Review of a Joint Academic/Industry Sponsored Degree in Computing between The University of the West of England, Bristol and Hewlett-Packard

Authors:

Rob Williams, University of the West of England, Coldharbour Lane, Bristol, UK BS16 1QY, rob.williams@uwe.ac.uk
Julie Grady, HP Labs, Filton Avenue, Stoke Gifford, Bristol, BS34 8QZ, UK, julie.grady@hp.com

Abstract *— What had started as a straightforward meeting with Hewlett Packard about obtaining sponsorship funding for students pursuing the BSc Computin g for Real -time Systems degree led to a radical rethink of the academic programme. HP, like many employers in the hi -tech sector are concerned about the level of technical skills offered by graduates and their lack of commitment to employers. The prelimina ry meetings in 2000 progressed through detailed discussions, which had a major impact on the final course design. As a result, a new industrially sponsored degree scheme is now being trialed at UWE. It is structured on a 2 + 2 format: two years full -time at the university followed by two years of extended placement (the equivalent of a year round internship or two year co -operative education programme) experience with HP, Customer Support Division. In our arrangement, students have two years of full time study, they are not part -time students released by the employer for a day or two a week, which is a typical model used by industry in the UK. After two years they embark on a full-time two -year placement in HP, returning to University only to complete the remaining modules and to undergo oral and written examinations. The selected students have their tuition fees paid and receive academic bursaries during the first two years. They then take up a placement as graduate apprentices at HP for the second half of their course and benefit from appropriate salaries for those two years. In order to study the required number of modules and so obtain the necessary academic credit within the normal four -year period, two modules are delivered during the summer vacation in block, short course mode. Should a sponsored student be referred twice on an assessment element, they are required to withdraw from the sponsorship scheme and transfer onto the normal award stream. Thus, special adjustments to assessment regulations h ave not been necessary. Two of the block -mode modules are jointly taught by HP and UWE staff to allow for the maximum relevance to placement activities, while retaining good academic depth. Further CBT materials and training sessions have been arranged by HP to support their students' studies and extend their skills in commercial and professional areas. Technical experience with particular HP hardware and software is provided through a substantial long -term loan of multiprocessor HP9000 mini -computers. Cu rrently, the UWE scheme includes 14 students, and it appears to offer a good model for other awards, which also serve employment sectors with specific recruitment problems. In summary, students can reduce their debt burden, employers obtain more benefit fr om their investment in placement students and the university develops a useful relationship with an active industrial partner. This paper reviews the experience so far, from both UWE and HP's viewpoints, and raises some ideas for further discussion.*

Index Terms *– Engineering Education, Industrial Work Placement, Joint Degree.*

1. Introduction and History

Year 1 - UWE
Year 2 - UWE
Year 3 - placement
Year 4 – placement

A new style of degree, involving student sponsorship and a two year internship, has been under trial for three years as a partnership between HP, Mission Critical Proactive Services, and University of the West of England, Bristol. It is based on the well-established BSc Computing for Real-time Systems degree which has been successfully graduating students for nearly 20 years. But as a result of the discussions between HP managers and UWE tutors, a novel style of industrially sponsored degree scheme was devised within a 2 + 2 format: two years full-time at the university followed by two years of extended intern experience with HP. This plan differs from other industrially linked schemes, such as that offered by IBM and Portsmouth University in that our students have two years of full time study, and then two years on placement with HP. They are not part-time students released by the employer to attend college for a day a week, or periodic vacation employees. During the two-year placement, they must return occasionally to university to complete remaining modules, enjoy some

academic supervision for their project work and, of course, undergo oral and written examinations. It is a "smorgasbord" rather than a "thick sandwich".

2. HP Requirements

BSc Computing/IT/EE qualification
Accreditation BCS/IEE not essential
Maximum of 2 years to employment
Working knowledge of Unix
Customer-facing skills
Confidence with computer hardware
Willing to consider a long term career in HP
Practical approach to life

During the preliminary meetings between UWE and HP, some base requirements were tabled and some concerns were discussed. Administrative skill with Unix and familiarity with computer hardware were the primary technical requirements for the envisioned commercial role. Because the work involved dealing with clients' problems, often on site, it was essential than students gained good communication and inter-personal skills. It was clear that the sponsored students would be needed to contribute effectively in the workplace after two years. A traditional, day-release part-time scheme was considered but quickly rejected as inappropriate. Also, there was no great enthusiasm for professional accreditation; it certainly was not considered an essential requirement that the graduates from the award would become eligible for CEng status at some time in the future. The ability to solve complex practical problems involving hardware and software on a variety of computer platforms, not restricted to desktop PCs, was the central requirement.

