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(Article begins on next page)

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ABSTRACT

The placements and internships are one of the main paths to get professional background and some skills for students, especially in areas like informatics and computer sciences. The European-funded VALS project tries to promote the virtual placements and establish a new initiative in virtual placements called Semester of Code. This initiative binds higher education institutions, students, companies, foundations and Open Source projects in order to create virtual placements and solve needs that they have in relation with those placements. This paper introduces some projects about virtual placements that other institutions and companies perform, also the paper describes the needs, opinions and considerations about the virtual placements for each stakeholder involved in the placements, to finally explain the design decisions and actions behind the Semester of Code, and how they are intended to get better virtual placements and successful results.

Categories and Subject Descriptors

K.3.2 [**Computer and Information Science Education**]: *Computer science education*

General Terms

Human Factors

Keywords

Virtual placements, Informatics, Computer Sciences, VALS, Semester of Code, Open Source.

1. INTRODUCTION

Placements are one of the most followed strategies to give the students professional certain focus before leave the University or their formal education. The placements allow students to get insight about the professional world and its workflow, this is essential in the case of work fields like Informatics and Computer Science, where the students need a quick growth in their professional skills when they get a job after leaving the University, due to the academic systems in most cases teach them a lot of useful concepts giving them insight in many knowledge areas, but usually they do not give them the proper professional skills they would need to develop their professional career. Some educational systems try to solve this lack of education and training in professional skills introducing placements programs in the degrees. In the case that the educational system does not include the placements as mandatory part of the degrees, the students usually can perform optional internships managed or not by the university, but with no academic rewards when they achieve them, they only get the professional skills.

In the context of today's world, in the context of a globalized world and, in the last years, a world in crisis, the internships and placements are one of the best options for students to get professional background before they leave the university, and in other cases a catalyzer to get their first job when they leave these Higher Education (HE) institutions. The European-funded project VALS (540054-LLP-L-2013-1-ES-ERASMUS-EKA) [3] tries to help students in the process of get this professional background before leaving the university, managing some initiatives like the Semester of Code [4], which allows students get placements in some of the best international open source projects, companies and foundations, getting later academic rewards as the professional skills intended.

In the crisis context, not every student can get an internship in other city or countries, for this reason emerges the possibility of making virtual placements in those companies and foundations: the students work in placements locally, but their placements have an international context. The VALS project and the Semester of Code promote the virtual placements as key factor to allow students getting professional background without leave their homes, or the cities they study, and without spending other personnel or familiar resources but personal work.

This paper explains how VALS project has designed the virtual placements, what kind of requirements has detected from the different stakeholders involved in the virtual placements processes and reviews some previous projects that perform similar programs. These explanations guide the reader over the concepts, mantras and needs behind the project, to later explain the design and implementation of some good practices and win-win solutions that can increase the opportunities and the possibilities of achieve successful virtual placements for all stakeholders. Several sections that guide the reader along the content presented in a structured way compose the text. The first section is the Introduction to the virtual placements and the problems related to them, the second is about the State of the Art and previous initiatives related to software development and virtual placements. The third section (Virtual Placements for the stakeholders) describes how the different main stakeholders understand the virtual placements and the Semester of Code initiative; this section shows the possible requirements gathered by the VALS project team to design and develop the strategy to perform the virtual placements. The fourth section explains how the VALS project team has designed the virtual placements and the Semester of Code initiative to respond the needs raised by the requirements and thoughts retrieved from the involved stakeholders. At the end of the paper, the reader can find some conclusions about the development of virtual placements in this project.

2. STATE OF THE ART

The VALS project tries to establish virtual placements in Informatics across the Europe, integrating these virtual placements into the academic plans of the participant academic institutions, not only as a placements ad hoc in the academic plan and the academic system. But VALS project is not the first project (public or private) that tries to bind the different stakeholders in order to create virtual placements in a national/international context. The following sections will introduce two previous projects, one from Google and other from the Universities in Canada that develop programs for virtual placements; one is specially focused on the business part of the placements (Google Summer of Code) and the other is focused on the educational aspects of the virtual placements (Undergraduate Capstone Open Source Projects).

