The role of industry within an undergraduate module: a tale of unexpected surprises, cunning, and banana republics

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The role of industry within an undergraduate module: A tale of unexpected surprises, cunning, and banana republics

Russell Lock

Department of Computer Science,
Loughborough University,
r.lock@lboro.ac.uk

Abstract

The interaction of industry within undergraduate modules is generally fairly limited, with most interactions taking the form of case studies and guest lectures. This paper outlines how industry was integrated into student coursework on an undergraduate module within a Computer Science department. In doing so it provides insights into how such coursework could be designed, and explores many of the issues that need to be addressed in order to make such interactions a success.

1. Introduction

This paper discusses the outcome of a course run during 2010 within the Computer Science department of Loughborough University. The course, "E-business Planning & Marketing" covered a broad range of topics designed to explore how to construct new businesses, and how to extend existing businesses to fare better within the marketplace. Whilst the course introduced the students to new skills and techniques, it also built upon the mixed range of skills the students had encountered over the course of their degrees. As a third year optional course available to students on a number of degree schemes, those on the course had different academic backgrounds ranging across Computer Science, Management, Publishing and Mathematics.

The paper focuses on the use of assessment methods and incentives within the course, which involved groups undertaking problem based learning activities [1] designed to give an experiential learning experience [2]. The paper does not discuss the methods used to teach material on the course for space reasons.

However, a significant body advice ranging from the formal [*3*] to the informal [*4*][*5*] already exists on this topic.

The course assessment involved a real world industrial stakeholder. The stakeholder was an entrepreneur who had contacted the University earlier that year, to find people willing to undertake work with him on a number of new business ideas. It was decided that the department could take advantage of the fact that a real world stakeholder existed, by incorporating the business ideas into the assessment for an undergraduate course. The entrepreneur was from a sales background, and had reached regional management level within a large multi-national company. The motivations for contacting Loughborough University were the result of one of Loughborough's previous graduates, who worked for the entrepreneur at the time. The value of alumni in providing industrial input into undergraduate courses is one which is explored further in section 2.2. Given that new business ventures are rarely set up by entirely by one person, the course used group assessment rather than individual assessment. Whilst this method has both benefits and drawbacks [*6*], its use was necessary to simulate more closely the experience of business creation and marketing within the outside world.

The structure of the paper is as follows. Section 2 explores topics relating to the use of real world stakeholders within a university setting. Section 3 discusses the issues and problems encountered during the course, and finally section 4 provides conclusions and discusses the future of the course.

2. Background

There are a number of areas of potential discussion when considering the role of, and issues relating to, the use of real world stakeholders in undergraduate university courses. Although the case study used within the paper is from a science background, the topics discussed are generic to most disciplines.

2.1 The role of the real world as a motivating factor

Within the Computer Science department of Loughborough University dwells a man named Disco Jones. The scourge of the student population, he is a fictitious character who appears across modules and years in the guise of generic coursework stakeholder. He has had websites designed for him, and UML diagrams map every faucet of his professional career. It is the opinion of this author that one factor that could affect the engagement of students is that they know their coursework will be marked, and then recycled, having had no appreciable impact on society at all. Whilst achieving an acceptable mark in a module is a significant motivation for a student, there are others including the stimulation of professional work goals such financial gain, CV building and decisions on career direction.

For many courses the real world can be introduced through the use of case studies [7], or guest lectures, and through introduction to the techniques and tools used within industry.

2.2 Benefits and Drawbacks of the use of real world stakeholders

There are a number of benefits to the use of real world stakeholders within student coursework, including:

- Allowing students to gain a more realistic understanding of how the real world applies to the subject under discussion.
- Coursework can more easily support non scripted elements. For example, during the coursework in question the entrepreneur entered a period of heavy workload and effectively stopped communicating for a few weeks, providing a very realistic problem for the groups. It forced them to make decisions that could have ramifications if they were to be overturned after the hiatus in communication. Whilst this type of communication silence, or the evolution of requirements on an ongoing basis could be simulated using an invented stakeholder such as Disco Jones, the complaints the students would make to the department involved could damage the relationship of trust built up by the lecturer [8], who is of course also responsible for teaching material on a given course.
- It emphasises the importance of communication skills. Students are used to the idea of presenting in front of their peers, and lecturers. In this instance the entrepreneur not only observed the groups final presentations, but brought three managers with him. The formality of the event lent gravitas to the presentations. The students also understood from previous interactions the extent of the stakeholder's technical knowledge, allowing them to pitch their presentations at an appropriate level.