3. Structure of BSc CRTS (Extended Placement)

Initially there appeared to be an impossible requirement to deliver the full 360 academic credits within the first two years. So a compromise was arrived at, whereby three modules are brought forward "ahead of time" and the remaining three taught modules are delivered during the second two years, in accelerated, short course mode. In addition, only 100 level 3 credits, the minimum necessary for the award of a degree with Honours is gained, rather than the normal 120. Some attention was paid to the best way to deal with a sponsored student who gets referred in an assessment. It is possible to be referred once and recover, but after the second attempt at the same assessment element, they will be required to withdraw from the sponsorship scheme and transfer onto the normal award stream. Thus, special adjustments to assessment regulations have not been necessary, only a careful restructuring of the constituent modules (Figure 1).

4. Advantages to Scholars

Financial support
Placement security
Team building, group support
Placement employer commitment to training
Fast-track start to career
Professional mentors available
Status within the university
CV enhancement

The selected students have their tuition fees paid and receive generous academic bursaries during the first two years. They then begin their placement as GAs (Graduate Apprentices) for the second half of their course and benefit from appropriate salaries for those two years. Each GA has a named HP manager who has volunteered to act as a professional mentor throughout the four year period. The status which selection for this scholarship programme endows stems partly from the fierce competition they faced to win the award. The group of GAs also study together during lab sessions and are encouraged to support each other in their work. Obtaining a placement with HP was already considered before this scheme began as one of the best opportunities available during the third year, so the selected scholars are anxious to maintain this prestige.

5. Disadvantages to Scholars

Extra stress on candidates/scholars
No academic options
Professionally oriented short-courses
Narrowing of career horizon
Summer-term modules for accelerated credits
Reduced vacation time
No placement choice
Moral tie to employer at graduation

The application process was very competitive, with interviews and assessments, which could be seen as quite a gruelling experience for unselfconfident seventeen year-old. The HP/GAs continue to feel somewhat under the spotlight, and perhaps anxious to perform to their best at all times. Interestingly, not all applicants wanted to be tied to a single sponsor throughout their studies. This especially concerned those wishing to take up a placement in Europe or America. Other enquirers expressed more interest in a research career and were not keen to enter a vocational degree with a commercially oriented target. Very early in the first term one GA withdrew from the course, feeling that his academic preparation (AGNVQ in IT) was insufficient for the course of study. The same crisis occurred with three other ex-AGNVQ students on sister computing awards that also require some programming experience at entry, and so cannot be taken as evidence of unacceptable extra pressure. There have also been the normal rates of family problems and personal issues amongst the HP/GA group.

6. Advantages to the University

Spur for course review and renewal
Commercial collaboration: syllabus & teaching
Equipment Loan/Donation
Assistance with marketing effort
Boost to recruitment
Student self-esteem and motivation enhanced

The opportunity to discuss at length the content and aims of one of our more technically oriented degree programmes was very useful and led to several revisions which had much wider impact than just for this award. Of particular benefit was the chance to plan for joint teaching with HP staff on selected modules. The ease with which guest lecturers, with specialist HP experience, could be conjured up, appeared near miraculous! Extra CBT course material and training sessions have been arranged by HP to support their students' studies and extend their skills in commercial and professional areas. In particular, it was suggested that an emphasis on the development of "soft" skills would be appropriate. Technical experience with particular HP hardware and software is provided through a substantial long-term loan of multiprocessor HP9000 mini-computers to the university. The publicity that accompanied the launch promotion provided benefit to the whole department in terms of marketing expenditure and effort. Throughout their time at UWE, tutors have remarked how the HP/GA cohort was noticeably better motivated and well-behaved in class, and delivered better assignment work. This must be due partly to their enhanced self-esteem and the desire to justify their financial privilege.

