered in a high school and university computer science/computer engineering departments. The work group is discussing and elaborating on the content inventory and is proposing various course topics and a master curriculum. The whole activity will be performed by cooperating closely with similar initiatives and projects undertaken in Europe. The paper describes and discusses in detail the ideas and experiences of tOSSad WP4.

Introduction

In Europe, many think that it would be desirable to improve the usage of Free, Open Source Software (F/OSS) in all branches of IT and public life, in general. Although there is a committed open source community in IT-strong countries of Europe, there is much more to be done. F/OSS communities throughout Europe can achieve better results through co-ordination of their research activities/programs that reflect the current state-of-the-art.

More precisely, the tOSSad project aims at improving the outcomes of the F/OSS

communities throughout Europe through supporting the coordination and networking of these communities by means of state-of-the-art studies, national program initiations, usability cases, curriculum development and the development of collaborative information e-bays and web-based groupware. By conducting these actions on an international European level, with inclusion of the ACC and NMS countries, the tOSSad project will create sufficient momentum for a general acceptance and coordinated boost of F/OSS development.

The project is in line with the EU policies that encourage wider usage of F/OSS in Europe on every platform. It also supports the objectives of the IST Work Programme 2003-2004, in particular, as stated clearly in Part 2.2.2: "The development of open standards and open source software will be encouraged when appropriate to ensure interoperability of solutions and further innovation."

The detailed objectives of the project are:

1. To give a clear picture of the current status of F/OSS in Europe and explain the main reasons for technical and social barriers against its wider deployment.
2. To build the basis to start up national programs for improved usage of F/OSS in "F/OSS target countries". This outcome will be measured by the quality and the quantity of the intentions and initiatives of governmental bodies through adoption of F/OSS with concrete and applied national plans.
3. To integrate current applied research activities in Europe in the field of usability and accessibility. A success factor for this goal will be how much the outcomes generated from usability tests and surveys will support today's technological needs.
4. To develop and revise F/OSS training standards in intermediary education, general public schools and universities, and help form the infrastructure and standardization of training documents.
5. To disseminate the results of all project activities, producing the dissemination plan, running the project's web site, forming the brochures and other instruments (i.e. newsletter), and showing up in various media for increased awareness.

More specifically, this paper presents in detail Work package 4 of tOSSad project, which is related to F/OSS education and curriculum development.

The Workpackage 4: The F/OSS Curriculum Development

In order to generate a stable and viable economy based upon local developers leveraging F/OSS to their advantage, the educational aspect is very important indeed. Without it, the less developed countries run the risk of falling behind in the technology race.

It is important to spread understanding how F/OSS culture can be an attractive alternative in terms of cost, quality, reliability, security of software solutions, and how it is invaluable in terms of community, democratization, and human-rights. Quoting an observation of the European Commission Working Group on F/OSS, "Consider the recommendations not as 'how to help open source software', but 'how to help Europe to benefit from open source software', one can only restate that if F/OSS can be relied upon to help Europe, it can help everyone else; and this lesson must start from education".

A mass of trained IT professionals is a very important factor impeding the spread of F/OSS in many developing countries. This issue can be best addressed by taking a second look at the educational and vocational training policies, which should make sure that the students get a chance to know multiple technologies, and are not limited by the predominance of a single

vendor or technology in the educational curriculum and in laboratories.¹

The relationships between F/OSS and education, however, are multi-faceted, and some of them are yet to be considered in depth. Among others, we may report the following issues:

- F/OSS software needs education and training, as with any software package. If you don't know what the software does, and how to use it, you cannot take advantage of it. One needs an educated section of the population to fulfill the full potential of F/OSS
- Learning F/OSS systems poses new issues, because true mastering of a F/OSS application involves cooperating with its developer community. Collaborations within the F/OSS community enhances knowledge of the applications.
- F/OSS helps, enhances, and complements education by providing tools to promote education. This is achieved on one side because using F/OSS enables schools, especially in developing countries, to set up computer laboratories at a lower hardware cost, and at no software cost; and on the other side because exposing students to F/OSS, a working software that can be read, studied and modified in cooperation with its authors, can be a very powerful tool for achieving well-educated professionals, able to substantially advance their economy. Moreover, as quoted above, F/OSS culture is invaluable in terms of community, democratization, and human-rights.

