

# Software Engineering Projects with 3<sup>rd</sup> & 4<sup>th</sup> Year ANU Students 2009

## INTRODUCTION

I am writing to you as you have expressed interest in proposing a software development project for a team of 3<sup>rd</sup> and 4<sup>th</sup> year Software Engineering students to undertake during the course of the 2009 university year (March to October inclusive).

The project component of the Bachelor of Software Engineering Degree (BSEng) Program at the ANU is an important aspect of the requirements of *Engineering Australia* who have accredited the degree. More importantly, the project component provides students with an opportunity to learn more of the practical aspects of software engineering and therefore to be more prepared to join the workforce as qualified software engineers.

In the past the benefits that have been realized by both students and the participating organisations have been significant. For example, students get to work on a 'real' project and therefore experience and deal with 'real' world pressures, demands and issues. Such experiences tend to mature the students quickly and thus prepare them for their ultimate careers in software engineering. They also get to experience the real benefits of what they are being taught within the BSEng program, especially in the areas of planning, project management, requirements elicitation, design and quality management.

Receiving an operational end product is but one of the benefits to the participating companies/organisations. Other benefits include:

- an appreciation of young people who have been educated well and who represent some of the best performing students in the university;
- working with young professionals who deal with issues effectively even when they possess little initial knowledge concerning the project domain and the surrounding political, social and technical issues.

Over the past eight years, 58 external/industry projects and 20 university projects have been completed by software engineering students. Most of these projects have been completed to expectations, with only a very small percentage that haven't. However, all projects have provided benefit to clients. Many of the participating students have been offered jobs as a result of their excellent work and their professional attitudes.

The first BSEng graduates from ANU completed their degrees in 2001 and around 160 graduates have graduated since then.

From 2001 to 2003 various software companies and government departments in the ACT provided the opportunity for teams of 4<sup>th</sup> year BSEng students (only) to undertake a variety of software development projects. Since 2004 the project teams have consisted of both 3<sup>rd</sup> and 4<sup>th</sup> year students.

## **DEGREE REQUIREMENT**

The BSEng program includes a requirement for the conduct of two significant software projects – one conducted in 3<sup>rd</sup> year and another in 4<sup>th</sup> year. Until 2004 there was no overlap between 3<sup>rd</sup> and 4<sup>th</sup> year projects.

Since 2004, 3<sup>rd</sup> and 4<sup>th</sup> year students have combined to undertake projects. This strategy will continue in 2009. The essential roles of management and technical work separate the focus of 4<sup>th</sup> year students from that of 3<sup>rd</sup> year students within any team. Generally teams will consist of two 4<sup>th</sup> year students (managers) and four to six 3<sup>rd</sup> year students (technical staff). Of course the separation of roles is not absolute, especially since most projects typically contain a greater proportion of technical work. However, the 4<sup>th</sup> year students have the responsibility of ensuring planning, estimating, scheduling and monitoring of progress, as well as being the principle contact point for clients.

Several benefits have been gained by conducting projects using combined 3<sup>rd</sup> and 4<sup>th</sup> year student teams. The major benefits have been:

- more consistent capability among students receiving their degrees, and
- 3<sup>rd</sup> year students can focus on improving their technical skills whilst at the same time observing how well they are being managed and therefore learn more of the importance of good project management. Hopefully the 3<sup>rd</sup> year students will also identify how to manage better for when they enter 4<sup>th</sup> year and run a project themselves.

The lecturers have also learned much in the past six years about creating combined 3<sup>rd</sup> and 4<sup>th</sup> year student teams. Feedback from students has been excellent and many good suggestions for improvement have been made and have been implemented. Some further good suggestions for improvement have been received this year and are currently being acted on for 2009. One of the major improvements we implemented in 2005 is the academics responsible for the course taking the role of senior management within a big company which has standard systems for project governance.

As in past years, this invitation is being sent almost exclusively to local Australian SMEs (small to medium enterprises) and some government organizations with the intent of aiding Australian industry. So, if there is interest from your organisation in having some well-educated software engineering students undertake a NON-CRITICAL software development for your company/organisation, then please read on.

## **GUIDELINES FOR PROSPECTIVE CUSTOMERS**

The general guidelines for choosing a project for the 3<sup>rd</sup> and 4<sup>th</sup> year BSEng students to undertake are:-

- the project effort should constitute 1500 - 2000 person-hours of effort (depending on team size), and
- it should not matter to the company/organisation if the students fail to deliver a final product within the time frame.

The emphasis that the university places on the work that the students do includes a combination of "practice" and "product" and not just the product. The entire exercise needs to be one of learning from the adoption of new ideas, the adaption of theoretical understandings, and the experience of making considered decisions. Of course as a prospective "customer" your emphasis will likely be different and so all three parties (your company/organisation, the students and the project coordinators) need to establish clear understandings and expectations. This does not mean that lengthy, complicated agreements need to be created. However, all participating parties need to be sure that the students are in a position at the end of the year to complete the course satisfactorily.

So far in their degree studies, 4<sup>th</sup> year students have learned about (in no particular order) software development lifecycles, requirements analysis/modeling, software architecture and design, programming techniques, project management, documentary deliverables, (some) configuration management, (some) testing. In 4<sup>th</sup> year they will also learn about quality management, testing, IV&V (independent verification and validation) and process improvement through measurement, as well as engineering law.