7. Advantages to HP

Known technical ability
Commitment to "Total Customer Experience"
Strong commercial awareness
Energetic, bringing new perspectives to the work
Excellent source of potential colleagues
Easier to convert to full time permanent hire
Immediate contribution
HP understands more about academia

HP's Mission Critical Proactive Services organisation is a customer-focused group responsible for delivering proactive support services to customers. HP's goal is to avoid preventable service outages by keeping customers' environments stable

and available and so ensuring their businesses are successful. In the latter part of 1990s the organisation was finding it difficult to find the right calibre of skilled technical staff and were seeing significant skills gaps in both new and experienced graduates. While many candidates were strong in their technical area, they lacked many of the "softer" skills around customer engagement, which are crucial to the success of this business. The HP managers had experience of working with interns from UWE and saw an opportunity to develop a cohort of students with excellent technical skills, but of equal importance, a strong emphasis on customer commitment. It was felt that what was really lacking was a "passion" for assisting customers and so HP needed to develop high quality engineers with strong interpersonal skills. With an improved understanding of customer care, they could be nurtured for a potential long-term career in HP. The concept was to establish a new benchmark course for the HP engineer of the future.

The HP/GAs had the opportunity to get involved in real multi-disciplinary problems and team projects not commonly found in university courses. They have worked well with project leaders and other team members, and demonstrated initiative and self-reliance. They have learnt to communicate clearly and succinctly often in high-pressure customer-facing situations. These students have demonstrated a willingness to see beyond the technical problems and develop sensitive understanding of customers' business in order to add both technical and business value through a wider commercial awareness.

HP staff also got involved in teaching giving specialised talks and lecturers on both technical and business management issues, leading to a deeper understanding of the academic role of the University.

8. Disadvantages to HP

Four-year financial and management commitment out of step with short-term business models
HP-Compaq merger and new management
Tensions between high profile HP/GA and standard intern scheme
No guaranteed permanent job offers at end of degree
Short-term needs of business vs. longer educational viewpoint

Many of the problematic issues of developing and managing this cohort of students relate to the novelty of the degree format, with a two-year extended internship and the long-term engagement that entails. While the commitment from the team to this partnership degree was strong, there were still internal hurdles that had to be overcome. Many businesses, despite their best intentions, find the concept of planning over a four-year cycle beyond their normal operational model. Budgets are decided on a yearly basis, being dependent on the current business situation. The merger of HP and Compaq was a challenging time due to the significant number of organisational and management changes. It took a lot of personal determination from the responsible managers during this period to ensure the success of the programme for all parties: HP, GAs and the University. Similarly even though there are only 14 students, it remains major resource commitment of management time to provide support. There are also challenges for HP in balancing short-term business goals with the need to ensure that the broader educational requirements of the GAs are not ignored. Due to resource constraints the project manager also had to act as student liaison manager. Although it may have been preferable to have a more neutral 3rd party to manage such issues this situation reflects how problems are resolved in industry. HP had originally intended for the GA s to spend time in different regions of the UK as part of their extended placement but this proved to be impractical due to resource limitations. As a consequence the students have remained based in two main regions developing their role within that business.

Also this course has created some internal tensions between the standard intern programme (1 year industrial placement) and this novel scheme based on an extended placement. The students on this course receive bursaries and have their tuition fees paid and many other interns have wanted to transfer onto this programme as it is seen to be higher profile role and more financially rewarding. While this is a positive result for the programme it has been important for management to position this course carefully as meeting the specific demands of their business.

9. Problems to be considered before starting a scheme

Resolving academic and commercial aims
Sponsor demands too much control
Unforeseen effects of market fluctuations
Disappointed scholarship applicants

Envious majority group of students
Time spent meeting with sponsors
Effort to revalidate the programme
No direct cash to University
Marketing the offer
Dealing with referral and failure.
More complex recruitment selection criteria

