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ENHANCING THE ACADEMIC VALUE OF INDUSTRIAL PLACEMENTS WITH THE AGILE FRAMEWORK

Abstract:

Within the context of academic placements that take place within the undergraduate studies, we discuss a model that aims to maximise the value of transferable skills while maintaining a positive outcome for the hosting organisation. Aiming to engineering and computer science students, this model relies on concepts of the Agile development methodology which caters for incremental complexity, performance monitoring and flexibility so as to allow the trainee to focus on skills of interest. The model consists of four phases namely, Preparation, Initial Training, Engagement and Sign-off in all of which the trainees work under the mentorship of a junior engineer. Applying this model results to work reusable by the organisation while the trainees receive practical extension to technologies and procedures that have been taught in their academic studies.

Keywords:

Industrial placement, continuing education, hands-on experience

JEL Classification: I23, M53

1. Introduction

Industrial placements are a mechanism where students take a break from their studies to work in a professional environment for a relatively long time, usually a semester or an academic year. This gives them the opportunity to acquire hands-on experience, improve their skills and possibly get a job offer pending on the completion of their studies. Furthermore, they acquire expertise that is transferable in work environment rather than the classroom such as acceptance testing. On the other side, the company obtains a fairly low-cost, junior employee and a potentially acquainted future staff member who will not require a period to be of full speed. Consequently, there is potential for a placement to be rewarding for both parties involved.

From an academic perspective, the fact that engineering skills cannot be fully developed with teaching and hence a placement is beneficial is well underlined in surveys [1] [2]. The importance of internships and placements is proven to result better academic results [3]. Undertaking a placement is considered helpful by the majority of students, however most of them do not believe they get the most out of it [4]. Contacting a placement must be prepared efficiently [6] but cannot be considered a priori successful; problems such as incomplete specification of required work and small amount of transferred skills are reported in [1].

Therefore while the rationale for placements is solid, to achieve an effective placement is not apparent as it encompasses risky factors. The trainee does not always or quickly fit into the professional environment. Being a young person, they may not take the opportunity for career progression seriously but view it as another academic task or even be disappointed and isolated. The company on the other hand may not have the mentoring skills or resources to guide the trainee, due to lack of trust assign auxiliary tasks to them. At the end of placement, the trainee's work is usually discarded as unfinished, unsupported or non-trustworthy.

In this paper we present a model for handling engineering and computer science placements which is based on the Agile [5] development methodology. Our high-level objective is two-fold. First to maximise the exposure of the trainees to professional practices and second to link their training to their academic background. The model relies on the knowledge received under their academic curriculum previously in classrooms and labs and aims to provide them with the practical extension. We borrow concepts from Agile with the objective to build a technique that offers exposure and training to a variety of skills while safeguard the quality of produced work in order to be utilised by the hosting organisation. We have applied this model at a technology gateway, i.e. an academic research centre with strong links to the industry with a wide set of applied projects.

2. Placements in Technology Gateways

The model is developed in the Nimbus Research Centre [6] which belongs to the Cork Institute of Technology in Ireland and deals with the commercialisation for research and the development of prototypes out of concepts presented by client companies. As such, the centre bridges the gap between academic research and the professional world– business, industries, communities, professional and representative bodies. Being placed between academia and industry, it makes the ideal place to host

industrial placements of students. The engineers of the centre have both academic and/or industrial experience in engineering and placements are a significant part of the activities since they fulfill both educational and industrial goals.

3. Phases of the Model

To better organise the model activities and monitor the progress of the various Agile tasks we have devised four different stages in the placements model (Fig .1), discussed next. Agile uses an iterative-cycle to manage projects. This is compliant with the educational features of the training as it first caters for gradually increasing involvedness and second provides the metrics to supervise the progress of the trainees.

A. Preparation phase

This phase takes place when the placements have been finalised and certainly before the arrival of the trainees. The goal is to identify projects and tasks that the interns will undertake and have a first version of a project and activities allocation to each intern.

B. Initial Training phase

This phase takes begins with the arrival of a trainee and lasts for two weeks. We seek to have multiple trainees starting at the same time. This is to act as the foundation for forming a team among them but also to minimise resourcing allocation for this initial training. We offer a set of technical short crash courses over the skills needed for participating in projects for the remainder of their placement. Examples of these courses are Electronic boards Design, Test Driven Development on C++ and embedded technologies. We consider as prerequisite that the trainees have passed relevant academic modules.

At the same time, a short research project is assigned them not only to make them familiar with research procedures but also to expose them in tasks such as literature review and competitive analysis. Furthermore, this task aims to possibly identify a strong interest in research that could be driver to their career.

The interns are assigned a mentor coming from the junior engineers of the centre. This is to make them feel more comfortable for asking questions but also to give the junior engineer experience in mentoring. However, a senior engineer oversees this interaction and if needed provides training session on tasks such as researching state of the art, defining criteria and goals for evaluating different technologies and writing programming code using code standards. Sitting arrangements are also important as we seek for the trainees to feel comfortable but also be monitored. We place the trainees together so they become part of the team but close to the junior mentor who acts as head of their technical work.

C. Engagement phase

This is the main stage of the model and deals mainly with implementation tasks. Development methodologies such as Agile or waterfall are taught in most engineering courses. [9] Yet this is done in a mostly theoretical manner and we fulfil the requirement for practice on real projects. We use the Scrum methodology and trainees are incorporated into Scrum teams. They get involved in all Scrum activities (*morning standups, sprint planning, sprint review, sprint retrospective*) apart from *Backlog*

Grooming. The educational objective is to provide training using hands-on procedures and help them clarify the knowledge they have received in their studies.

