Free Software – Open Source Software. A Powerful Tool for Developing Creativity in the Hands of the Student.

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Abstract: *Free Software / Open Source Software (FS/OSS) is a tool for the entire academic community. Its role can often prove to be indispensable in the field of Education. May be the perfect example of how research leads to the final tool for use, which is one of the key purposes of Universities.*

For students, it doesn't just create users, but develops their programming skills. In the academic community, it promotes and contributes to research and last but not least, the free distribution of the source code[1] helps to improve the final product of the companies which active in the field of IT, and the visibility of the manufacturer.

The business community can find the scientists of future generations that seeks, create research and make educated professionals, through the field of University and education of free software[2]. Furthermore, there are major economic benefits, due to the lack of need to spend financial resources for purchase of software to Universities.

Keywords: *Dynamic simulation models, Free software / Open source software, Education.*

I. INTRODUCTION

This research indicates that the freely available software is necessary, if the final aim is the creation of scientists who have gained knowledge through testing processes. Editorial research[3] has showed that knowledge that somebody earns, when there are no limits to the "tools" used, is qualitatively improved.

Students develop a critical mind, they are prompt to "search" tools, to share their knowledge through the World Wide Web[4] and eventually reach the level of the product designer, which is the ultimate goal. It is of great significance in the whole process, the publication of the findings of any programmer on the Internet[5].

In this way the student gains recognition. This is one of the strongest motivations for the student and it contributes, in a very effective way, to the continual reinforcement of his efforts for improvement. Alongside, this is the trigger for his colleagues to redouble their efforts towards the same direction.

Finally, FS/OSS programs develop students' knowledge, creating networking conditions in a globalized environment. By using the newsgroup (forum)[6] via the World Wide Web, the student expands its horizons beyond the boundaries of his country and becomes an active member to the expansion of a worldwide knowledge[7]. The student incorporates himself and his developing skills in a global group which has a common goal: the use and development of common tools.

To see whether in fact the field of higher education knows uses and develops FS/OSS programs, we conducted a qualitative and quantitative research[8] to students and professors of Faculty of Sciences. The questions were, whether the students know, use and develop their products of FS/OSS, whether professors use and promote products of FS/OSS and whether Universities have the resources to develop and promote products of FS/OSS.

Based to the survey findings, we concluded that open source programs are quite widespread in the University community. Students know that the programs of FS/OSS are quite easy to use and can use them in everyday work. Some of the students use those programs, without knowing that they belong to the category of free software and some do not know that the programs of FS/OSS may have been initiated and developed by students.

Professors use the programs of FS/OSS during the course and realize that there is quite a strong response from students. Their interest is very satisfying as well in developing and promoting programs of FS/OSS.

Universities from their side, see the interest that exists from professors and students to use programs of FS/OSS. Every day, working groups[9] are created in their field, with common goal to develop open source programs. On the other hand, the survey we conducted shows that the movements made by the side of the University community to promote open source programs do not satisfy the entire academic community.

Considering all these, we come to the conclusion that Universities and professors should undertake the role of promoting programs of FS/OSS, through the courses, in a way that more and more programs are at the disposal of students.

This will result in the actual evolution of open source programs, as more people will be involved with their use and development.

II. METHODS

A. Dynamic Simulation Model

The conjunction between the products of FS/OSS, the academics, the students and the companies involved in manufacturing of open source programs, is dynamic. There was a qualitative and quantitative research in

1000 students and 100 professors of Faculties of Sciences.

As shown by the dynamic simulation model, the results change when a factor is altered. Depending on the sources that the University provides, involving money, personnel, personnel training and classrooms, the percentage of students who know and develop open source products changes. In result, the development of professional skills of the student is improved both in a qualitative and quantitative way.

A.1. Reasons to create the simulation model
In order to highlight in the best way we can, the problem among students, Universities and products of FS/OSS, we created the Dynamic Simulation Model. The main reasons are listed below.

1. Comparison between closed and open source software.

2. Savings for the University.

3. Developing students' skills.

4. Benefits for companies of the field of IT and for the products via the freely available source code.

5. Development of products of FS/OSS in the Academic Community and Education.

6. Development of research in Universities.

Dynamic Simulation Model
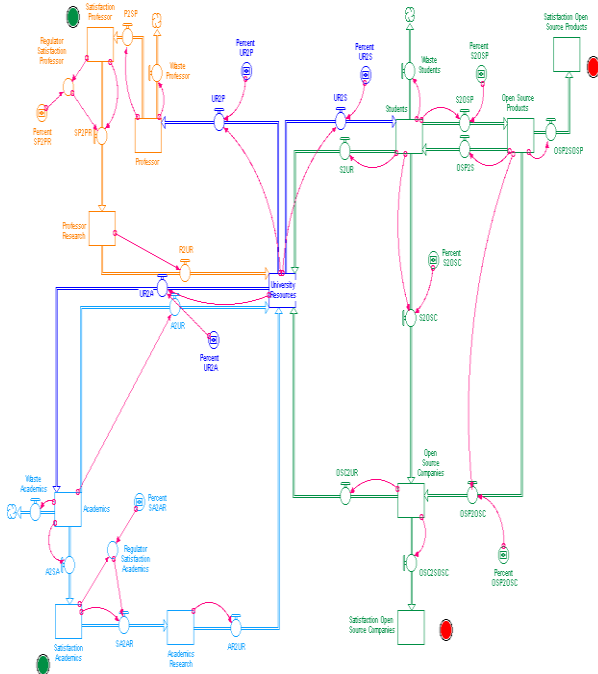
A.2. Handling and Analysis of Dynamic Simulation

Model
In the Dynamic Simulation Model that we built, it is indicated the relation between the resources available in a University which are used to promote an open source product, the development of students' knowledge, the level of research that is conducted and level of improvement of FS/OSS products.