One drawback for lecturers attempting such real world interactions is the almost inevitable loss of some control over the information students are given; something which is usually controlled entirely by the lecturer in question. Students can become easily frustrated by ambiguity when attempting problem based learning [9] a situation which should not be underestimated, and requires ongoing monitoring of the interactions between stakeholders and students. It also increases the time the lecturer is likely to spend on coursework preparation. There are difficulties in getting outside organisations to engage in undergraduate courses. A number of possible techniques are put forward below, all of which the author has either attempted in the past, or is in the process of exploring:

Contacts

- Cold calling organisations has perhaps the least likely success rate, and is also one of the most time consuming for busy academics. Un-directed cold calling is unnecessary, more can be achieved by making use of

generic intermediaries aimed at a wide audience, or through focussed intermediaries for a given area. For example:

- o Alumni Links – Within Loughborough University the Alumni department sends out 78,000 magazines on a bi-annual basis, and 39,000 e-newsletters bi-monthly. The majority of those alumni will be in paid employment, and even if the appeal that is made is only taken up by 1 in a 1000, a significant number of responses can be expected.
- o Regional government organisations such as the East Midlands Development Agencies iNets [10], which link networks of organisations involved in specific areas including Transport, Food and Drink, Sustainable Construction and Healthcare and Bio-Science can be useful in dissemination of information.
- o University administrative departments responsible for undertaking Enterprise activities may prove useful.
- o During this case study the Loughborough University Innovation Centre, which houses a number of university and student spinout companies was approached, and has supplied 5 companies for the upcoming year.

- A number of organisations operating within the UK give guest lectures on courses, and often put up prizes, giving the organisation the opportunity to 'size up' potential applicants for placement and recruitment schemes.

Selling the idea

- By appealing to an organisations philanthropic nature, in helping to train the next generation.
- By appealing to an organisation's commercial needs (cost reduction, exploration of niches etc). The decision to become involved will be influenced by risk perception, which will alter gradually as trust builds over time [11]. Cultivating contacts over time is a necessary step which applies equally to teaching and research.

2.3 The use of formative and summative assessment techniques

Rather than use an exam as a form of summative assessment the coursework was designed to provide both formative and summative assessment. Formative ongoing assessment involved discussions with the stakeholder at a number of points as described within section 3, alongside draft deliverable feedback designed to allow the students to learn from their mistakes. Given the danger of over assessment within higher education the use of draft deliverables was made optional, allowing students to get advice if they wished. The summative assessment involved both the stakeholder and the lecturer assessing oral and written contributions.

2.4 Over assessment and pressure

As part of normal departmental practice at Loughborough University, coursework has to be approved both internally by a member of academic staff (in addition to that of the proposer) and by independent external assessor. By doing so, consistently across modules can be assured. Given a situation where students are partly responsible for managing end stakeholders expectations, there is a danger of students attempting too much and subsequently placing themselves under inappropriate pressure. In order to attempt to minimise the danger of such over pressure time limits can be placed on presentations, and page limits on reports.

2.5 The use of incentives to encourage engagement

Although students are expected to engage with a course of their own free will, there are a number of benefits to the use of real world based coursework. Firstly, it provides an experience that can be described within a CV as real world application of techniques learnt. Secondly, it may provide benefits in the form of prizes, work offers and placement year opportunities etc. Such incentives may or may not affect an individual's quality of work within a course. There is also the potential for students to become over incentivised, potentially becoming stressed or causing disruption if within groups.

2.6 The applicability of real world industrial stakeholder based coursework across disciplines

Some disciplines lend themselves more readily to this type of real world assessment than others. However, most disciplines could make use of real world partners. By way of example a few possibilities are put forward:

- Departments could take advantage of local museums and exhibition spaces, to allow students to create installations suitable for assessing most disciplines. Whilst this type of research and presentation is often performed within departments, very few appear willing to perform outreach activities such as this, which would in fact act as excellent publicity for the quality of a course and institution.
- Business and management courses could make use of the same style of coursework covered within this paper, by allowing groups to perform analysis, report writing and idea generation for start-up companies. This type of coursework is used to some extent on postgraduate courses, but far more rarely at undergraduate level.

