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# Bridging the Gap between Academics and Industry

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# BRIDGING THE GAP BETWEEN ACADEMICS AND INDUSTRY – COLLABORATION ON AN UNDERGRADUATE DESIGN PROJECT

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## Abstract

The benefits of close collaboration with industry for undergraduate design students have been repeatedly emphasised in the literature. This paper describes the operation of a design competition as a collaborative project between the DIT School of Manufacturing and Design Engineering and an external company. Small groups of design students were set a design brief and guided through the year by company representatives and by their academic supervisors. Along with giving an example of problem-based learning and showing how academic projects can remain relevant to the commercial design field, this paper gives an example of what approaches can be taken to ensure that the industry-institute collaboration proceeds smoothly and produces effective learning and results for all concerned.

***Keywords -*** Industry-Academic collaboration, project-based learning, group project, product design, design engineering.

## 1 INTRODUCTION

This paper gives an account of Industry-Institute Interaction on an undergraduate design project, the hurdles involved and the consequent benefits to students, the institute and industry. In this project, groups of third year Product Design students are given an open-ended design brief to which they are expected to apply design, engineering and business skills in order to produce a viable and marketable product. It was decided to embark upon collaboration with an external company in order to give the students the closest possible approximation to real-world design experience. Several international models were studied prior to commencing the project. Feedback was obtained from students and from the company before, during and subsequent to the project. The experiences of the author are documented, together with an account of the outcomes and subsequent work.

### 1.1 Background

Dublin Institute of Technology's Product Design programme is a relatively new one, having been established in 2002. It aims to address the traditional divide between the design engineer and the industrial designer, giving graduates the skills to develop products both from an aesthetic and engineering background. One of the drivers behind the establishing of the programme was to address Ireland's future needs as a knowledge economy based on innovation and development of intellectual property. As a consequence, the program is being developed from year to year on the basis of input from the various stakeholders: the institute's academic staff, professional bodies (the programme is accredited by the IED), industrial partners, external examiners and the National Qualification Association of Ireland. An issue which has been raised by both external examiner and industry partners is the necessity for close ties to industry for the course to ensure that it remains relevant to the needs of industry. For this reason it was decided to embark upon collaboration with an external partner. This paper describes the results of that collaboration.

Tidi Solutions Ltd. is an Irish-owned company specializing in the design, manufacture and distribution of innovative products for the home. The company has offices in Shannon, Hong Kong and Shanghai. The design team is based in the company headquarters in Shannon. The project described in this paper was part of the first Tidi Design Competition, a national competition which the company plans to sponsor on an annual basis, between students in product design programs in colleges throughout Ireland.

## 1.2 Educational Rationale for Project

Collaborative projects, when run effectively, can serve to give immediate feedback from industry to a program. By giving students direct contact with companies in the industry, they gain immediate exposure to the abilities and skills which will be expected of them in industry and are exposed to the commercial realities which lie behind their designs. The consequent benefits to the confidence of graduates are obvious. It has been shown that the undergraduate learning experience can be greatly enhanced from being put in a situation which more closely simulates the industrial environment than a non-collaborative project. From the institute's point of view, collaborative projects enable timely feedback from industry on the students' abilities, which can be very useful in curriculum evaluation. Where the company is concerned, the collaboration will enable them to stay in touch with the current abilities of design graduates, investigate a possible future recruitment stream, and gain positive exposure both within and external to the college. There is no doubt that these projects can be greatly beneficial for all three parties when managed correctly.

It is acknowledged that many excellent designers have come from the shop floor, starting with an apprenticeship and moving up through the academic levels through night courses. This pattern, however, has declined greatly due to the widespread availability of university grants and the "virtual collapse" of the apprenticeship system. Salter [1] mourns the loss of this route of education and the consequent loss of key skills from the design office. He believes that in many ways the old apprenticeship provided a more complete preparation for a career as a designer than the current university based education. He believes there to be several areas in which the old system was superior: apprentices were continuously surrounded by the technology of their industry, and were exposed to a very wide range of company activity. They were exposed to the entire production process and constantly confronted with the results of their own design mistakes, seeing the physical manifestations of their ideas. In the modern day university environment, this is an aspect of engineering education too often neglected in favour of computer simulations, which are cheap and safe for students to use.

