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Brisbane Australia

This is the author's version of a work that was submitted/accepted for publication in the following source:

Wrigley, Cara & Bucolo, Sam (2011) A design approach to teaching new product development. In *International Conference of Education, Research and Innovation 2011 (ICERI2011)*, 14 - 15 November 2011, Melia Castilla Convention Centre, Madrid.

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A DESIGN APPROACH TO TEACHING NEW PRODUCT DEVELOPMENT

Cara Wrigley, Sam Bucolo

*Queensland University of Technology (AUSTRALIA)
cara.wrigley@qut.edu.au, s.bucolo@qut.edu.au*

Abstract

The educational unit new product development, taught within the industrial design program at the Queensland University of Technology (QUT) introduces the relationship between product design and commercialisation to third year industrial design undergraduate students. In which, they are exposed for the first time to product strategy development aimed at meeting consumer expectations, whilst at the same time achieving corporate objectives. Delivered content such as intellectual property, market opportunities, competitor analysis and investor requirements are taught within the thirteen week semester timeframe. New product development theory is not a new field. However, the design approach to teaching this theory and more importantly how designers can use it in the design process is novel. This paper provides an overview of the curriculum design of this unit as well as its incremental development over the past four year duration period. Student project outcomes and more importantly the process and tools from this unit are also discussed and presented.

Keywords: Industrial Design, Design Education, New Product Development.

1 INTRODUCTION

In the thirteen week long semester the unit new product development (NPD) is taught in the second half of the third year industrial design program at the Queensland University of Technology (QUT), Brisbane, Australia. Up until this point in time, the industrial design undergraduate students' education has been primarily focused on aspects of human centered design and core design skills. These foundational expertises are imperative in order for the students to have a well developed understanding of ergonomics, user needs, manufacturing and design process. Building upon this foundation the introduction of NPD theory to students has been developed and run as a unit over the last four years, in which time the authors' roles have been to develop, implement and evaluate the design of this unit.

Previously the theory of NPD has been taught within industrial design programs across the world as a marketing elective or unit adapted from main business programs, where the content is taught and delivered to design students from the business faculty alone. The difference with this unit is that the content presents the question of how does this theory impact on the design of a product? It provides industrial design students the opportunity to expand their foundational design tools and engage in the possibility of commercialising their designs. The aim of this paper is to provide an overview of the curriculum design including the incremental developments executed over time and additionally the challenges faced during that period.

2 NEW PRODUCT DEVELOPMENT

New product development (NPD) is a term that broadly describes the management of processes which is required to bring a product or service to market. It has been previously established that the fields of marketing and design are key contributors to the new product development process (Kotler, 2003; Kahn, 2001; Bruce and Bessant, 2002). But can this statement work the other way around? How does new product development contribute to design? More specifically industrial design? Particularly concerning how, and the degree to which marketing, business and industrial design are inextricably linked into the development process. This requires further investigation if the understanding of these critical aspects of product design are to be managed and intergraded effectively (Veryzer, 2005).

Globally, new product development is an essential part of a healthy growing economy and business structure (Annacchino, 2007). Yet few business activities are heralded for their promise and approach to optimistic outcomes derived in the NPD engagement process. Through the creation of new products and services, revenues and profits are generated and returned to individuals, businesses and governments. From which successful new products have the added benefit of revitalising an

organisation, resulting in a growing trend within the area of new product development management literature, spanning the past 30 years (Trott, 2005).

Within the realm of NPD industrial designers play various roles. These roles vary from maker to marketer. However one role that is universal throughout the NPD cycle is the skilled ability for the designer to not only see the bigger picture in terms of the design at hand, but the ability for a designer to confidently present a proposal that could ultimately allow the product or service to become a reality. Typically this would involve the designer in the restricted role of developing a feasible design concept that meets the intended user needs. NPD also involves identifying how the project can be funded by demonstrating that it can become an economically sustainable value proposition. Often such considerations are undertaken separate to the design process. However, by considering the business implications of a design, at the time of design development will ensure the final solution has been customised to meet the needs of both the user and market.

Product innovation and the development of new products and services has become crucial to the survival and prosperity of the modern business and without NPD would not be achievable (Bucolo & Matthews, 2011). Industrial designers play a significant role in this development process due to the fact that at its core is the generation of the ideas and concepts which underpin product and service innovations. Being able to translate these ideas and concepts into commercial opportunities is also a critical step in the product development cycle.

Decision makers in the new product development process must address five key issues: What to launch, Where to launch, When to launch, How to launch and Why they are launching. These decisions involve significant commitments of time, money and resources. They also go a long way toward determining the success or failure of any new product or service. Deeper insights into tradeoffs these decisions involve may be able to help increase the likelihood of success for product launch efforts in the future (Hultink, Griffin, Hart & Robben, 1997). It is the proposition of this educational unit taught at QUT that designers are encouraged to be a part of these decisions at the forefront of the product development cycle not at the end.