2.1 Google Summer of Code (GSoC)

According to Google Summer of Code (GSoC) website [7], "Google Summer of Code is a global program that offers post-secondary student developers ages 18 and older stipends to write code for various open source software projects. We have worked with open source, free software, and technology-related groups to identify and fund projects over a three month period. Since its inception in 2005, the program has brought together over 7,500 successful student participants and over 7,000 mentors from over 100 countries worldwide to produce over 50 million lines of code. Through Google Summer of Code, accepted student applicants are paired with a mentor or mentors from the participating projects, thus gaining exposure to real-world software development scenarios and the opportunity for employment in areas related to their academic pursuits. In turn, the participating projects are able to more easily identify and bring in new developers. Best of all, more source code is created and released for the use and benefit of all".

This placements program is developed by Google Inc. and offers money rewards to students involved in the development of the Open Source projects proposed in the Google Melange [5] virtual placement system. The students and organizations can be located in anywhere in the world because the entire program is performed using Internet systems and resources. The goals of the GSoC [6] are:

1. *Create and release open source code for the benefit of all*

2. *Inspire young developers to begin participating in open source development*

3. *Help open source projects identify and bring in new developers and committers*

4. *Provide students the opportunity to do work related to their academic pursuits (think "flip bits, not burgers")*

5. *Give students more exposure to real-world software development scenarios (e.g., distributed development, software licensing questions, mailing-list etiquette)*

These projects must necessarily be related to Open Source Software and must be licensed under an open license. To perform this placements, in the Google Summer of Code several different stakeholders, like the students, organizations, mentors, etc. are involved. As a brief abstract of the process and workflow of the GSoC, it is possible to hightlight the following steps [6]:

1. *Open source projects who'd like to participate in Google Summer of Code in 2014 should choose at least two organization administrators to represent them.*

2. *Organization administrators will submit the mentoring organization's proposal for participation online.*

3. *Google will notify the organization administrators of acceptance, and an account for the accepted organizations will be created on the Google Summer of Code 2014 site.*

4. *Students submit project proposals online to work with particular mentoring organizations.*

5. *Mentoring organizations rank student proposals and perform any other due diligence on their potential students; student proposals are matched with a mentor.*

6. *Google allocates a particular number of student slots to each organization.*

7. *Mentoring organizations make their final decision on which students to accept into the program.*

8. *Students are notified of acceptance.*

9. *Students begin learning more about their mentoring organization and its community before coding work starts.*

10. *Students begin coding work at the official start of the program, provided they've interacted well with their community up until the program start date.*

11. *Mentors and students provide mid-term progress evaluations.*

12. *Mentors provide a final evaluation of student progress at close of program; students submit a final review of their mentor and the program.*

13. *Students upload completed code to Google Summer of Code site.*

The main difference of this program with other similar is about the rewards: Google extends a paycheck to students who finish the process and develop successfully the project. So, the rewards of this program are mainly the professional experience acquired by the virtual placement, the paycheck, and the possibility of being recruited by any of the participant organizations or by Google.

2.2 Undergraduate Capstone Open Source Projects (UCOSP)

The other project that develops virtual placements, and is selected to show the state of the art in this paper, is the Undergraduate Capstone Open Source Projects (UCOSP), which is developed at this moment in Canada and only for Canadian Universities [8; 11]. This program was a pilot project funded by the Canadian government in order to test virtual placements with undergraduate students of computer sciences and informatics, and to provide them the opportunity to get some professional experience before leaving the university (*What are the learning objectives of this program? For students to gain hands-on experience with real-world development practices in a realistic environment while simultaneously learning and applying some core concepts of computer science* [11])*. This initial project went forward and later it became a reality with the support of a steering committee, sponsors, and the committed universities, teachers and students from Canada. Today this program has involved more than 400 students from 25 Canadian universities in the last six years.