For all the above reasons, studying and developing F/OSS education is very important. However, F/OSS education is in turn a multi-faceted concept. Many kinds of F/OSS curricula and courses may be devised, at various levels, very different from each other:

- Courses and curricula about using the most popular F/OSS desktop applications — F/OSS office automation software, mail applications, Web browsers, Wiki's, etc. — even on proprietary operating systems.
- Courses and curricula about F/OSS server application & management – Linux operating system, application server (Tomcat), Web server (Apache), databases, middleware, and related system applications.
- Courses and curricula about F/OSS software development tools – IDE (Eclipse), Versioning Systems and related tools.
- Courses and curricula about how to develop and take advantage of F/OSS software — the software engineering of F/OSS. They are related to ongoing research on methodologies and tools for F/OSS development, and aim to train software developers to build, customize and consult on F/OSS applications, and to be active members of the F/OSS development community.
- Use of F/OSS software in computer science courses and curricula, as a cheap and powerful mean to help understanding the computer science concepts.
- Courses and curricula about evaluating the economic impact of F/OSS adoption, and about the F/OSS business model for software firms. These issues are again related to ongoing research.

¹ “Free as in Education: Significance of the Free/Libre and Open Source Software for Developing Countries”, Niranjana Rajani, <http://www.maailma.kaapeli.fi/FLOSSReport1.0.html>

There is a recurring request for help in preparing a series of courses on open source software in general. Although curriculum development lags behind the progress of F/OSS, we believe it's time to begin working on F/OSS curriculum development, because a) there is now sufficient knowledge and skills, b) there is increasing interest c) the number of courses in F/OSS and Linux have grown rapidly during the last two years.

The work group of WP4 gathers partners with deep and complementary knowledge in software engineering, university curricula development, e-learning and collaborative learning, application of open source methodology and business models to real world problems. The academic partners are: University of Cagliari (Italy), Technical University of Tallinn (Estonia), and Trinity College (Ireland); the industrial partners are IOTA (Turkey), The KnowNet (U.K.), and Ukrainian Lviv Institute for Business Informatics (Ukraine). WP4 partners are working together in order to define one or more broadly accepted, detailed curricula for F/OSS. We will focus in particular on courses and curricula about F/OSS operating systems, Linux related system applications, courses and F/OSS software development tools whilst not excluding studying and giving suggestions on other education-related subjects.

The initial attention is directed to courses that could be offered in a high school and university computer science engineering departments. This is because we believe that they are a key factor for F/OSS success, today's students being tomorrow's professionals. Moreover, convincing schools of the rightness and goodness of the F/OSS approach is perhaps easier than convincing end-user organizations or firms. The work group will discuss and elaborate on the content inventory and propose various course topics and corresponding curricula.

This curriculum planning will provide a solid foundation for students in high school with grade 10-12 and university students (year 1-4). The work group includes technology coordinators, curriculum planners, instructional technologists, teachers and students with technical training in the Linux operating system. It will support and disseminate the utilization of F/OSS technology in education and promote the critical technology and career competencies that the computer industry increasingly demands.

The project plans to strengthen the relationship between educational institutes and the business community by organizing events between industry mentors, students, technology executives and teachers. It would not be sensible to develop a curriculum "in a vacuum"; strong collaboration with software industries is of the utmost importance for the success of the work package. Additionally, university students will especially benefit from the different aspects and philosophies of technology planning and development with the help of this curriculum.

Work carried on in this work package includes additional research and collaboration activity with various projects that are trying to push F/OSS technologies within schools, in particular with Special Interest Group in Open Source Software for Education in Europe (E.U. project SIGOSSEE²), SkoleLinux³, KDE edutainment⁴ and DebianEdu. With this target in mind, the adoption and acceptance of a F/OSS curriculum will definitely be easier in an enlarged Europe.