The Dynamic Simulation Model functions through the control of interfaces, which control all avenues of resource allocation that the University affords.

Depending on the allocation of resources that we put through these interfaces, we will satisfy the need of more students to deal with open source products. Moreover, we will meet the needs of companies in the field of IT to find people to fill their needs in trained personnel. These companies, on their turn, will assist the Universities with funds, through a donation of software, for example. The research that academics conduct will increase, better products will be created, more projects will come out and of course, there will be a quite considerable return of resources to the University.

The results vary as we allow more or less outflow from the University to students and academics. The whole process works in chain. The result we anticipate is that some of the resources spent by Universities in order to develop and promote products of FS/OSS return to them, so as to complete the supply and demand circle.

B. Dynamic Simulation Model Results
The results of the Dynamic simulation model are shown in tables and graphics below.

Months	Students	Percent S2OSP	S2OSP	Open Source Products	Open Source Companies
Initial	25.00	3.00		0.75	0.07
1	22.21	3.00	0.71	0.45	0.46
2	20.41	3.00	0.64	0.38	0.44
3	18.93	3.00	0.60	0.35	0.41
4	17.85	3.00	0.55	0.33	0.38
5	16.77	3.00	0.52	0.31	0.36
6	16.16	3.00	0.50	0.29	0.34
7	15.70	3.00	0.48	0.28	0.33
8	15.33	3.00	0.47	0.28	0.32
9	15.07	3.00	0.46	0.27	0.32
10	14.83	3.00	0.45	0.27	0.31
11	14.64	3.00	0.44	0.26	0.31
12	14.47	3.00	0.44	0.26	0.30

Table 1 : Students in conjunction with the products of FS / OSS.

Months	Satisfaction Academics	Satisfaction Open Source Comp	Satisfaction Open Source Produc	Satisfaction Professor
Initial	16.00	0.07	0.45	15.00
1	28.06	0.37	0.81	31.45
2	38.33	0.83	1.06	50.04
3	43.83	1.25	1.29	58.88
4	50.79	1.66	1.49	73.82
5	57.35	2.03	1.68	84.10
6	63.86	2.38	1.86	87.85
7	69.79	2.72	2.04	70.91
8	88.14	3.05	2.20	81.69
9	66.43	3.37	2.37	83.57
10	64.70	3.68	2.53	83.90
11	70.40	3.99	2.69	87.20
12	68.59	4.30	2.84	89.16

Table 2 : Products FS / OSS in conjunction with the Academic Community and Companies in the area.
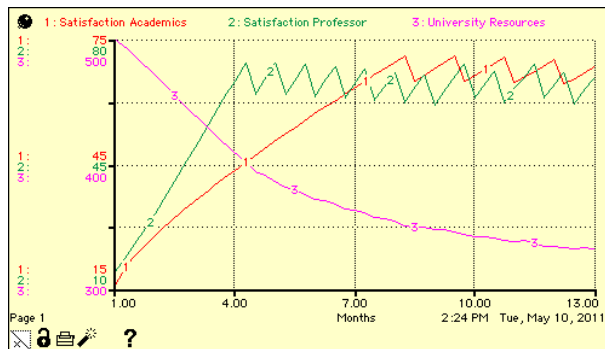
Figure 1 : The resources of the University in conjunction with the Professors and the Academic Community.

B.1. Suggestions for Promotion of open architecture

To promote the use of open architecture in Information Systems[10], existing or new, it should be taken a series of initiatives in highlighting the benefits that come out of using the programs of open architecture and in sensitizing the organizations or institutions to the risks that are associated with the use of closed systems. In particular, it is suggested:

In the stage that new projects are announced, it is sensible to pay special attention to the compliance of the procured systems with the existing international standards[11] at every level, from the requirements of interoperability between systems, up to the followed standard of creating, handling and storing all kinds of documents and data files. Thus, it will be ensured the unceasing cooperation between the systems implemented and the future multi-use of their potentials.

The development of a reliable IT system, should be based on the functional specifications and operational requirements of the Organization or Entity[12], and not on exhaustive technical details as crucial data for the success of the project. In this way, the insistence to specific minor technical characteristics, something that is not always innocent, will be reduced.

In cases of existing IT systems, it should be pursued the phased conversion of those systems to open architecture systems, by selecting the most appropriate way each time, depending on the seniority of the system that is replaced or upgraded and the desired functionality. The general direction to achieve this, is the reduction of the degree of dependence on closed architecture systems.

Establish an information and coordination center, specialized on open architecture systems (this should be given better treatment to prevent additional phenomena of centralization and bureaucracy), which will aim at increasing the penetration of open architecture systems, in both the private and public sector through:

- Counseling during the procedure of selection of systems and software[13]. The provided assistance, beyond the benchmarking of the available options, should be extended as well to the stage of implementation of the systems, in order not to void the

efforts done, aiming to use standards and services.

- Creating a forum for the dissemination of the best practices of open architecture systems use and exchange of the know-how gained from the use of such systems.

- Providing information, in relation to the problems that arise from the use of closed architecture systems, which suppress the long-term growth, and are an increasing economic burden for the user in order to maintain and operate them.

III. CONCLUSIONS

The open source products can be an important tool in the hands of the students, as they can use them for their own purposes, as well as contribute to the development and evolution[14] of those systems. The students become members of a global team, develop their knowledge and abilities.

Eventually, the products of FS/OSS also contribute to the economy of a country. Many studies have demonstrated the positive contribution of open source products to economy, particularly in countries with smaller production sizes[15].

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