Where-ever possible two members of each project team will be 4<sup>th</sup> year students. They will be the team managers and therefore will be responsible for contract negotiation, requirements elicitation, project planning and oversight, analysis and design and the agreed deliverables. The remaining members of the team will be 3<sup>rd</sup> year and possibly conversion masters students. These students will participate in some of the requirements elicitation, planning, analysis and design as well as being responsible for coding, testing, version control and quality assurance. The 3<sup>rd</sup> year students will

become next year's project managers.

## **CUSTOMER REQUIREMENTS**

To initiate proceedings for having a team of students undertake a project for your company/organisation, a documented set of (at least) the broad requirements (one to two pages only) of your proposal should be provided.

You should also provide an indication as to how much effort (in person-hours) you expect your project to require for completion. Anything significantly over **2200 person-hours** is probably too large and therefore should be scaled down, while anything less than 1500 person hours is probably too small.

You must also provide a nominee who is to act as sponsor and main contact for the duration of the project. Nominees will need to be available to the student team managers for the purpose of clarifying, detailing and scoping of the requirements. It is suggested that nominees meet with (4<sup>th</sup> year) students at least monthly during the life of the project. It is likely that nominees will also need to be available to students to answer questions, via email or phone, at other times.

Student team managers are expected to make effort estimations and subsequent software development plans (SDPs) based on their team's known commitments and time frame guidelines mentioned earlier in this document. If it appears that the job may be too large in the light of known constraints, then team managers will need to prioritise (with the company/organization nominee) which tasks/components are mandatory and which are "optional". Within a relatively short time, all participating parties should agree on what it is that the student team is expected to produce. During this early phase of development, each team is expected to identify assumptions, risks and constraints and to also develop a risk management plan.

Software development plans are to be monitored by the student team manager and, as required, changed to accommodate new risks or occurrences of identified risks. Nominees should ensure that team managers keep them advised of project progress on a regular basis.

It is hoped that the learning outcomes of this overall scheme will not be just a one-way flow from industry to student but also from student to industry. At this stage in the history of software engineering there are a variety of practices ranging from very poor to excellent within industry. It is hoped that the students will experience mainly the latter, but also may be able to help make improvements to the former.

## **CONDUCTING OF PROJECT**

As part of the development, student teams are expected to specify the requirements, document the architecture, produce self-documenting code, test the code and document the results as well as produce installation documentation.

Whilst it is important for student teams to make every attempt to fulfill customer requirements, it is also important that they conduct the project in a professional fashion. This means that they must produce documentation that will allow all parties to review and understand what information is being input to the various decisions that need to be made and indeed be able to provide auditable evidence of the validity of the processes and quality of the artefacts that they use/produce.

As part of the deliverables to project coordinators, each student is required to carry out a postmortem analysis of the project. The emphasis of the postmortem is on lessons learned about processes and decisions. Students are required to demonstrate the final product to their peers and other academics during lectures in the last few weeks of second semester. Since 2006 we have held a showcase of all student projects to which clients, prospective clients and other interested parties were involved. All who have attended were impressed with the quality of the work the students had completed as well as the variety of projects offered to students.

We welcome feedback from sponsors (written and /or verbal) at any stage of the project, but especially on the value they received from the product delivered.

## **INTELLECTUAL PROPERTY**

Following University guidelines, any IP remains the property of the students unless negotiated otherwise. However, student teams have in the past signed over the rights to the sponsoring organisation/company such that the IP may be further developed and/or sold. These are usually non-exclusive agreements, so that students still retain the rights to the IP as well.

However, if IP relating to student efforts allows your company/organization to make significant profit then it is preferred that some sort of sharing arrangement with the student team should be adopted. This is as opposed to anyone (including project coordinators and students) deeming as exploitive an "all my IP" attitude if/when a financial bonanza might occur when based purely on student work.

## **IMPORTANT DATES**

If you wish to participate in this program in 2009, I need to receive your (one to two page) outline of your project prior to **1 February**. I intend to offer this year's 3<sup>rd</sup> and 4<sup>th</sup>

year BSEng students a limited range of projects, most of which will be offered by industry and non-university based organizations, so I cannot guarantee that your project will be offered to students. The first semester begins on **23 February**. Before that date I need to have selected the projects that will be offered to students. By **23 February** I also need to provide the basic requirements of the software products to be developed to student teams for their consideration.

I will advise you by 23 February if your project is not to be offered to student teams. I will advise you by 6 March if your project has been selected by a student team. At that time I will give you contact details for the students.

In previous years we have met with project sponsors early in the semester so that we can present more detail about how we run the projects and how the student assessment scheme fits in with organisational needs and procedures. This has proved to be a very successful way of for all parties to meet and to clarify any concerns that anyone may have. We plan to do this again in 2009. This is likely to take place during a lunch time (12 – 2) during the week 10 – 13 March, or at the latest in the following week, 16 – 20 March.

In previous years many project sponsors have made a brief (10 minute) presentation to students to give an overview of the organisation and the project and to enable students to ask questions about the project before deciding to undertake it. This has usually taken place during the first lecture of week one of semester one (23 – 27 February). At this stage I do not have a lecture timetable, but would let you know when this would be at the same time that I let you know that your project is to be put to students.

If you have questions and/or require further information then please contact either Lynette or myself on the mobile numbers shown below.

## **CURRENT COURSE SUPERVISORS**

**Ms Lynette Johns-Boast (Office: 6125 4526, Mobile: 0405 611 859)**

**Dr Shayne Flint (Office: 6125 8183, Mobile: 0410 571 025)**

I look forward to your participation.

Yours sincerely,

*Lynette*

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