The engagement phase is built around three pillars namely, research, implementation and project planning. As each individual is different and their interests vary, we offer the opportunity to work in each one of them, obviously after negotiation with their mentors.

Research tasks are a continuation of the training phase, applicable to trainees that show an interest in research activities. The overall goal is to produce a research paper and trainees are encouraged to put forward their own ideas but at the same time are educated on the definition of aims and objectives, evaluation of similar works and the structure of a paper. While we do not expect them to be the major contributors in a research effort, it is collectively advantageous to not restrict them in any idea generation or other research work. The nature of research also inspires them to broaden their interests, engage with new domains and technologies thus acquiring a global understanding of their field of studies.

The implementation part consists of tasks of progressive duration and complexity. Any of these tasks is a real project activity and refers to the training the received during the training phase. Scrum is employed so as to define tasks, measure progress by reporting in stand up meetings and impose a sense of responsibility. Furthermore they have regular mentor-intern meetings to discuss technical difficulties and in extreme cases abandon a task and undertake another one.

Lastly, for the trainees that have more interest in technical writing, we include them in the meetings around project preparation. They receive training in minutes capture and reporting, project plan preparation, identification of project risks and competitive analysis. Such tasks have also been taught and probably assessed in professional skills modules through mock assignments but in this place we realise them in real-life projects. Complying with the Agile/Scrum regulations facilitates their comprehension as well as providing the opportunity participate in negotiations and help resolve issues.

D. Sign-off Phase

Finally, as each project is signed-off and delivered to the client, the trainees participate in the installation of the solution to the client's servers or premises and under the mentorship of the junior engineer contribute in writing documentation and manuals. They also act a second line of support for any bugs identified but we have found out it is too early for them to give any initial training to the clients.

4. Conclusions

Based on the feedback we received in various stages and especially at the end of the placements, the trainees feel hugely benefited with the Agile-based training they receive. Not only they supplement their knowledge in development methodologies but understand the full product life cycle which widens their perspective on subsequently attending their final year of studies. The flexible features of this model are also well received; trainees noted that many myths such as research and innovation were demystified and they discovered new interests to their careers. Finally, their training helped their professional orientation with the vast majority declaring that they had a

much better perspective and were planning to define their subsequent final-year project on areas they had work on.

Future work involves the further development and improvement of this model but most important its integration with course assessment so as the work of the trainees is formally quantified and taken into account. Towards this objective we use case studies [10] and are developing a set of Rubric Tables for each of major tasks they undertaken as well as for each of the model's phases.

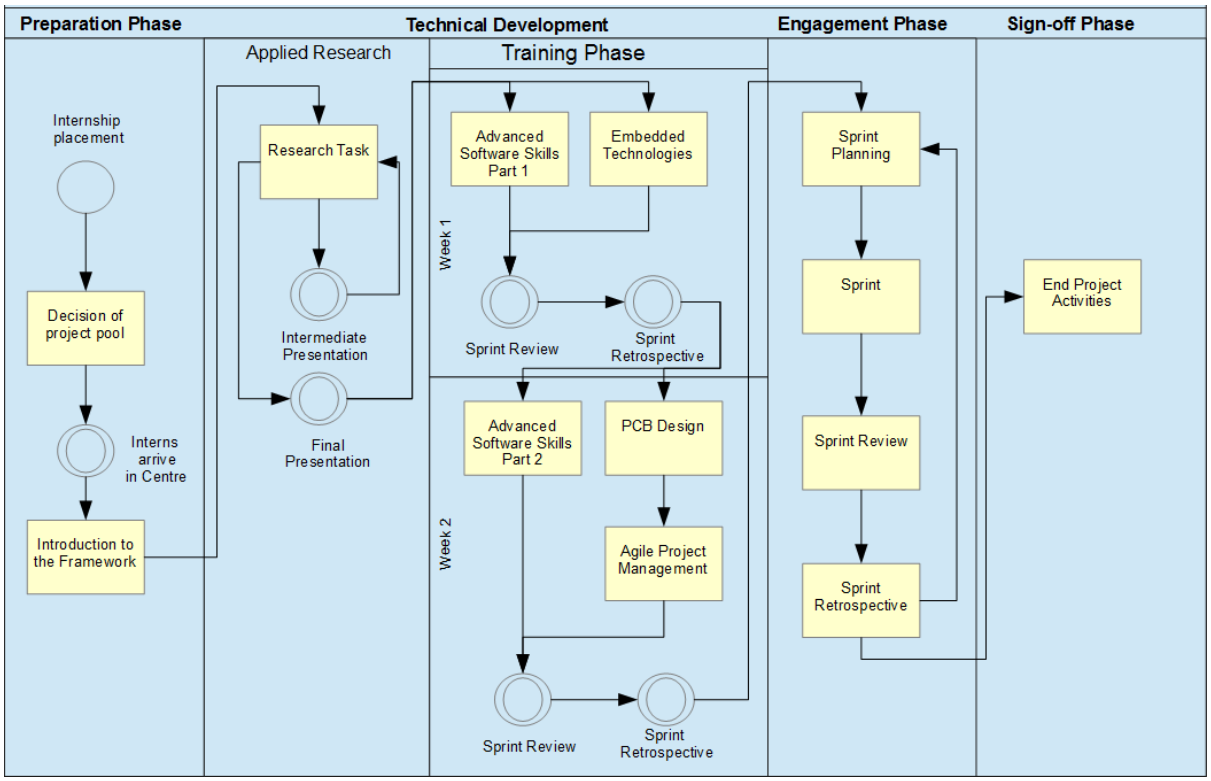

Fig 1. Agile Placement Framework

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