3 TEACHING THEORY

The aim of the NPD unit is to provide students with the knowledge pertaining to the commercialisation of product design and what effect this will have on the re-design of their initial idea. Theory is taught during the semester in regards to market size and share, intellectual property, competitive advantage, funding requirements and path to market strategies. The main learning objectives for students are in addition to knowledge pertaining to the theory of new product development, are also to understand and be capable of applying it to the design process in an iterative cycle. Skills such as pitching to investors and writing a business case were also taught and assessed in the unit.

4 PROJECT CONTEXT

The first stage of the new product development cycle is often referred to as the '*Fuzzy Front End*' (Kahn, 2005). Industrial designers have traditionally played an important part in this stage of the development cycle, where they are required to respond to a brief in the form of design concepts. There are many formal and informal approaches used to assist the designer to generate creative solutions in this initial design stage. However it is this stage of the project that allows students to extend their traditional design toolset that can be applied to a design concept – specifically those that are governed by the product classification and product development strategy for the type of product or service being developed.

Students were required in groups (of three to four) to individually select a design idea they had previously produced (either within the industrial design program or outside the university) and take this design through all the NPD stage gates, theory and tools to evaluate and challenge their original design idea. The project was undertaken in two stages. Part A allowed students to expand an existing design idea using a series of NPD tools that were introduced in the first half of the semester. Part B allowed students to develop and present a new product development strategy as a business case for their design concept as well as pitching this idea for investment.

The assessment submission was two formal presentations (one in week six and one in week fourteen) where students presented:

- An original design solution
- The application of the tools to the design concept and expansion of the design idea
- The evaluation of the design exploration, referencing the analysis phase
- The final design solution justified through an initial new product development strategy

The purpose of the business case was to capture the reasoning and justification for ultimately selling the project outcome to financial investors. This project provides an introduction of the diverse approaches to business case preparation and presentation for new product development. This is done by applying the theory learnt in the lectures to the revised design solution from Part A of the project.

As a group, students are required to refine their chosen design concept by considering specific strategies on how the product might enter the market. They had to decide on the best possible strategy and probably refine the design concept further to work within their chosen approach. Also students needed to identify what funds were required to launch such an initiative (beyond manufacturing costs) and identify where such funds may be sourced.

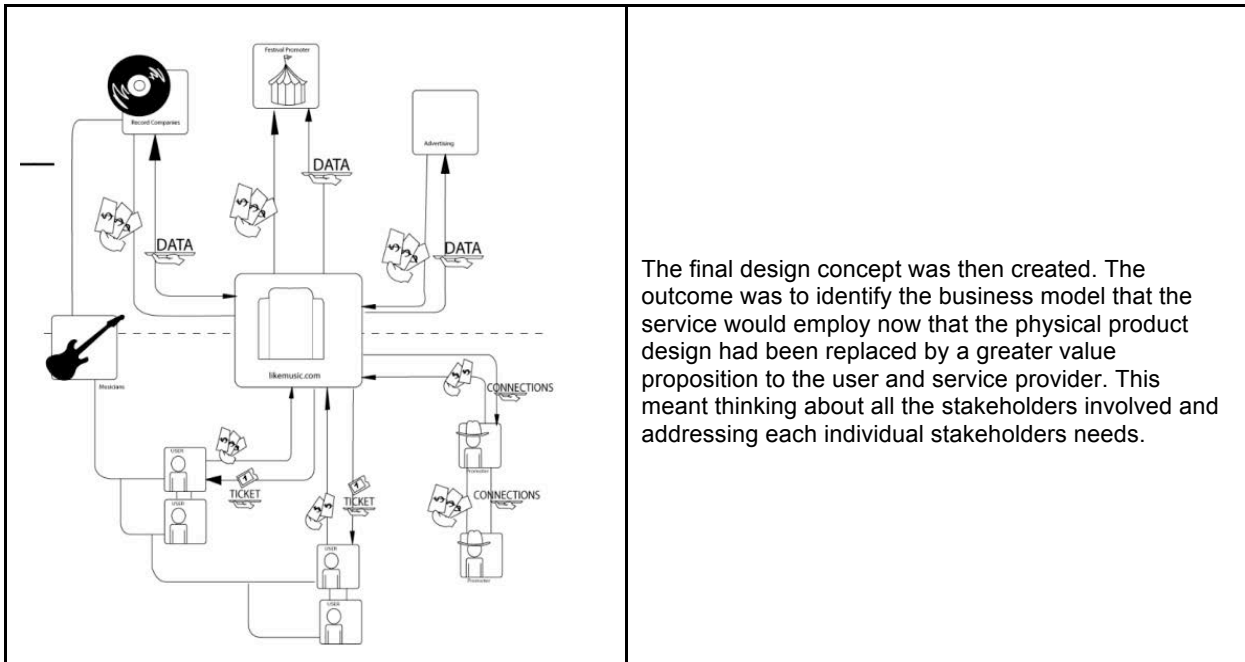
Lectures and tutorials were provided to allow for refinement of the design concept and develop the business case on a weekly basis in class. Feedback was then provided during the tutorial sessions from the lecturers and tutors. Within the business case every new product development decision was rationalised and justified in relation to the NPD strategy. The final task was then to present the new product development strategy as a final business and design solution, which was then used to seek investment in order to launch the new product or service into the market place. The final design idea and strategy was then summarized and 'pitched' to an external panel that then provided feedback on the feasibility of the groups new product development strategy.