UCOSP project promotes virtual placements with two special characteristics: one of them is having physical meetings (at least one on the begin) between students and mentors, in order to plan the placement and know each other to generate a better understanding between them; the other special characteristic is that the rewards from success in the project are purely academic (in a different way that the Google Summer of Code with their paycheck). Within these academic rewards, students can get validations for programming subjects, degree thesis, etc. This project has a strong focus on the academic questions and it intends to improve the academic system and the professional background of the students. The role of business stakeholders of the program is to provide the projects and the real problems to solve or the funding for the program as sponsors. This money from the sponsors is used to maintain the infrastructure of the project, to make possible the physical meetings between mentors and students, etc. and never to reward students.

3. VIRTUAL PLACEMENTS FOR THE STAKEHOLDERS

In order to design and develop the right mechanisms and solutions for the virtual placements, the VALS core team interviewed the different main stakeholders involved in the virtual placements and the Semester of Code initiative. These stakeholders are the students, the companies and foundations and the academic institutions. These stakeholders can be subdivided in others but is simpler to consider the requirements of each them using this classification. Also these three stakeholders are the minimum stakeholders necessary to run the Semester of Code pilots and the virtual placements. For example, the academic institutions as stakeholder can be composed by personal of the faculties, the academic supervisors, bureaucratic personal, etc.

This section (and its subsections) describes the main thoughts and expectations of each main stakeholder with the virtual placements posed in VALS project and Semester of Code pilots. These descriptions will help the reader to understand the different decisions and actions planned to get success.

3.1 Virtual placements from the students' point of view

The students are one of the most sensible parts of the process, and they are one of the keys of the success in virtual placements. Their commitment with the virtual placement and the project to develop, their interest in to achieve the planned goals and their personal skills (communication, ability to work in groups, etc.) [2] are key factors in order to get success in the virtual placements. Also, some of these, like the professional skills o the commitment level with a project, are intended to be improved through the virtual placements and the work with professionals [9].

The students interviewed by the VALS team are almost interested in the Semester of Code initiative, and, in general, they would like to participate in it. The students observe some potential benefits in their participation in this virtual placements program. Some of those benefits are:

- Possibility of getting academic rewards through working in real context. The students consider that the Informatics careers have a lack on deal with real problems and initiatives like Semester of Code give them the opportunity to reduce this issue.

- Development of their professional skills, gaining experience in software development. This is an important point for the students, due the software companies give better contracts to professionals with demonstrated experience.

- Possibility of developing the initial stage of their professional career in an important company or foundation related to Free/Open Source Software (FOSS). This is an important change comparing to the traditional internships and placements for students; in many countries the internships are optional, or in some cases mandatory, and those internships are performed in local software companies, where students feel that they can not learn all the issues they can, or big software enterprises, where they feel that they are only one more and not every people is interested in help them in their learning process.

- Related to the previous point, the students consider that there is an opportunity to get hired by the company where they perform the virtual placement. This is a powerful motivational aspect for them.

3.2 Virtual placements from the business point of view

Companies and foundations related to Open Source Software (OSS) or Free Open Source Software (FOSS) know and participate in other similar initiatives to Semester of Code, like the previously explained in the second section (State of Art, subsections about GSOC and UCOSP).

From the point of view of this kind of business stakeholders, the Semester of Code and similar initiatives are a great opportunity for them because:

- It is a great opportunity to seek talent between students in several education levels (undergraduate, MsC, etc.).

- They prove these talented students with real problems, without saving money. The money and hours saved in developers is spent in mentors (the participation in this kind of programs is not based on money).

- These companies and foundations related to OSS or FOSS use this kind of initiatives to find new committers to their projects.

- Also these programs are a great window to publicize their brands and projects to a potentially interested audience.

3.3 Virtual placements from the academic institutions point of view

The virtual placements are not usual in most of academic institutions contacted by this project. Some of them have previous experience with programs like the Google Summer of Code but in general, these institutions do not include the virtual placements in the Informatics academic plan.

