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Teaching Design Led Innovation: The Future of Industrial Design

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Abstract: The profession of industrial design is changing and with that so must industrial design education. The newly derived final year industrial design unit at the Queensland University of Technology (QUT) was created to initiate such a change. A designers' role in industry is no longer limited to the invention process surrounding human centered design but has now evolved into design led innovation. This paper reflects upon the teaching methods employed over a two-year period and improvements made over that time to the unit. The student project outcome is to produce a design solution that integrates an underlying novel technology into a new product and or service, with business strategies and manufacturing details being fully integrated into the design process. It is this integrated approach to industrial design teaching that will foster a more grounded and resourceful future designer.

Keywords: Industrial Design, Design Led Innovation, Design Education

Introduction

THE AUTHORS' ROLES in this unit were to develop, co-ordinate and execute the fourth and final year industrial design class, within the new course, Bachelor of Design (Industrial Design) at the Queensland University of Technology (QUT). This unit was run for the second time in 2010 and a comparison on the improvements made will be discussed. This paper examines the approach taken in creating this new unit, including curriculum structure and learning outcomes while implementing and reflecting on more effective approaches to its teaching.

The practice of industrial design has seen a rapid transformation over the past decade. As part of this transformation, the profession of industrial design has also evolved to meet the growing expectation of clients. In recent years, industrial designers typically have formed part of a larger eco-system of professionals, which develop innovative and sustainable products and services for a wide spectrum of clients. To meet this changing demand, the knowledge and skills of a contemporary industrial designer have expanded to compliment their existing expertise in manufacturing design, but to also consider the experiential, business and supporting services of a final design solution. Often industrial designers are brought into a project at an earlier stage and it is expected that they assist in defining a product strategy rather than solely defining a one off solution.

This paper will touch on some of these emerging approaches in industrial design, as does the content and structure of the unit. It provides students knowledge about the various contexts that impact on products – from client engagement to business and manufacturing. The unit

also aims to provide an environment allowing the exploration of these concepts by working on a hypothetical industry related project grounded in Intellectual Property (IP) within a professional design studio context.

Design Led Innovation

In an era where companies can no longer rely on technological breakthroughs and incremental product development to compete on an international stage, innovation is high on many management agendas (Gassmann, 2006; Chesbrough, Vanhaverbeke & West, 2006; Cagan & Vogel, 2002). Innovation creates a competitive advantage which leads to company growth. Design is the key that reveals the differentiator through an experiential understanding of a market and its users. Design enhances the outcomes of numerous innovation activities, bringing together benefits such as increased quality of goods and services, improved production flexibility and reduced material costs (Cox Review, 2005).

Traditionally, the role design has played within companies has confined it to the manufacturing and production arena or as a styling afterthought. Nowadays design is increasingly being viewed as a vital and important strategic business resource (Dell'Era, Marchesi & Verganti, 2010) and consequently companies worldwide look to design to help them innovate, differentiate and compete in the global marketplace. This is done by properly employing, carefully evaluating, skillfully managing and soundly implementing design throughout a company's business strategy (UK Design Council, 2004). The value design brings is a different way of thinking, doing things and tackling problems from outside the box. In practice, design is key to greater productivity, whether by way of higher-value products and services, better processes, more effective marketing, simpler structures or better use of people's skills. Design is no longer a niche market luxury. It is the most persuasive priority for solving problems, ensuring long term sustainability and gaining competitive advantages (Queensland Smart State Council, 2008).

Design Led Innovation, broadly refers to a set of methods which allow the designer to consider and evaluate their design development from multiple perspectives, typically spanning user needs, business requirements and technology demands. The final design solution is not presented as an artifact in isolation, but an integrated product and service concept. As the design profession moves from servicing a manufacturing economy to a knowledge economy, the role of a designer assisting their clients has also evolved and new approaches to design used. Design Led innovation is a strategy that aims to radically change the emotional and symbolic characteristics of products through a deeper understanding of broader changes in society, culture and technology. Rather than being driven by user needs or technological developments, Design Led Innovation is pushed by a firm's vision about possible new product meanings and languages that could diffuse in society (Verganti, 2008).

Chhatpar (2007) argues that in order to do their job most effectively, designers need to be brought into the innovation process at the very earliest stages. Many companies today still make the mistake of keeping business strategy and design innovation separate. "Typically, marketers conceptualise a new product based on business strategy; the project team gets input from various areas of the company and creates a business case; and senior executives make a final choice from among the possibilities they're given. Only then does the idea go to the designers" (Chhatpar, 2007:30).

