Project Proposal
3rd Year

ETHERA
Multifaceted Student Industrial Placement System

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1. Introduction

The Faculty of Applied Sciences, Rajarata University of Sri Lanka is a well known applied sciences faculty which creates skilled graduates. From the name itself, "applied sciences" elaborates about the degree programs of the faculty focused on. That is building science graduates who have the ability to use their science knowledge and apply them precisely to solve challenging real world problems. So it makes the room to come into a clear thought that students coming out from the faculty as graduates should be skilled to prove the faculty's name by applying their science knowledge in to various industrial needs. This output makes the difference between a typical science faculty and an applied sciences faculty.

Employability refers to a person's capability for gaining and maintaining employment. For individuals, employability depends on the knowledge, skills and abilities (KSAs) they possess, the way they present those assets to employers, and the context (e.g. personal circumstances and labor market environment) within which they seek work. As such employability is affected by both supply-side and demand-side factors which are often outside of an individual's control. As the supply-side, the faculty should have a proper strategy to guide undergraduates to become well employable within their context.

The Employability can be divided into few broad topics. Out of those, it is good to have understanding about what the below topics provide, since they seems the best points to kick-start the strategy of improving employability.

- Assert: A student's 'employability assets' comprise their knowledge (i.e. what they know), skills (what they do with what they know) and attitudes (how they do it).
- Deployment : self-awareness (i.e. diagnosing occupational interests and abilities), opportunity awareness (knowing what work opportunities exist and their entry requirements i.e. labor market knowledge)
- Presentation: The presentations of CVs, the qualifications student possess, interview technique, and, of particular importance, work experience/track record.

For a faculty that intends to output graduates with practical knowledge, should definitely have a functional and well organized Career Guidance Unit. The Career Guidance Unit itself should have a mechanism to communicate between students and industry back and forth, rather than just using traditional communication methodologies such as telephone calls, Emails, notices etc.

Currently the career guidance unit of the faculty of Applied Sciences is practicing a manual process to select best and most suitable undergraduates to industrial training and jobs. But in the sake of efficiency and effectiveness, it is essential to have a proper way to fill up the communication gap and overcome the problems of current selection process.

Our idea is to propose a project that supports undergraduate industrial training allocation process by introducing a system with a series of logic. Meanwhile we'll fill up the communication gap by developing a full comprehensive message passing system including Email and SMS.

2. Background and Motivation

2.1. Literature Review

In a University, for students, not only the theoretical knowledge but also providing an effective training relevant to their area of study based on their preferred career path is essential. It will be helpful to develop necessary transferable skills including attitude, motivation and skills required to deal with the industrial environment easily. Then only they can perform well and contribute to the efficient workforce. For a faculty of Applied Sciences it is essential to produce the most suitable people for the industrial requirement. Career Guidance Unit (CGU) is responsible for arranging, monitoring and evaluation of industrial training and also for planning and organizing activities in guiding students for gainful employment prospect. For that there should be a proper mechanism to interact with the industry as well as students. Therefore Career guidance Unit should concern both industry requirement and student preferences. Otherwise if a student is selected for a particular job or a training that he/she will never willing to do, definitely his/her performance will not be utilized into maximum. This will damage the reputation of the University and will end up with having bad impression on the industry in student's mind. Therefore CGU is doing a critical job by acting as a bridge between industry and University which affect to the students' lives directly.

Currently the CGU is conducting a manual process for industry recruitment. The coordinator of CGU keeps contacts with the companies. Once there is a opportunity or a vacancy for a job, CGU puts a notice and call for CVs. Then the students willing to apply will be interviewed and recruit to the companies. The people who got through this selection process will only be able to go for the interviews by the company. Here the whole selection process is based on academic performances, no considerable concern on extra activities. Also no proper criteria to evaluate students, most probably the skills the CGU evaluate may not what the industry require. This will end up in not selecting them by companies although recruited by CGU, which is wastage of a valuable opportunity.