3. Course experience

This section outlines the assessment methods that were used within the coursework, and provides insights into notable problems that were encountered.

The coursework itself was composed of a number of parts, each of which (apart from the final reflective review) was conducted as a team of 6.

Requirements Document (10% weighting)

The requirements document ensured that groups had negotiated sufficiently with the stakeholder to establish a baseline for their work.

Prototype (45% weighting)

The prototypes involved a significant degree of programming and design work. Students within the teams with programming skills, and design skills had different interrelated tasks to perform.

Marketing Assessment / plan (20% weighting)

Determining who the competitors to the business idea were, what features were important, and theorising on the direction of the market

Marketing Campaign (10% weighting)

The marketing campaign was an open ended in that the groups were free to use whatever forms of media they wished.

Presentation (10% weighting)

The presentation was used to reinforce the transferable skill of presenting introduced during the course.

Reflective Piece (5% weighting)

Used to determine whether workload was consistent within groups, and to allow the students to reflect on the experience and what they had learned.

The coursework was designed to exercise multiple levels of the Bloom taxonomy [*12*] for the cognitive domain. By applying learning across the levels it was hoped that students would gain a well rounded understanding of the domain in question. Figure 1 shows how the different aspects of the coursework can be categorised using Blooms taxonomy.

3.1 Student IPR issues within a university setting

At Loughborough University, as with many other universities, students own the IPR (Intellectual Property Rights) to their own work. For the purposes of this course we asked students to allow their IPR to be assigned to the entrepreneur. This was necessary for a number of reasons:

- This would be the situation should work be sub-contracted within industry.

- It allowed the entrepreneur to launch the websites without further negotiation. This, we believed to be the price of involvement with industry. That without that incentive a given company or individual could only be motivated by philanthropic reasons to work with the students.

Only one student queried this situation, but they agreed after discussions to remain committed to the coursework put forward. In the event that some students did not agree, the fallback option was to create a fictitious stakeholder, within a fictitious project for those unwilling to assign their IPR.
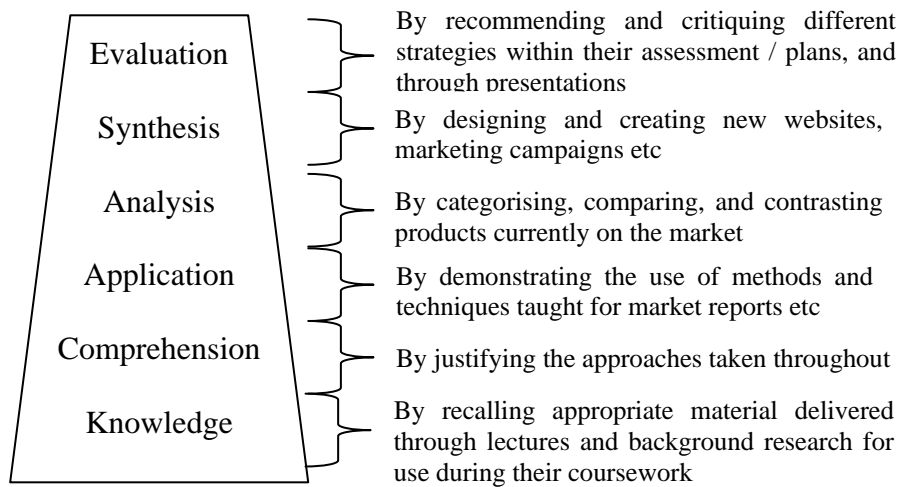
Evaluation	By recommending and critiquing different strategies within their assessment / plans, and through presentations
Synthesis	By designing and creating new websites, marketing campaigns etc
Analysis	By categorising, comparing, and contrasting products currently on the market
Application	By demonstrating the use of methods and techniques taught for market reports etc
Comprehension	By justifying the approaches taken throughout
Knowledge	By recalling appropriate material delivered through lectures and background research for use during their coursework

Figure 1: The coursework with reference to Bloom's Taxonomy for the cognitive domain

3.2 Interactions with the stakeholder

One of the key skills taught during the course was how to manage the expectations of stakeholders, in this case the entrepreneur. As a result, the teams were faced with a piece of coursework that at varying points threatened to outpace what they could provide. Whilst the lecturer in question was there to provide guidance, it was down to the student groups to determine what could be achieved in the time they had.