Academic institutions in many countries have some barriers in the application of virtual placement programs in the academic degrees, those barriers are related to bureaucracy and rigidity of the educational system. For this reason, the academic institutions do not participate in these kind of initiatives if there is no students, teachers and employees really committed with the consecution of the virtual placements. Within this bureaucracy and rigidity, there are main question to resolve about how to perform the virtual placements?; when should be done the virtual placements?; in the regular season?; in other dates? These questions are so important because the virtual placements must fit into academic plan, and the academic institutions should seek a niche to place the virtual placements inside the academic season (while there are many subjects) or outside the academic season (when the teachers could be on holidays). Students' subject overload during the academic season could make the students reject to participate on virtual placements (or physical placements) and the location of the placements (virtual or physical) on holidays can make both students and teachers reject to participate. In some countries this problem of timing is solved by the academic plan, due to it includes placements as a mandatory or optional subject. These placements are usually physical, but it is possible to perform them as virtual ones if they assure the quality to the stakeholders [1; 10; 12; 13]. For the educational systems that do not include placements as part of the education process in informatics, it is necessary to fix the dates for virtual placements in each institution. Also the VALS project should face up this problem with the dates not only in the local or country context of each academic institution, but in the European context of all academic institutions that could participate in the Semester of Code in this first phase of the project.

Regarding the inclusion of the virtual placements in the educational system, most of the academic institutions have a positive point of view, they consider that this kind of placements are a good opportunity for the students, could improve their possibilities of find a job, could improve the international projection of the academic institution itself, and could imply a significant cost reduction of the students'

placements (for example, academic institutions do not need to pay the same insurances for students if it is virtual placement or if it is physical placement).

4. VALS APPROACH TO VIRTUAL PLACEMENTS

Regarding these different point of views of the stakeholders, VALS project tries to design and perform different actions and strategies to get win-win solutions for all the issues and risks collected. In this section will be presented the different questions that VALS project needs to solve in order to create successful virtual placements and achieve the goals intended for the project and the Semester of Code initiative.

4.1 Defining a framework to make possible the Semester of Code

In order to clear the Semester of Code workflow and provide the same rules and opportunities to all stakeholders, the VALS project core team has developed a framework that defines the process to make possible the Semester of Code, the participation of each stakeholder in it, and the possibilities that each one has.

This framework defines the general principles of the Semester of Code, and the rules and actions that each stakeholder could perform. This framework is not an inviolable document or fact, it is intended to be used and adapted in benefit of them. For example this framework provides the workflow on how organizations, students and institutions can join to Semester of Code, rules about the rewards that students can get, general proposals to manage the virtual placement process, etc. Some of the issues addressed in this framework are explained in the following subsections.

4.2 Mentoring students to success in the virtual placements

The mentoring process in the VALS project and in the Semester of Code is one of the key factors in order to achieve the success in the virtual placements. This mentoring process is performed in two ways: one relative to academic mentoring (with the role of the academic supervisors) and the other with the business mentoring (with the business mentors).

This mentoring process is essential to reach a win-win solution in benefit of the three main stakeholders in the Semester of Code:

- The students have personalized attention from two mentors to learn how address the problems raised from the project on which they work.

- The academic supervisors help the students to get success in the educational context of the virtual placements. This mentoring in the academic way ensures the quality from the educational point of view of the placement, and the validity of the work performed, to later be awarded with academic rewards.

- The mentors (business mentors) help the student to solve the real problem, they should know in deep the project and are the best possible counselor on how to manage and solve the project, teaching the student the principles and philosophy of the software projects and the business issues around them. A good mentoring process helps the achievement of the project success in terms of a professional solution for the real problem, and achieving the success of the virtual placement for the company or foundation that owns the project.

4.3 Scheduling the virtual placements across Europe

The task of schedule the virtual placements for all the participant universities and the possible participant institutions in the Semester of Code is revealed as one of the most complex issues in the pilot phase planning. As previously explained, the virtual placements proposed in the VALS project and the Semester of Code are not intended to be outside the academic system, but they are intended to be validated as placements presents in some European educational systems or to be validated as other academic rewards (like degree subjects, homework, thesis, etc.). To make possible this convergence with the educational systems, it is mandatory one of these solutions: 1) virtual placements adapt their schedule to each educational system timing; or 2) VALS project proposes a schedule that fits with all the educational system timings.