Salter believes that it should be possible to transfer the best features of the classical apprenticeship into a university environment and compress them into a shorter time. Projects in which the students are exposed to real industry feedback, are expected to produce working prototypes not computer models, and in which real market pressures are evident, will only help to drive this message home.

The vital importance of combining product design students' natural creativity with instruction and formal guidance has been identified by, among others, Kurowski and Knopf [2]:

> *A successful product designer must combine natural creativity with the systematic use of structured design methodology and modern computer-aided design tools. Practice without proper instruction and formal guidance fails to recognize the vast knowledge of the design process developed by successful professionals. However, designing a product solely by theory without the experience derived from practice is ineffective because many subtleties and exceptions are learned by working on actual design project.*

Butterworth [3] stresses the importance of professional development for design lecturers by close contact with professional designers and outside agencies. He says:

> *A revised design curriculum needs to inspire a passion for making things and a curiosity about how they could be made better, for hand, body and spirit; and to factor in a sense of the expectations of the new consumer. It also has to be supported by increased professional development for teachers, that involves professional makers and designers from a wide range of practice, and those agencies and organisations representing the creative and cultural industries.*

This shows another benefit of outside partnership, that of continual development for lecturers. The days when lecturers could gain an expertise in a subject, gather a set of notes, then spend a forty-year career delivering the same material to successive groups of students are long gone. This is particularly true in technological fields such as design and engineering in which the pace of advancement is continually increasing. It is critical for lecturers to ensure their expertise remains

relevant to the industry, and there can be no better way of doing this than working on collaborative projects with designers from industry.

Steiner [4] describes the experience of Rensellaer's O.T. Swanson Multidisciplinary Design Laboratory in providing real-world experience for students. In this case companies sponsoring projects are required to define an open-ended, technically challenging design problem which is intended to prepare students for entering the workplace. It is clear that such an exercise can only improve students' employability on graduation. Furthermore, many of these projects are multidisciplinary in nature and require students to work alongside students from other disciplines to find a solution. The results are clear:

*We have found that compared to the typical engineering senior, PDI students clearly differentiate themselves, since they are comfortable and competent with multidisciplinary thinking and at odds with the conventional mindset that tends to focus on disciplinary specialization. They represent the kind of student that industry is asking for to be cultivated as our next generation of engineers.*

DIT has a proud history of collaboration with industry. In its strategic plan, the institute states the enhancement of this collaboration as a strategic objective with a view to "extending DIT's student base, the relevance of its programmes and the employability of its graduates, and to ensure the effective participation of DIT with industry in supporting economic development." One of the goals identified by the Institute, through which it aims to pursue this objective, is to develop industry links in programme development and delivery. Projects similar to the one described in this paper form part of DIT's effort to reach that goal.

# 2 METHODOLOGY

## 2.1 Project Structure

The design brief given to the students was specified by Tidi Solutions and was as follows: "To design a product to improve the lives of parents of children aged 0-24 months". This was a slight departure from previous briefs given for the same module, which would specify a product area for the students to concentrate on. Another change made was to run the project as a team project, with groups of 4 students working together. It was felt that this would improve the students' soft skills such as teamwork and project management.

Eight teams of four students each were given an open-ended design brief: "Design a product to improve the lives of parents of children aged 0-24 months". Teams were required to explore the design process through to final design, prototype, branding etc. Three to four visits from Tidi representatives were scheduled at regular intervals during the year – at the beginning, at mid-way for guidance and finally to assess the final products.

The teams were instructed that each team was to elect a project manager, who would keep minutes of team meetings and hold team members accountable for tasks they were assigned. This project manager was to be rotated during the project so that each student had a number of weeks in the role. The students were timetabled for three hours supervised project work during the week.

## 2.2 Observations

The sometimes differing needs of academia and industry were shown clearly in the course of this project. Students were told at the outset that they were aiming to satisfy two judges; firstly DIT academic staff, who would grade the module according to the quality of the design process including the level of the finished product, and secondly, company representatives who were concerned with the viability of the product produced. It was made clear to the students that the most innovative and marketable concept will be the one which wins the competition, but this will not necessarily correspond to the most comprehensive and best design process! From an academic point of view they are judged not only on the final product but also on their presentation skills (written, verbal and image based), teamwork, project management and many other aspects of the project.