The above mentioned problem is common for all Universities when recruiting undergraduates for industrial training .Our background review identified very few systems which already have tried to address the same problem domain but in different methods.

Faculty of Engineering of the University of Peradeniya has developed it as a part of a web application where students can obtain useful information to improve employability. But there is no any feature to introduce students to the industry or select best suit to the industry requirement. Since the system is not revealing further

details on the industrial training recruitment process we have no clear idea about their future plans. Currently they are practicing a manual process for recruit students for training.

University of Colombo is having a web application based on the same problem domain. Though it has suggested some additional sophisticated mechanism for the industry to view students such as "Find a graduate" and a place to publish vacancies, those are not yet implemented. They also having more detailed set of articles based on employability development and provide other recourses which will be helpful for industry placement. For example company details, time planners, schedulers.

Not only in Sri Lanka but the Swinburne University of Technology in Australia also has developed a system for industry placement of undergraduates. The additional functionality they have is a student selection process where students can apply for a vacancy online. And also students can connect with the industry through that system directly. But they also have not implemented a mechanism for the industry to pre evaluate students before their interviews.

The above examples imply that not only the local but also foreign Universities face the same problem when recruiting students to the industry. But almost all the identified solutions have tried to make easy access to the information regarding industrial training student recruitment but have not touched the area of student selection in and efficient way for companies and also have not paid attention to improve the ability to recruit best student for the most suitable place.

We found a system belongs to "APPIC Internship Matching Program" which is bit closer to the solution we are suggesting for correct student selection both considering student's preference and industry requirement. Basically the concept is based on matching students for internships. The function of "matching algorithm" is as follows.

 The matching algorithm uses the preferences stated on the Rank Order Lists submitted by applicants and internship programs to place individuals into positions. The algorithm starts with an attempt to place an applicant into the program that is most preferred on the applicant's list. If the applicant cannot be matched to this first choice program, an attempt is then made to place the applicant into the second choice program, and so on, until the applicant obtains a tentative match, or all the applicant's choices have been exhausted.

An applicant can be tentatively matched to a program in this process if the program also ranks the applicant on its Rank Order List, and either: the program has an unfilled position available for the applicant. In this case there is room in the program to make a tentative match between the applicant and program. The program does not

have an unfilled position, but the applicant is more preferred by the program to another applicant who is currently tentatively matched to the program. In this case the applicant who is the least preferred current match in the program is removed from the program to make room for a tentative match with the more preferred applicant.

But here also consider only the industry and student preferences then based on 2 ranking lists either by students and industry, the selection process takes place. The major issue here is, there is no proper method of student evaluation, also no way for the companies to keep contacts.

The LinkedIn is one of the best solutions we have found so far. LinkedIn is obviously a great tool for professionals in transition. It help to connect professionals. Companies can view profiles and give chances to the people with the necessary skills they required. This will help the companies to select professionals according to their wish, as they can pre evaluate using the profile. It is a well designed system containing the same idea we want to develop for student recruitment process in the University. But the system we are proposing is not totally similar, but the objective of exposing students and make them visible to the industry can be achieved by a similar method used in LinkedIn. In addition to that we need automated process for student selection for industry recruitment and also an effective and efficient communication method in between industry, CGU and students.

As a conclusion it should be mentioned that although the problem is identified by many parties related to student recruitment for industrial training , there is no any proper solution have been yet implemented , where the University, students and companies can interact each other and select the best suit for the vacancy. And also none of the solutions have reduced the overweight of student selection for the responsible party as well as none has considered about student preference, industry requirement and student skills and performance all together when selecting students. So a better sophisticated solution matching to the industrial recruitment process within the University is highly required.

2.2. Motivation

From the bottom line there is a massive communication gap between the industry and students as they are considered far away from the metropolitan area. There is no way to show their talents unless they are put into the industry. The current trend emphasizes the importance of having a good image within the industry. So students are responsible for making the big picture by performing well in the industry.