The business case submission requirements:

- The design solution and need
- Market Size and Share
- Service Design Strategy
- Competitive Advantage
- IP Protection and Strategy
- Market Entry Strategy and Business Model
- Funding Requirements
- Potential Risk and Returns

5 STUDENT PROJECT OUTCOMES

A group of students (Jack Walkom, Matthew McNaughton, Jared Gilsean and Sam Bleakley) from the 2011 class started the semester with four different design ideas which was then narrowed down to one by using the NPD tools as analysis stage gates to try and kill the ideas off one by one. After the presentation in week 6 the RFID (radio frequency identification) wristband to be worn by patrons at music festivals was selected as the most viable option. After the application of the NPD theory and tools this idea transformed into a service design business centred around the organisation and ticket purchasing involved with music festivals. Their work is shown as an example of the new product development process and can be seen in the Table 1.



6 UNIT EVALUATION

As this unit has been run now for the fourth consecutive year some of the changes made were associated with the structure and content of the material. As presented in Table 2.

Table 2: NPD Unit Evolution

	2008	2009	2010	2011
Content	<ul style="list-style-type: none"> • NPD Overview • NPD Strategies • Developing a technical case • Ideas to Innovations • Organisational structures • Market Size and Share • Competitor advantage • Market Entry Launch • Funding Requirements • IP • Business Case and the Pitch 	<ul style="list-style-type: none"> • NPD Overview • Product Classification • NPD Strategies • Analysis Tools • Market Size and Share • IP • Business Case • Organisational Structures • Funding and Costing 	<ul style="list-style-type: none"> • NPD Overview • Investor requirements • Product Classification • IP • Competitor advantage • Market Size and Share • Path to Market • Funding and Costing • Return on Investment • Business case and Pitch 	<ul style="list-style-type: none"> • NPD Overview • Product Classification • Service Design • Competitor advantage • Market Size and Share • IP • Path to Market • Funding and Costing • Manufacturing Requirements • Return on Investment • Business Case and Pitch

As table 2 highlights the content of the unit has changed over the past four years. The main difference is that students are now exposed to a lecture on 'service design' early on in the semester. For most students this is the first time they have had to produce a design that may not end up with a physical product as a solution.

7 STUDENT EVALUATION

In a retrospective interview with students from various years having completed the NPD unit, responses were given on their thoughts to the value that the unit provided in the context of their industrial design education.

One student responded that “NPD introduced us to business thinking and concepts that are foundational in grounding industrial design in reality”. Another stated, “designers must be conversant in business to succeed as a professional designer”. There was a unified consensus that “business is a universal language that designers need to learn to speak and the unit NPD teaches this extremely well”. Remarks such as “it put industrial design in the context of the real world” and that “the unit opened my eyes up to many more paths to industry and options rather than being a service provider working as an in-house designer”.

8 CHALLENGES

The authors have had to face many challenges involved with this unit over time. One is the resistance from students to learn this theory, they are reluctant to believe its worth and value. At the beginning of the semester the attitude of some of the students is that this is not what an industrial designer does and that this is a marketers role. Students place this theory outside the traditional realm and understanding of the role an industrial designer plays and therefore rejects the theory outright. It is not until the end of the process (the unit) that they see the full impact and turn around their design has had. The authors have had many of these students retrospectively express their newly found appreciation and respect for the theory and skills taught in this unit.

9 FINAL REMARKS

A continual review of the teaching theory and curriculum must be applied to all educational content in order to deliver quality teaching material and methods (Briggs, 2003). The unit discussed in this paper is currently evolving based on the reviews and comments made each year by the students and staff. As a result each year the quality of student work produced increases as the content evolves and improves. This unit of new product development, taught in conjunction with the other foundational and speciality teaching units within the industrial design programme taught at the QUT is imperative to producing a grounded future industrial designer. It is the authors vision that this unit is just the beginning in an effort to embed industrial designers in various areas of business, allowing them to potentially integrate their skills and knowledge into companies be it product or service centric.

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