The sequential method above ensures that the product fits within the company strategy, allowing the team to build a general consensus, and gives senior executives an array of options. This can take time. Design Led Innovation however, brings designers in at the very beginning of the process, allowing designers to bring innovation and creative thinking in at the ground level, producing a more innovative solution. As the business case is being developed, prototypes are put into circulation to uncover users' responses and attitudes with the project team, enabling the company to nimbly adjust to changes in market opportunities long before the product concept is set in stone.

Through Design Led Innovation, solutions are created that customers do not expect, but they love, by creating products and services that are so distinct from those that dominate the market and inevitably make people passionate. It creates an unbeatable and sustainable competitive advantage through innovations that do not come from the market but that create new markets. Firms using Design Led Innovation are competing through products and services that have a radical new meaning: those that convey a completely new reason for customers to buy them (Dell'Era, Marchesi & Verganti, 2010). Dell'Era, Marchesi and Verganti (2010) identify Design Led Innovation as "innovation where novelty of message and design language are significant and prevalent compared to novelty of functionality and technology". It is based on the idea that each product holds a particular meaning to consumers and that the style is just possible language that can be exploited to communicate it. From concept through development, designers should function in parallel with corporate decision makers, creating designs for a number of variations on a product and then test them with users and, if appropriate, partners (Chhatpar, 2007).

Good Design = Good Business

Thinking like a designer can transform the way you can develop product, services, process and even strategy (Brown 2008). Design has and continues to reposition itself from a downstream manufacturing related activity to one, which adds strategic value to business. Although the role of design is constantly evolving, the fundamental underpinnings of design thinking have remained largely unchanged. The importance of design to a firm's innovation has been the subject of much previous research (Bruce & Bessant, 2002; Walsh, 1996), particularly in the design and development of new products.

Martin (2009) believes that design thinking is the way in which to transform a companies innovation capabilities, through structure and process. By using the exploration of new knowledge (innovation) combined with the exploitation of current knowledge (efficiency) to regularly generate breakthroughs and create value for companies competitively (Martin, 2009).

Formosa and Kroeter (2002) agree that design is a key and vital component of business discussions today and that design is absent from the majority of educational business programs. They propose a new business education strategy to fill these voids in the design criteria, where the goal is to produce business leaders who are fluent in the principals of business management and who are simultaneously acquainted in the principals of design (Formosa & Kroeter, 2002). The basis of this analysis was graduate business programs in the United States of America. The suggestion of electives and workshops to be taken focusing on inter-divisional collaboration was the proposed solution. A cross comparison of art/design programs at the leading universities across America was produced. As well as the suggestion that a

university that has a design school will develop better business graduates. It is the authors' opinion that the mere cross discipline elective is not sufficient enough to facilitate such an imperative change. This unit was derived as an industrial design subject employing business skills and evaluation approaches, a simple business unit elective, as substitute for this unit would not have produced the same outcomes for the students.

From a business and education standpoint, these areas have acknowledged but not yet identified how to implement the infiltration of design into business curriculum successfully. But it is still obvious that infiltrating design into business and business into design are two separate tasks, this unit developed by the authors' deals only with the latter. In an attempt to address this gap in knowledge a unit was developed which integrated design and business knowledge together within the industrial design course discipline.

Teaching Theory

The aim of this unit was to provide students with knowledge pertaining to product integration within various service and system contexts relevant to industrial design. This is imperative due to the fact that professional industrial designers frequently need to integrate different contexts and cross discipline boundaries in order to achieve a successful design outcome. Lectures were given throughout the semester on a variety of subjects including: client engagement, market analysis, intellectual property, co-designing business scenarios and design strategies.

Project Context

Research and technical development create the foundations for product opportunities, but do not identify them. In order to find and implement these opportunities, both insight and design are needed. Design provides the link between the pushing mechanism of technical development and the pulling mechanism of the market place. This is essential for transforming inventions into innovations and for linking the often implicit demand with the emerging possibilities. Design can develop what technology allows into specific proposals, and it can also be used to sell the innovation (Keinonen 2006).

Students were given a hypothetical scenario to complete the assessment pieces within the overall project context. The scenario consisted of the class being a medium sized industrial design practice, who pro-actively peruses projects, by identifying new technologies and transforming them into new products and services.