By having a strong feeling about the problem and since the problem persist severely inside our degree program (Information and Communication Technology), we are motivated to solve the problem.

Since the problem domain is very much familiar to us and known it in advance, it is easy to identify the requirements clearly and make it easy to design. Our client is a part of the faculty, therefore most of the communication and requirement gathering issues are solved. Although the risk is there when dealing with industry and this has a direct impact on faculty reputation and its' students lives, we have the confidence to address the problem and solve it in a unique and the best way using the knowledge we have obtained so far from our ICT degree program. We also have the expectation of improving our knowledge while implementing the solution according to the requirements.

3. Major Issues with Current Process

The major problem we are going to address is the communication gap and the poor student selecting process for industrial training in Faculty of Applied Sciences.

In current process Career Guidance Unit tries to keep the contact with the industry using informal communication links such as personal contacts with the industry people etc. But it is not very effective way to interact with the industry because it may not helpful for the new comers to the industry to find us and also to maintain the available interactions.

When considering about current situation we can identify some weaknesses in student selection process. In current process, what Career Guidance Unit do is that they inform students by putting notice on notice boards and collect CVs from students. Then after evaluating CVs they will call for interview and select students for particular jobs.

The first weakness we identified here is that notice is not an efficient way of passing inform to students because most of the time they do not read notices.

The other drawback is that the students have no clear understanding on what they really like and capable of doing. May be they have not clearly identified the scope of their employment area. This will be a major issue when doing selection. Sometimes students might change their preference even after they have selected for a particular job. There is no way to address these issues in current process.

Another drawback of current students selecting process is that the career guidance unit does not have a proper CV evaluation criterion. Current process mostly consider about student academic performances such as GPA. But the GPA is not the sole factor to measure a student's talent and ability to perform well in the job. According to the current process the best suit may not capture. That will affect to the reputation of the faculty.

What the industry requires form a graduate of applied sciences is not only GPA but also their learnability, adaptability, employability, team spirit etc. But the current student selecting process does not support to improve students employability.

4. Aims & Objectives

The aim of this project is to develop an application that supports the Career Guidance Unit to overcome the difficulty in student selection process for industrial training more efficiently and effectively while filling up the communication gap.

To achieve the above aim we have defied the following objectives:

4.1 Business Objectives
- Improve the student visibility to the industry and obtain more opportunities.
- Implement a system that helps all industrial training recruitment process in Universities.
- Improve productivity, efficiency & effectiveness of CGU.
- Maintain a virtual bridge between CGU, Industry & students by implementing an advanced communication methodology.
- Improve the way of assessing students by depending not only on the GPA but also several assessment factors.

4.2 Learning Objectives
- Apply the Software Engineering Principles to study the drawbacks of the current student selection process and barriers for effective communication of students and implement a system to solve the identified problems.
- Applying the knowledge in web services to integrate different types of RESTful service together.

- Using the design and analysis of algorithms knowledge to develop and tweak related algorithms which are currently in the business where necessary.
- Design a portal that opens the opportunity to examine students in an extensive way that helps industry to identify students prior to the industrial placement process.
- Evaluation of the usability of the proposed system to overcome above problems.
- Identify the required changes, fine tune them and make the best solution available to address the situation.
- Prepare final documentation with the support for further enhancement based on the additional requirements.

5. Proposed Solution

As a result of the background review and the motivation we had, we've been able to come up with a solution that minimizes the problems & inefficiency of the current manual process. Since the audience of the system is a distributed one, this system will be in a web based format such that it will be easy to access it from anywhere in the world.

As we found out from the literature survey, there is no current system which actually addresses the same problem domain. In fact almost all of the universities are still practicing a manual process to select students in the industrial placement programs.