Initial negotiations between DIT and Tidi solutions representatives centred on intellectual property ownership issues. Uniquely among Irish higher educational institutions, DIT guarantees that all intellectual property produced by students is retained by the students themselves. It was important to retain this as a key element of the students' involvement; therefore initial requests from the company for all IP to be transferred were turned down. The competition proceeded with the students owning the IP.

The differences between the students' academic and industrial requirements were apparent on the first visit from company representatives to the group. Each team had been detailed to produce a 15 minute presentation on their research and work so far in the project – this would include their primary and secondary research, conceptualisation and the presentation of three concepts which they feel would be viable prospects for further development. It was important for the academic supervisors to examine and assess a full suite of learning outcomes including process and product, presentation, teamwork, etc. The company, however, had little interest in the research and was mainly concerned with two assessment criteria: the marketability of the concepts and the innovation shown therein. It was necessary to give a clear message to the students that success in the competition would not necessarily mean the highest marks awarded (or vice versa).

It was also concluded that a more interactive approach was required and future sessions were run, not as a presentation session, but as a show-and-tell session, where the students demonstrated their concepts briefly and company representatives were given far more time to question the students on various aspects of the design. Some images of these meetings are shown in Figure 1.

Figure 1: Project Meetings with Tidi representatives

## 2.3 Sample Outcomes

A variety of innovative products were produced in the course of the project. Shown in Figs. 2 and 3 is “the Stork”, a baby sling which can be attached to a buggy to that the child can be easily lifted out of the buggy, and “myPak”, a baby changing unit stored in a conveniently-sized backpack for easy access. All groups produced virtual and physical prototypes of the products they designed.

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Figure 2: The Stork: a new baby sling


Figure 3: myPak Jnr: A backpack which opens to become a changing unit

# 3 PROJECT OUTCOME

## 3.1 Results and Conclusions

The competition judging was undertaken by Tidi Solutions with no input from academic supervisors. The company used focus group techniques, as they would when developing a commercial product, to select the winning design. Figure 4 shows the designers of the winning product, "Cotflip – a retractable baby changing table for your cot", receiving their award from Murty O'Donoghue, MD, Tidi Solutions.

Students and company were asked for feedback on their experiences and what they felt that they gained from the project. The results are summarised in Figure 5.


Figure 4: Benefits from Collaborative Project to Students, Company and Institute

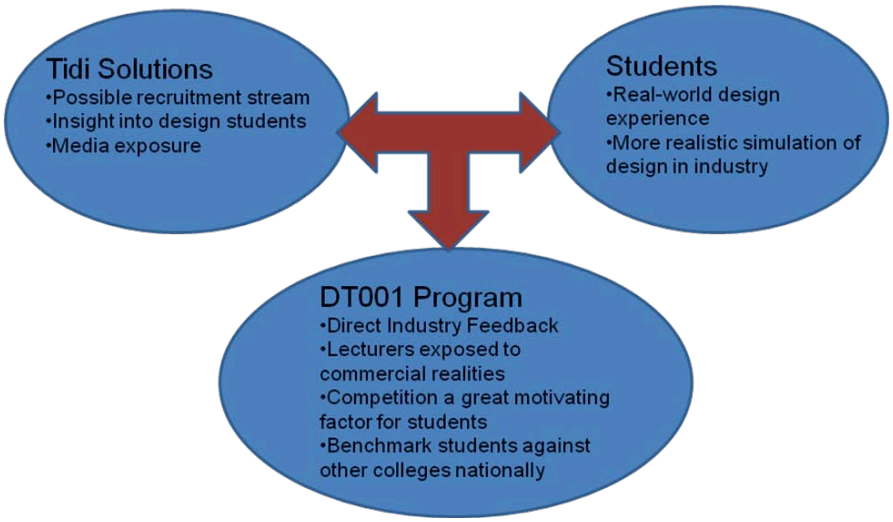


Figure 5: Benefits from Collaborative Project to Students, Company and Institute

## 3.2 Outcomes and Subsequent Work

The final assessment of projects took place in March 2009. After that date, further feedback was obtained from the student group, and also from external examiners. Having taken into account the views of all stakeholders, the competition was planned to run for a second time for academic year 2009-10.

The structure of the competition was altered significantly for its second year. It was decided that there will be one national award. The prize on offer is that Tidi Solutions will offer to take the winning product to market and pay royalties to the students. It was stressed to the students that they have the choice of whether to licence their design to Tidi or not.

Figure 6: Initial Meetings for Session 2009-10

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