In order to complete the coursework the first step was for students to elicit requirements from the stakeholder. In order to ensure that the students got the chance to experience the benefits and pitfalls of different communication techniques, as many different methods as feasible were used:

- Initial contact between teams and the entrepreneur were made by written project brief. The briefs were written by the entrepreneur, and were not corrected for grammar or spelling before release to the groups. By doing so the students were faced by occasionally ambiguous and incomplete statements, which they then had to follow up.
- Initial written material was followed up by pre-recorded video clips, after which students had free reign over communication mediums.
- Some groups preferred contact via email. Others preferred telephone calls.
- One face to face session was arranged (due to time constraints).

3.2.1 The video

Due to time restrictions with our entrepreneur, the initial business idea handouts given to each team was followed up by a pre-recorded video clip played back to students, to outline in the entrepreneur's own words what thoughts he had on each project. Due to a misunderstanding the entrepreneur believed each video segment would only be played to the relevant team, and subsequently introduced himself at the start of each clip. By the fifth clip the students were joining in with the introduction. However, the feedback from the use of such clips was quite positive. While students could not interact directly by asking questions, it helped convey the enthusiasm of the stakeholder, and provided visual cues that would not have been evident in a written document.

3.2.2 Face to Face

A face to face meeting was arranged to allow the individual teams to ask questions of the stakeholder. In retrospect the decision to hold this session within a regular lecture slot, with all teams present, was a mistake. Each of the five business ideas was allocated a twenty minute slot, allowing the two teams working on each business idea to ask questions. However, the session progressed very oddly. Students had questions to ask, but it was clear that they were trying hard either not to ask them, or to ask them in an incredibly obtuse way. In discussions after the session with a number of the teams it become clear that although the two teams working on a given idea independently were not competing directly with each other (there was no winner or loser), the presence of the entrepreneur, and the prospect of winning a prize or even employment made the student teams very competitive. They simply didn't want to give away their ideas to the opposing team.

3.3 Incentives

The course used two incentives. Firstly, the possibility that the entrepreneur would wish employ students to continue work on the business ideas after the course had concluded. And secondly, a £250 prize for the best team.

At the conclusion of the course (and the students' degrees) a survey during the final session identified that only 5 of the 60 students had secured any form of job position outside the university. The economic climate is likely to have increased the value of the incentives to some extent. Regardless of the economic incentives one of the students gained a marketing post at a prestigious London agency, after an interview where they had produced the coursework they had written as an example of their ability to analyse real world situations.

3.3 Issues

The following section explores some of the more prominent issues that were encountered during the course, and outlines where possible what could be done to avoid, minimise or mitigate such occurrences in future.

3.3.1 The role of governance; from democracy to banana republic

Whilst it was a good idea to give students the ability to manage their teams as they saw fit, there were a number of problems:

- A number of the teams made the transfer from democratic leadership by committee to one of dictatorship very quickly. In one case this appeared to be a direct response to those students who wanted to achieve first class degrees trying to marshal those who were less academically inclined to do what was required.
- From discussion with the students it appeared that those who were studying Computer Science saw themselves to be more important within their groups with regards to decision making than those from other departments, in particular that of Publishing. It is plausible that this may be an inevitable consequence of courses run by departments that are open to the students of other departments.

3.3.2 The fairness of group coursework within mixed groups as sole marking.

There are a number of issues relating to the use of solely group coursework within a given course. Those who are aiming for higher degree classifications have no control over those they are grouped together with. Whilst attempts were made to use individual reports to outline the effort expended by members of a given team in order to dampen harsh inequalities, internal politics meant that few were prepared to risk marking their fellow peers down [*13*].