The system we propose will have set of core functionalities which are focused on the student assessment and selection process. The process starts with the point when fresh student registers in the system. The registration service will be open in a certain time window. After the registration the student profile will be reviewed by one of the authorized CGU person from the approval console and approved/disapproved users will be notified via Email and SMS (if mobile number is there in the profile). After this approval, students will be have the chance to update their profile continuously including extra activities they possess while their official academic performance will also be updated from the relevant console assigned to the registrar office authorized people.

After some time (Basically end of the first semester, second year) student will have a chance to add their targeted areas within the industry. Also, after a certain time, those profiles will be in a frozen state until they got the approval from the second phase. After this approval, the profiles of the students will be available in the student filtering system. The filtering system will provide a way to expose students' skills to the industry prior to apply for industrial placement. In this state a company can access the filtering system and if they need, they may select specific student who they like from the shopping cart like interface and pre-suggest them.

By the time which all the possible allocation amounts received by the companies, students profiles will be switched in to another phase that has the capability to select relevant company(s) for the targeted field. After re-submission of the student profiles, there will be a final approval happening in the backend and a set of student profiles will ready to run through an algorithm to select most suitable company for a student based on their performance.

Below illustration will express the basic approach and facts considered about the development of selection algorithm.
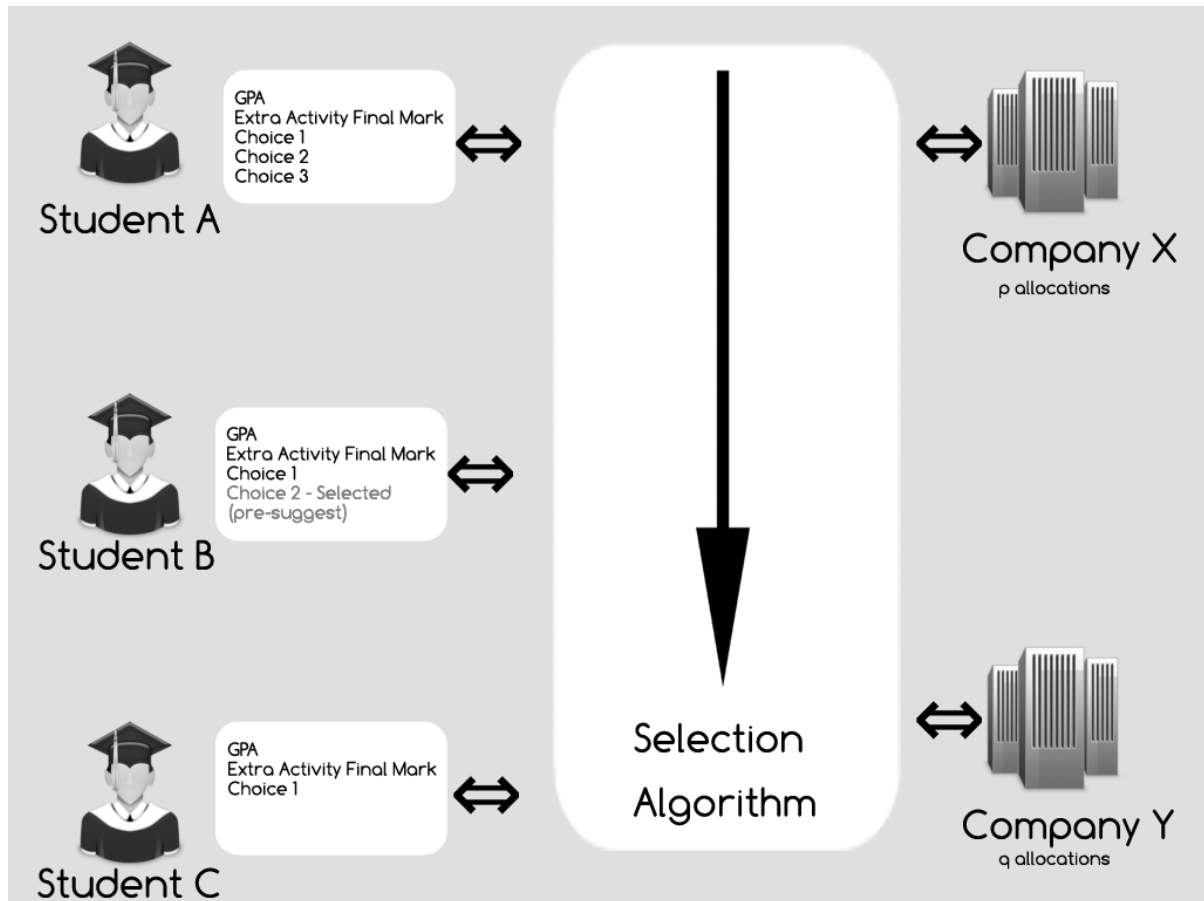
6. Project Scope

