INTERNATIONAL ENGINEERING AND PRODUCT DESIGN EDUCATION CONFERENCE
2-3 SEPTEMBER 2004 DELFT THE NETHERLANDS

IS YOUR PROJECT BIG ENOUGH?

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ABSTRACT

The MDes/BSc Industrial Product Design Degree is a highly successful course run at Coventry University. It is jointly taught by staff from the School of Engineering and the School of Art and Design and has an equal balance between the disciplines. This paper will look at the way the curriculum was designed and developed with particular reference to the large component of industrially based project work which is the focus of the degree's final year.

The benefits of such projects to the students, the companies and the University will be discussed, together with problems associated with Intellectual Property Rights and Patents. Also covered will be the strategies for obtaining good quality, industrially based projects, strategies for ensuring the proper assessment of group work and conclusions drawn concerning the importance and continued value of including such large projects in the students' curriculum.

Keywords: Design education, links with industry, design projects

1 INTRODUCTION

When the MDes/BSc Industrial Product Design degree course was being conceived and developed it was deemed to be essential that it included industrially relevant projects and had good links with industry. This was considered key to the formation and development of the product designer and was to be augmented whenever possible by a period of design experience external to the university.

The proposal was not derived simply from the perceptions of the academic staff but was also based on research carried out with key players within manufacturing and design companies that sought to determine, from their perspective, the attributes and formative experiences which combined to develop effective product designers. The research additionally indicated that students should undertake projects that were of sufficient size and depth to give them a good appreciation of working in an industrial context.

It was observed that the majority of competitor courses available at this time had quite small so-called 'major' projects – very few having industrial linkage and content and many providing neither opportunity for industrial placement nor for group working.

The modular system at Coventry University dictated that there should be 8 modules per year and so the initial course design contained a triple module group project in both the 2nd and the final years of the course.

The projects in year two were run by the School of Art & Design and tended to focus on the concepts, usability and ergonomics of products as diverse as multi-functional and multi-rider bicycles and tricycles, hydrotherapy wheelchairs, industrial computers and children's playground equipment. Unfortunately this project which served as preparation for the students' industrial placement year was lost as a result of module rationalisation in the school.

The final year group projects were run by the School of Engineering and in general had learning outcomes biased more towards engineering design deliverables, although without ignoring the aesthetics and product semantics. Companies such as Nokia, Bertrandt, Volkswagen and Malvern Instruments were involved with these projects, as well as many others from the consumer, industrial and transport sectors.
The final year also included a 4 module wide individual self-selected project which aims to stretch the students and to enable their individual strengths and weaknesses to be assessed.

2 THE COURSES

The original BSc course was designed in the early 1990s to produce graduates who were complete 'product designers' as opposed to being industrial designers or mechanical/engineering designers. Industrial Designers are usually thought of as being concerned mainly with matters of appearance and perhaps ergonomics whereas Engineering Designers are concerned with function, manufacture and cost. Both these design activities must be done well and embodied in a product if technical innovation is to be exploited in the market place.
The Industrial Product Designer was defined as a person who can address both these areas to design commercially viable, fully functioning, user friendly products which express the spirit of the age whether they be domestic products or capital goods.
All sectors of the industry were widely consulted and it was realised that Coventry University was ideally placed to run such a course at it had excellent Schools of Engineering and Art & Design and it was the synergy between these partners that carried the project forward. The course was seen to occupy the middle ground of the ART - SCIENCE spectrum with a 50/50 balance between the disciplines and was, and still is, taught jointly by staff from both the School of Engineering and the Coventry School of Art & Design.
Based in some measure on the already successful BEng Automotive Engineering Design Course which embraced the philosophy of problem based learning it was decided that the course would have a substantial studio based element and large project modules particularly in the final year of study.
The course has undergone two periodic reviews by the University and also had been subject to two accreditation visits by the Institution of Engineering Designers. In 1996 the MDes route was put in place as it was felt that those students who had undertaken a period of industrial training [1][2][3] and performed creditably in their final year of study merited an enhanced award. At its last review it was also subject to a complete revamp of the modules available from the school of Art & Design.
The BSc and MDes Industrial Product Design courses have survived these challenges and changes and continue to deliver competent graduates with the right balance of skills to the design community.
The courses aim to produce product designers with a balance of skills that may be applied to a wide spectrum of products. This demands the study and application of many different facets of the Arts and the Sciences according to the nature of the problems presented.