In this scenario the industrial design firm has a relationship with a large technology research and development organisation, which has the patent rights to a number of innovative technologies. The technology organisation, does not develop products around their own intellectual property, but rather licenses the technology to other organisations who would integrate this into a product, then launch within a specific market. This model has been highly successful for the technology company as the royalty and licensing fees return a healthy profit to enable ongoing research and development to occur.

The technology company has no expertise in product development, and uses the services of the design firm to firstly explore what opportunities exist, and then develop businesses around their underlying technology in new or existing markets.

Therefore the role of the students was to work with a client/researcher to explore the application of their core technology in new markets, while also developing a design strategy to assist them in making the decision to invest in developing their own products, which they hope to launch within an 18 month timeframe. In order for them to make the necessary budget commitments, they would like the design vision to be presented to them within 6 months.

As the technology organization does not undertake market research or prioritise its intellectual property (IP), the student's first role is to identify potential technologies available and gain the buy in from the project team to develop the project into a business opportunity. This first activity is undertaken speculatively and if successful (client buy in) students engage to transform the idea into a design solution where they are able to resolve the design, business case and manufacturing plan.

An example of this can be seen in one group of students who linked technology, business and design together to produce an implementable solution. The students in this example adopted the 'ceramic mesh filtration' technology system (developed by scientists at the Queensland University of Technology). This can be seen in Image 1.

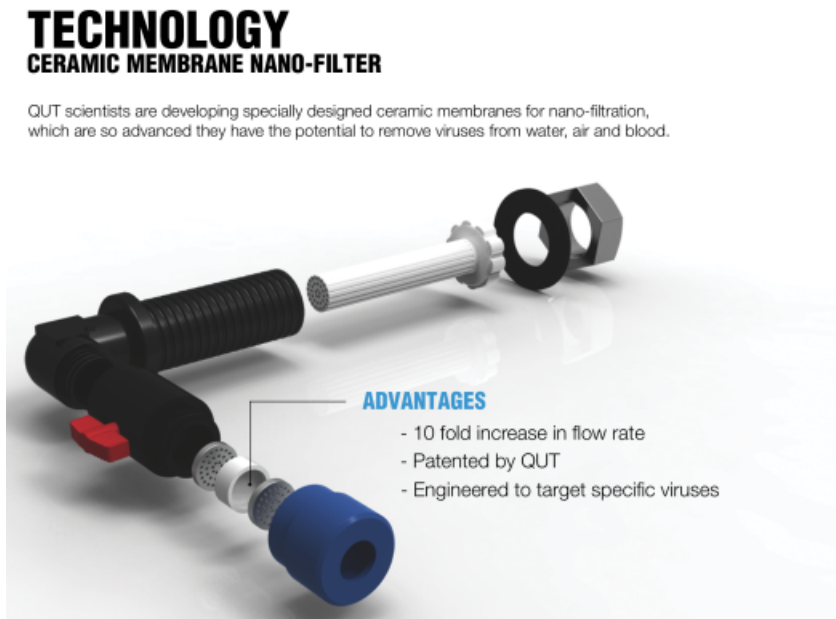


Image 1: Novel Technology

By engaging with these researchers (clients), the students investigated many possible design avenues, such as; the medical arena for filtering viruses in blood and the emergency relief industry. Throughout the design process the students kept questioning their design through a user, market and technology perspective. This allowed for continual evaluation and constant appraisal of the designs from the researchers (clients) and lecturers. Over the duration of the unit the students filtered through many possible design opportunities, a final design direction was then agreed upon. In this case it was the humanitarian need to filter water for farming irrigation of third world countries that was to be targeted. This can be seen in Image 2. The

students then evaluated their design solution through market analysis and manufacturing costing constraints until a complete feasible final design solution and business case was produced.



Image 2: Design Solution

Unit Evolution

As this unit has been run twice now, some of the main differences and changes made were associated with the structure and content of the material. As presented in Table 1.