The initial meetings resolved several differences between the employer's view of academic awards and that held by universities. UWE was keen to invite HP personnel to contribute to key subject areas through invited lectures or practical demonstration sessions. There was also some discussion about the lack of commitment shown by young graduates to their long-term career development. The volatility of employees in the high-tech sector might be a general theme for all commercial organizations which fund education and training. As fewer scholarships were being offered than the normal cohort size, UWE was worried about the possible negative impact of the "regret" letters arriving in the middle of the normal university entrance process. In the event, this did not seem to be a problem perhaps due to the care taken in dealing with this sensitive issue. Some candidates, however, did get frustrated by the lengthened application period and abandoned the whole thing in favour of traditional courses. The university academic administration did insist on a complete revalidation operation before the BSc Computing for Real-time Systems (Extended Placement) degree could be run, despite its close relationship to an existing award. This put a lot of unexpected extra work on the course leader! Much thought was applied to anticipating any situation where students fail an assessment. This could easily lead to a circumstance where the referred individual is disadvantaged with respect to a non-scholarship student. Marketing any new degree requires time and effort. In this case, a national advertising campaign drew in hundreds of enquiries over a short period of time, all requiring discussion by telephone or email. The selection activity was more complex than the routine annual process. Each applicant to the degree was individually mailed with details of the offer and a special application form. They were then all invited for interview at UWE. A short list was drawn up based on the information provided by their application form and personal interview. HP then invited the short listed candidates to a second assessment event that included individual interviews, technical appraisal and observed group activities.

10. Unexpected Issues

Youth Issues
Individual Ambition
The Scholarship Effect
Confusion of Academic & Professional Styles
Commercial Turmoil
Selecting and supporting personal projects
Diversity within the hosting firm

HP managers were not routinely experienced with interviewing younger school pupils. Some were more confident dealing with graduates or at least undergraduate, placement students. The relative lack of professional discipline and career plans, shown during the interviews, may have been a bit of a shock to non-family managers! Of the more academically gifted candidates, several had already decided to enter into research, and were somewhat thrown by discussions concerning customer service and commercial targets. A diverse group of students applied, with a much wider range of backgrounds than the university would normally encounter, attracted by the financial reward rather than the course content. The Scholarship Effect drew into the frame some who were already well qualified for entry into an elite university. Such individuals may not perhaps be the best-suited candidates for a vocational computing course. During the first year on placement, the culture clash between academic and professional viewpoints has been very evident. On the positive side, it has revealed latent skills in the HP/GAs that up until then had been dormant, or not recognised. There had to be a period of rapid adaptation if the HP/GAs were to fulfil expectations and future plans. The merger of HP and Compaq undoubtedly produced difficulties for the managers and the GAs. But such turbulent storms are not unusual in the commercial world, and on the whole the HP/GAs accepted the situation, and worked their way around the whirlpools with the aid of advice from experienced managers.

11. The GA View

Diverse group
Stress levels
Teamwork
Time for personal project
University short courses
Application of skills

Trying to distil a single, common opinion from 14 very different individuals is an impossible task but the enthusiasm and excitement that pioneering a novel programme of work and study is still tangible when talking with the GAs. There is a still a feeling that a lot is expected of them, which has somewhat increased their stress levels, especially with regard to assigning priorities between simultaneous demands. This is especially apparent as they struggle to engage with their personal projects which contribute a significant part towards the final degree assessment. The complexities and subtleties of working in a busy team and having quickly to develop diplomatic skills was a surprise after the more direct academic approach. Sometimes this meant that had to negotiate access to resources on their own behalf, which in a large organisation can be daunting. The short-course modules are judged to be enjoyable, but have reduced long-term value because the material is rarely used in their normal daily work. So it is quickly forgotten. But they are all looking forward to the next short course (Microprocessor Control Systems) to be hosted by the University of Kristanstad in Sweden as part of the EU ALICE agreement. This will give a welcome opportunity for all the GAs to get together and compare notes. The most fulfilment comes from the successful application of knowledge and skills for the benefit of HP and their customers.

12. Review and the Future

Hewlett Packard managers have already been surprised and impressed by the level of contribution that the HP/GAs have been able to make within the first year of their placement. Some highly visible work has rapidly raised the profile of this "guinea-pig" group which has benefited all involved. One caution that could be offered in retrospect is the diversity of personality, ambition and ability which emerges from even carefully selected group of school leavers. By starting with younger candidates, the probability of personal development and growing maturity must be accepted, and even exploited to the benefit of the organisation. For this reason, a range of potential career paths has to be available to fully capitalise on such a scholarship scheme. Currently, this UWE/HP scheme includes 14 students, and the experience is undergoing review by UWE and HP managers before committing to further cohorts. But it appears to offer a good model for other awards, which also serve employment sectors with specific recruitment difficulties. In summary, students can reduce their debt burden, employers obtain more benefit from their investment in placement students and the university develops a useful relationship with an active industrial partner.

FIGURE 1. Award Structure for BSc(Hons)Computing for Real-Time Systems with Extended Placement