² SIGOSSEE: <http://www.ossite.org>

³ SkoleLinux, <http://www.skolelinux.org/portal>

⁴ KDE edutainment, <http://edu.kde.org>

In the first six months of the project, various curriculum plans worldwide have been examined; the remaining months will be used to develop a F/OSS curriculum, tutorial and methodology for high schools and universities. The stakeholders of this work package will gather twice during the lifetime of the project. A key output of WP4 will be the “F/OSS in education” training program, a 1-day event covering the use of F/OSS in high schools and universities and targeting education authorities and institutes, described in the section below.

As said before, one problem that may exist in setting up a curriculum based on F/OSS is the sheer diversity of options available. The work package partners are also debating on the critical question: "Should the curriculum attempt a broad overview of everything, or should it allow potential students to concentrate upon topics of their own choice?" For example, a broad range would qualify someone's ability to install Linux, write simple applications in a scripting language, and deal with a range of everyday problems. On the other hand, students may have the need to install Linux on a variety of hardware, make it as secure as possible, and administer the system for a complex organization. The obvious solution would be to have a module-based curriculum whereby students could attempt the modules of interest to themselves. The curriculum and its courses will target teaching F/OSS and F/OSS development. It will be possible also to propose new versions of traditional computer science courses, having F/OSS at course topic level.

The curricula and course definitions produced by WP4 will in turn be made available through Creative Commons license for the content, in the true F/OSS spirit. So, the results of WP4 will be completely open themselves.

F/OSS in education training program

“*F/OSS in Education*” is a 1-day training session and a final birds of a feather session (BOF) covering the use of F/OSS in high schools and universities. This training program targets local authorities, education and technology ministries and all kinds of educational institutes and focus on the following issues:

- Syllabus preparation
- Curriculum development
- Educational course content
- Course evaluation mechanisms
- F/OSS e-learning methodologies

Work package 4 Tasks

The F/OSS Curriculum Development work package is as usual divided in tasks. These tasks are:

1. Organizing two workshops and the training program on “F/OSS in education”; the first workshop will study and discuss the various curriculum plans worldwide, and the second will discuss the developed curriculum. The workshops will be held together with other tOSSad and/or F/OSS events.
2. Evaluation of the needs of industry to enhance the qualifications in F/OSS, based on the societal objectives to improve F/OSS adoption. Local industries, including SMEs, will be contacted and interviewed, in order to assess their orientation toward F/OSS and to define which skills are needed by them to use F/OSS. To this purpose, a

questionnaire has been developed to help in assessing industry needs. The results of this task will be used in developing F/OSS curricula and courses.

3. Determining best F/OSS training methods, whether these are classroom based learning or e-learning (distance learning). This task will be developed by surveying and recommending pedagogic processes and methodologies for training in F/OSS. These recommendations will inform the nature and design of the proposed standards and curriculum.
4. Developing and revising F/OSS education and training standards and helping form the infrastructure and standardization of training documents. This task will build on the results of previous tasks, and will produce one or more proposed curricula and course programs.
5. Exchanging of information about curricular aspects of F/OSS and their further development

Conclusions

The educational aspect is crucial for spreading and acceptance of F/OSS among European public administrations, firms and organizations. To this purpose we need teachers, teaching material, courses at various level, entire curricula. Many F/OSS projects and organizations have realized this, and are actively working to produce the needed competencies and material. To be effective, however, we need coordination among efforts, and the definition and acceptance of course syllabi and curricula in high schools and universities.

The tOSSad project aims to help the definition of such syllabi and curricula, gathering information on present efforts, making proposals to competent authorities, and disseminating knowledge about the issues found and the proposed solutions. To this purpose, tOSSad partners actively seek contributions, will cooperate closely with existing initiatives, and will organize dissemination events.