Table 1: Evolution Summary

Unit	2009	2010
Structure	<ul style="list-style-type: none"> Split the teams up into a manufacturing and marketing focus and gave exclusive guest lectures on the separate topics 	<ul style="list-style-type: none"> As a team the pair of students had to focus on manufacturing and marketing as well as the impacts this has upon their final design solution
Content	<ul style="list-style-type: none"> Staff engaged with six different clients/researchers and provided substantial data on each piece of technology for the students to choose from Final design development was absent as the separate reports were the students focus and main priority at the time 	<ul style="list-style-type: none"> Students were responsible for selecting a researcher/client from QUT and arranging a meeting to engage with them Introduced a peer assessment criteria for each student to evaluate their team member
Presentation	<ul style="list-style-type: none"> The students presented the final design to the client/researcher at the end of semester in small groups 	<ul style="list-style-type: none"> A short pitch was presented to external investors on behalf of the clients as well as the entire class

By allowing students to select a piece of technology or novel research results, the unit run in 2010 provided a greater variety of project scope to the class and allowed students to select a topic of interest, thus creating a more positive attitude to the project. Additionally, the majority of the clients/researchers were unaware of the profession of industrial design and students had to convince them of their worth and contribution. This was a vast improvement on the previous year where the clients were already engaged in the unit due to the staff's recruitment.

Mid-way through the unit run in 2009, the teams were split into manufacturing and marketing foci. They were individually responsible for the write up of the focused report. This caused the final design to be left behind as it did not evolve concurrently with these decisions. In 2010 the teams worked together on both areas and looked more deeply into how these decisions in business and manufacturing would have an impact on the final design, leading to a more refined design solution.

The final design presentation in 2009 was separated into small groups, containing the clients/researcher who was engaged by multiple teams in the class. The impact was lost by having the class separated in small groups, as students were then unable to present to the rest of their peers. This was compared to the presentation style of 2010 where a short pitch to an external investor panel aimed to acquire initial investment to further capitalise on the design solution.

After an anonymous class feedback survey completed in 2009 and three interviews with graduate students from both years, the following comments were made:

- This unit was unlike any other subject, the staff were not driving the direction and feedback of the designs, the clients were.
- The practical skills learnt helped immensely in later endeavours outside university.
- The client from the project was impressed enough to create a job for the student upon graduation the following year.
- The realism of the project and client interaction gave the students motivation to do well and impress the client.
- One student said it was the best class they had taken at university.

Final Remarks

Educational delivery and content must be continually reviewed and considered in order to be successfully received (Briggs, 2003). Some of the improvements made to the evolution to this unit have been discussed earlier and as this unit continues to evolve so will its positive outcomes. Every year the unit widens its audience to many students from cross disciplines such as engineering, creative industries and business, by adding these students to the class mix of industrial designers it gives the projects a more diverse focus and challenges the students way of thinking. Positive student feedback was received in a formal manner (university learning and teaching experience survey) and informally with students expressing their appreciation of the unit after the final presentation. Creating, developing and delivering this industrial design unit has been a great challenge and rewarding not only for the students but for the staff as well.

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This knowledge community is brought together by a shared interest in the process of design and their conceptual foundations. The community interacts through an innovative, annual face-to-face conference, as well as year-round virtual relationships in a weblog, peer reviewed journal and book imprint – exploring the affordances of the new digital media. Members of this knowledge community include academics, designers, administrators, educators, consultants and research students.

Conference

Members of the Design Community meet at the [International Conference on Design Principles and Practices](#), held annually in different locations around the world. The Design Conference was held at Imperial College London, in [2007](#); in conjunction with the University of Miami, Florida, USA in [2008](#); at Technical University Berlin, Germany in 2009; at the University of Illinois at Chicago, USA in [2010](#); and at Sapienza University of Rome, Italy in [2011](#). In [2012](#), the conference will be held at the University of California, Los Angeles, USA.

Our community members and first time attendees come from all corners of the globe. Intellectually, our interests span the breadth of the field of design. The Conference is a site of critical reflection, both by leaders in the field and emerging scholars and practitioners. Those unable to attend the Conference may opt for virtual participation in which community members can either submit a video and/or slide presentation with voice-over, or simply submit a paper for peer review and possible publication in the Journal.

Online presentations can be viewed on [YouTube](#).

Publishing

The Design Community enables members of its community to publish through three media. First, by participating in the Design Conference, community members can enter a world of journal publication unlike the traditional academic publishing forums – a result of the responsive, non-hierarchical and constructive nature of the peer review process. [Design Principles and Practices: An International Journal](#) provides a framework for double-blind peer review, enabling authors to publish into an academic journal of the highest standard.

The second publication medium is through the book series [On Design](#), publishing cutting edge books in print and electronic formats. Publication proposals and manuscript submissions are welcome.

The third major publishing medium is our [news blog](#), constantly publishing short news updates from the Design Community, as well as major developments in the field of design. You can also join this conversation at [Facebook](#) and [Twitter](#) or subscribe to our email [Newsletter](#).

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