3 PROJECT PHILOSOPHY

As indicated above it was decided that the final year of study would comprise two major pieces of project work:-

- An individual project self initiated by the student although with approval by staff
- A group project which is undertaken in collaboration with an industrial partner/collaborator

From the outset it was considered that both the group and the individual projects would have an output that could be displayed at the final year degree show and that appropriate modelling techniques should be used.
It was also decided that although the group project would be run by the School of Engineering and the individual project by the School of Art & Design there would be joint final assessments by staff from both areas and further that both projects should encompass the ideals of a product design i.e. a meld of both the engineering and the art approaches.
In [4] the authors define a "good" or "successful" project as one where all learning outcomes are met, where the students have become highly motivated feel they have carried out a significant piece of real design work, and have learned a little of the joy of creative engineering or product design.
Projects where students are working in groups, have well defined challenging project briefs rather than a tightly defined design specification, are able to address real issues, have external sponsors and/or evaluators, are holistic in nature, and are active rather than passive. Also they will usually have a prototype, model or computer graphical simulation as one of their outcomes. These sorts of projects tend, in the opinion of the authors, to motivate the students, make the best use of student-centered time [5], give the opportunity to test holistic design process skills, enhance group working skills and can be skewed to either engineering design or industrial design. They are also cost effective in terms of staff time. The preferred mode of assessment normally includes verbal presentation by the group members and a physical display, including models and/or graphical representations.

4 THE BENEFITS

The benefits of large projects of the type discussed are many.
In both the individual and group projects it gives the students the opportunity to research and undertake design activities to a greater depth and rigour than would otherwise be that case. The reverse is also true – is gives students a greater opportunity to dig bigger holes for themselves!
The industrially based projects also give potential employers access to an extended interview situation with potential employees.
They can also benefit both students and institutions by way of financial award for work done.

5 INTELLECTUAL PROPERTY & PATENTS

It is important at an early stage, particularly with industrial partners, to establish the ownership of any intellectual property rights (IPR). At Coventry University the institution has a prior claim on all intellectual property created by students as part of their studies. This clearly is unacceptable in the context of an industrial sponsor or collaborator. It has therefore been agreed that the IPR in such cases where the collaborator has initiated the project resides with them. The University's own legal department keep a watching brief on the situation – just as they do with the final year

individual projects to ensure that IPR are captured and patents applied for, as appropriate, prior to public display.

6 STRATEGIES FOR OBTAINING PROJECTS

It has been said by many institutions that the running of industrially based, large projects is very difficult. It takes too much time to organize and few companies want to participate. Others claim that the student diet should include more engineering science and knowledge rather than large amounts of time where design is practiced. The point is being missed here as in the large project modules (if properly constituted) the students have to investigate and apply engineering, manufacturing and materials sciences and technologies with some degree of rigour.

The findings at Coventry contradict these points. There is never a dearth of companies wanting to be part of the final year group project scenario and many want to be involved year after year. The important thing is to be aware of the opportunities that exist within local industry as well as the wider picture. At Coventry University there are a number of projects that support industry. Many of the design problems presented may not fit easily into funded assistance programmes, or are of a more speculative nature, yet can be excellent student vehicles providing that the company can accept the fairly inflexible module time tables. In Coventry's case the group projects run from October to end of March.

7 EXAMPLES OF PROJECTS

In the current year the following group projects were undertaken: -

Two groups were given the task of suggesting modifications to existing, but now obsolete, Mk3 UK railway carriages to give them a new lease of life as vehicles pulled by a steam locomotive for themed touring holidays in Scotland. This involved not only considering the passenger experience but also taking due account of the engineering problems associated with modification to existing structures. Figure 1

Figure 1. MK3 Railway Carriage Modification

Three groups have an interesting assignment to design a taping machine for polycarbonate glazing panels for conservatories. The extruded polycarbonate sheet used for these panels is cut to shape and then requires edge sealing to obviate ingress of moisture and foreign bodies (top edge as installed) as well as allowing the panel to 'breathe' to avoid condensation. Further considerations were to remove swarf particles created by the cutting process and to cut the protective film to facilitate easy removal upon installation. Figures 2 &3