3.3.3 The non computer, computer scientists

A significant degree of variability existed with regard to academic background and ability within the module, which was open to a number of departments and degree schemes. Each team contained on average two computer scientists, two

management students, and one publishing student. As such, different team members had different skills they could bring to bear on the course. Developing a single deliverable that would have challenged all those on the course equally would have been near impossible. The coursework was therefore split into deliverables that allowed the teams to organise themselves, and put relevant expertise within their groups towards different aspects of the assessment.

During the coursework deficiencies in technical ability among the computer scientists became clear. Given the variety of topics covered on standard computer science courses at undergraduate level it appears it is possible to get a decent degree by being very good at non- programming topics, whilst being quite weak in the programming courses that have been traditionally associated with the subject. As a result, although many of the teams decided the computer scientists were best utilised in the website development deliverable this was not necessarily the case.

3.3.4 Copyright

Given that the coursework involved the creation of materials for an outside organisation it was necessary to give students a "crash course" in what material they could and could not use from the internet in the form of images, logos etc. Despite this, and possibly as a result of the compressed nature of the teaching of this area, the students achieved varying degrees of success. Only 1 team out of 10 managed to complete the coursework without any danger of copyright infringement; most had a few areas of concern. It is planned that in future this will be remedied by giving students links to more resources they can use freely, and by asking them to state the provenance of images they make use of.

3.3.5 Marketing 101

Teams were expected to provide marketing materials for their projects, and were taught the value of various techniques ranging from ordinary posters to online viral marketing techniques. The marketing aspect of the course was one area where a lack of formal constraints on what was allowed led to students undertaking well over the expected level of output. Students were encouraged to make use of multiple media types, and had access to equipment to aid in their work. A range of marketing techniques were used by the students, many of which were surprising. A number of groups had decided to unofficially launch the businesses that the entrepreneur had put to them. Some groups uploaded Youtube adverts, many set up live social networking presences, twitter feeds and in one case actually purchased the domain for the company name they had invented, to prevent competitors from using it. During the group presentations those involved were particularly surprised by the team that had written a radio jingle, and had approached a student within the department of English and Drama to sing it for them.

3.4 And they thought it was all over....

Upon conclusion of the course the entrepreneur ran a workshop, inviting all the participants on the course, to explore the possibility of commercial launch of the business ideas explored by the groups. Out of a class of 60, 25 attended the workshop. 15 expressed interest in continuing work on the websites developed with a mind to commercial launch. Over the span of the next two months contractual arrangements were discussed. A number of students decided against further involvement due to work commitments, and in a number of cases due to the end of their international studies. 7 students formed a new company in January 2011 to take forward in the first instance, one of the business ideas for launch.

The 7 will be invited back to deliver a half lecture for the next cohort of students on the course, to discuss the real world application of the material they were taught. It is hoped that this will provide a mechanism to allow peer learning [*14*] between generations for those on the course.

4. Future work and Conclusions

The course will run again this year. Feedback from students, and favourable news articles have increased the number taking the module by 50%, making it one of the most popular 3rd year options within the department. The coursework itself will be modified based on the experience of the previous year, in particular:

- The closure of a loophole on the use of Appendixes. Loose definition of what could be termed an appendix allowed a number of groups to produce marketing reports over a 100 pages long, even though the main body of the deliverable had been restricted to a 10 page limit.
- Increased weighting of individual reflective reports to give students greater chance to influence their own grades rather than rely on group marks.
- Additional guidelines will be written to control the amount of work put into the marketing side of the course, which students put a disproportionate amount of effort into.
- Efforts are being made to reduce the reliance on a single entrepreneur, and to reduce their workload in relation to the course. In particular rather than deal with a single industrial stakeholder, 11 have agreed to take part. The 11 comprise a number of local and international companies, start-up companies, and individual entrepreneurs. No more than two teams will work with a given company. It is hoped that the mix of project types will give many the opportunity of future employment, further development work, and failing all else, an experience that will be a valuable addition to their CV's.

In conclusion this paper has put forward the results of an experiment in industrial involvement within an undergraduate course. In doing so it allowed the lecturer in question to try combinations of formative and summative assessment, and explored the role incentives have in student engagement with a course. A number of issues were explored which have a bearing on multiple disciplines including copyright, use of media types and over assessment.

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