To address this schedule issue, VALS project proposes, unlike other virtual placements programs like GSoC or UCOSP, two possible rounds or waves for application for virtual placements. At this moment, these two waves are planned for the beginning of the academic season (between September and November); the second wave is planned for the beginning of the second semester of the academic season (around February or March). These two waves or rounds are basically equals but in different dates; on both exist the call for projects, the process to enroll universities, students and mentors (business mentors and academic supervisors). These two rounds are specially designed to involve as much students as possible, allowing them to participate in each they want or they can (based on their academic schedule, their number of subjects in the first or second semester, their university schedule for placements, etc.).

This section about schedule does not include time-limitations proposed by the business partners of the project, because the schedule and timing from the companies and foundations is less strict and does not have so many requirements like the academics schedule (nine months average for the academic season, different holidays, etc.).

This section is also representative about win-win solutions, all the students in different contexts have opportunities to get virtual placements, the companies/foundations have also opportunity to participate in the call for projects in the wave they want or in both (depending their personal/time resources on each of them). In the case of universities also is a win-win solution; each university can also participate in the round they want or in both, so the Semester of Code schedule could fix with the educational schedule of each of them.

4.4 Rewards for students

As previously explained, the rewards planned for students are purely academic, without including money. Assuming this characteristic, the rewards itself are defined by each university, regarding the context of the university and the educational system of each of them. These

rewards should be interesting for students and should return in any way the time and effort of the student with any advantage in their degrees, MsC, etc. Some of these academic rewards could be the validation of some ECTS credits (or subjects), the validation of some practices within a subject, the utilization of the work done in the virtual placements in a thesis degree, the validation of mandatory placements with the virtual placements performed during the Semester of Code, etc.

4.5 Equality in opportunities for all the stakeholders

The equality is a key issue in this project. The VALS project core team has spent much time designing workflows and processes to ensure that any student in Europe has the same opportunities than other student in other university, country or context. Due to the goal of equality, this project does not establish differences about the original universities enrolled in the project and other that joined later. Also the project does not establish differences between projects and between the students enrolled in the Semester of Code.

The project establishes a participation system based on the work of each stakeholder, for example: if the project fits well into the Semester of Code framework, it is accepted to be published; if the universities use properly the framework they can participate in Semester of Code; and if the students propose solutions for the projects and problems offered by the companies/foundations, those foundations will select the best solution (and the student who proposed it). The intention of VALS project is not to regulate the opportunities for virtual placements basing the decision only in previous merits, curriculum, previous experience, fame of the organizations or universities, etc. VALS establishes the same opportunities to all possible participants and bases the success of each participant (student, organization or institution) in the work they perform. This is a win-win solution for the VALS team, the equality and transparency in the workflow and the process ensures that the project is ethically healthy and promotes the proper values for students, business organizations and academic institutions, that will help to establish a good work ecosystem for the virtual placements.

5. CONCLUSIONS

The design and implementation of solutions and initiatives such as the Semester of Code depend on the amount of real needs that are able to solve. If this kind of initiatives want to succeed, they must consider all the possible stakeholders involved and provide them a benefits for participating. For this reason it is essential to create win-win solutions and frameworks that attempt to provide convenience and benefits to compensate the effort of different stakeholders. This paper describes the different solutions (new solutions and old solutions adopted from other similar projects like Google Summer of Code and Undergraduate Capstone Open Source Projects) and actions designed by the VALS core team in order to establish a clear and equal framework for all stakeholders. This framework is based on transparency, and equality of opportunities to all different roles present in the initiative, and providing solutions (dates, individual benefits) that compense all stakeholders in order to create better virtual placements and a sustainable initiative in the future, and create valor to the business-educational alliances.

6. ACKNOWLEDGMENTS

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