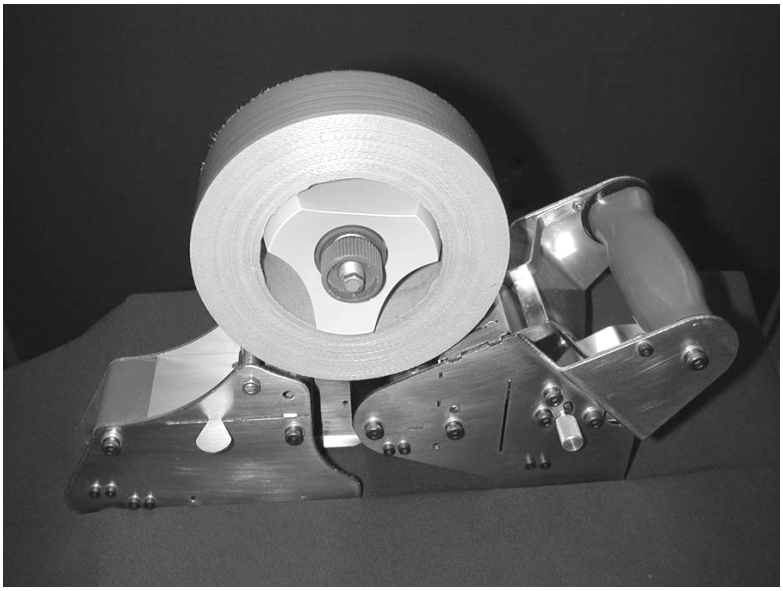

Figure 2. One solution to the edge-taping problem

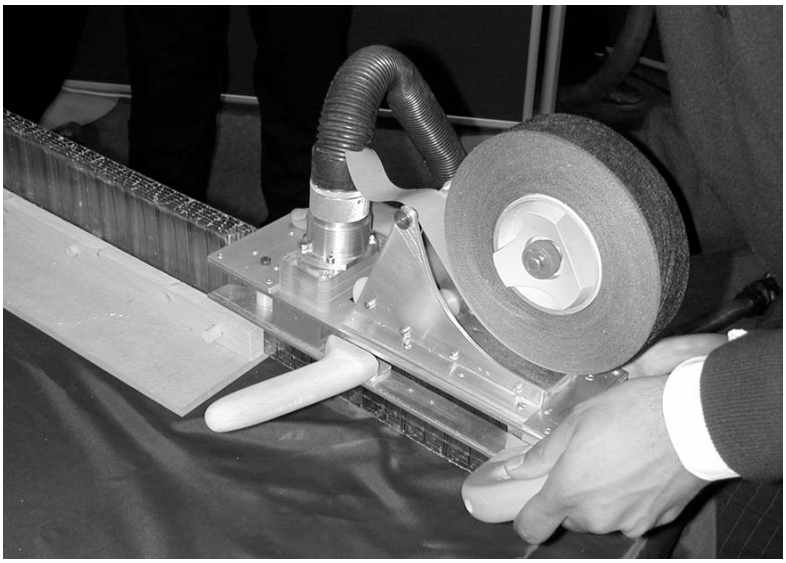

Figure 3. An alternative solution to the edge-taping problem

Figure 4. Courier's Bicycle Prototype

One group's assignment related to the design of railway carriage lighting, using LEDs rather than fluorescent tubes.

The other three projects were suggested by a major automotive consultancy. One was to investigate a range of themed accessories for a 4x4 vehicle, one to investigate secure interior stowage boxes for a 4x4 vehicle and the final one - to look at themed accessories for a top of the range touring/sports car.

With regard to the individual projects over the years some excellent examples of student work has been seen. The 'couriers' bicycle illustrated in Figure 4 is just one example. This project ensured that the student obtained his 1st Class Honours degree and also won several prizes. The prototype is currently on public display at the Coventry Motor Museum.

8 ASSESSMENT OF GROUP WORK

When running group projects it is of utmost importance that the individual students know that their individual contribution to the project has been properly valued. Not only by their group peers but also that they have been allocated the appropriate marks for their effort. It is never in the author's view acceptable to just allocate the same mark to each student in a group without taking other factors into account. At Coventry each group member completes a peer evaluation form these are then used by the module tutors to inform the final grade of each student. It is after all the members of the group who know what each has done. After that marks have been fed back to the groups the opportunity for discussion with the tutors is available although this is very rarely needed.

9 CONCLUDING REMARKS

It is interesting that the courses described above have taken on a life of their own. Although never promoted as 'computer aided design' courses students are increasingly

using more computer aided design and engineering tools such as Finite Element Analysis and Quality Function Deployment as well as use of solid modelling and presentation tools. In a large measure the author believes that this is because they have been given more space and time. It is also felt that the student experience in the final year more closely resembles that found in the design industry.
This aligns with McMahon's postulation [5] that the revolution in ICT could, and perhaps should, change the approaches to teaching used by universities. This in turn could free up some time to allow more actual design and project work to take place [6] It has also been suggested by some of the author's design colleagues that the increased use of computer software for engineering analysis could further release time for design and perhaps more CAD tuition.
It is also extremely interesting to observe that even though groups of students may be working on completely different project briefs they feel that they are in direct competition to be "best in class", even though tutors have not introduced a competitive element.

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