The system is mainly focused on the student performance assessing process and the selection process in to the industry. But as results of the processed data in different stages, below outcome can be taken as additional features of the system

- ✓ Student filtering system, a component that can be specially used by the companies who offer the internships to the students. From this component, students can be filtered in various constrains such as GPA for the given set of subjects, Extra activates, Team performance, etc.
- ✓ Shopping cart like student recommendation within the student filtering system. This will provide a way to the industry personnel to pre-recommend students.
- ✓ Comprehensive student profile which will be maintained as an archive for the future even after students graduated.
- ✓ SMS and emails will be used as media for notifications. Basically sending of SMS notification will be defined to specific scenarios and email notifications can be send on-demand to desired parties of the system.
- ✓ For the automated selection process of students, a selection algorithm will be designed and used. It'll run on the facts including student GPA, student extra curriculum activity total weight, student choice of field, student selection of the companies.

7. Methodology

Given below is an abstract description of the tentative approach we have planned in developing and implementation of the student assessment and Industry recruitment system project.

- ✓ The main selection of student process will consist with three broad state changes in the student profiles
  - Registration success state
  - Interested industrial area selection state
  - Company selection state in according to the selected interest areas.
- ✓ In middle of certain states, the information which will contribute in to the final evaluation of students will be in a freeze effect.
- ✓ Provide an overriding mechanism to manipulate final results of the automated selection process where necessary.
- ✓ Integration with the LinkedIn REST API to leverage the specific student details from their particular LinkedIn profiles and display them in their profiles in addition to the primary information.

- ✓ An Access Control List (ACL) will be implemented to describe the specific roles of the academic and administrative staff.
- ✓ Dialog Ideamart self hosted API will be used for the SMS notifications.
- ✓ Also we will implement a mass email system which will be used to send notifications, messages to the desired parties in the system and can be configured to utilize a remote SMTP server or local system.
- ✓ Our project will be licensed under appropriate open source license within the permission of the Faculty of Applied Sciences.
- ✓ We'll be using GIT for the collaborative coding and the code will be pushed frequently in to a remote repository like Github. So it'll also be easy to review the code and individual activity of the project team members.
- ✓ We're already maintaining a mailing list for the project group discussions and same mailing list will be using through the time for the discussions.
- ✓ If time permits we'll be implementing a RESTful web service API to integrate in to the student filter component.

8. Resource Requirements

Development   : Team members can manage the resources from their own.
Production   : In production environment there will be a requirement of resources mention below.

- Enterprise Linux Operating System
- Apache 2.2 or greater, PHP 5.3 or greater, My SQL 5.0 or greater
- Postfix MTA with remote SMTP authentication support
- PC or Server with Dual core 2.0 GHz or greater Processor, 1GB or more RAM.
- Internet connection with high uplink

References

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Appendix A

Plan of Actions

Major Milestones	Expected Time
Project proposal submission	December last week
Concept approval	December last week
Requirement review	January last week
Preliminary & critical design review	February last week
Test plan review	June Last week
System test review	July second week
Operational readiness review	August first week
Final deliverables (Presentation, Project report, System)	August first week