

DEVELOPING A SUCCESSFUL PEDAGOGY OF FRONT END STRATEGIC INNOVATION FOR INDUSTRIAL DESIGN STUDENTS

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ABSTRACT:

It is accepted that industrial design practice has changed, and that design education is also changing to reflect realities of innovative new product development (NPD). The paper presents a model innovation process, called Front End Industrial Design (FE-ID), which is employed in undergraduate teaching and learning. It has been developed to tackle the pedagogy of the broad arena of pre-brief, front end innovation activities in commercial NPD. Both macro and micro views are presented of the FE-ID process, providing an overall perspective but also reflecting on some of the particular (micro) activities which are considered critical for success, but which are notoriously difficult to develop. The FE-ID process has been found to be effective in developing knowledge and abilities in students to enable them to operate further up the NPD food chain, more in a business and brand context of ideas and propositions - not simply realised products and services.

1. INTRODUCTION

How often do industrial design educators pose the question "What do we expect our students to do, as a student and as a graduate?" The question probably arises when the design curriculum is being reviewed. The answers range from the designerly skills of drawing and CAD through to the more contemporary career ambitions of business and entrepreneurship. For example, the book *DesignDirect* (Ball and Overhill 2012), proposes a view of graduate design education as preparing designers to become CEOs.

The author has been pursuing a quest in industrial design education for nearly a decade. The holy grail is to find a way to offer industrial design students an achievable, sustainable future operating at the so-called 'front end' of commercial new product development.

Together with fellow teaching colleagues it was realised how pressing the need was to develop new components of an industrial design curriculum to cope with the radically changing design landscape of the early to mid 2000s. Wormald and Rodber (2006) detail a range of drivers for change that will now be familiar to most industrial designers, especially those from Western countries. Our concern, as industrial design educators, was that our student output would become 'designersaurus' - out-of-date industrial designers trained to work in a massively changed world. The danger would be that, as graduates, they could only operate towards the bottom of the food chain, as mere commodity suppliers.

The challenges of change tackled by the author are detailed in several publications (Wormald 2009, 2011). These papers also describe the research activities that monitored and evaluated the changes as they were happening. What has emerged is the realisation of a new broad area of design education. The author has named this area "Front End Industrial Design" (FE-ID). Pedagogical research, and research into associated relevant professional design practices, has had the objective of working out detailed educational methods, pathways and frameworks so that graduating industrial designers have enhanced knowledge and abilities across this new FE-ID landscape.

What has come to pass in the global design and business world has strengthened the case for industrial design students to be exposed to this front end of innovation. Movements such as Design Thinking, design-led innovation, and brand-driven innovation (Brown 2009, Verganti 2009, Roscam Abbing 2010) have emerged as critical components of successful commercial new product development. It has been realised that the teaching and learning of FE-ID is related to most of these developments - in a highly affective manner. This adds weight to the importance of the pedagogy of FE-ID.

This paper reviews some of the macro and micro aspects of FE-ID. This has been achieved through continuous reflection on personal teaching practices, plus an ongoing research project which seeks to better understand relevant professional and educational practices as they relate to FE-ID.

A significant aim of the developments in educational research and investigation into the design profession is to produce a workable 'theory' of front end innovation, at least one that can be exploited by industrial design students. What has been regarded as 'fuzzy' (as in fuzzy front end) is being made less fuzzy. Explicit learning and teaching activities are being generated to replace the tacit, 'black art' rules of thumb of the past.

2. MACRO OVERVIEW OF FE-ID

Figure 1 presents a process diagram of FE-ID. Included in this, simplified, map are the various inputs, internal activities, connections, and outputs that make up the overall FE-ID 'machine'. This diagram is an updated version of previously published FE-ID maps (Wormald 2009, 2011).

The map shows areas of user research (UR), global research (GR), and brand research (BR) within a context of commercial new product development (NPD). A traditional product design brief is an outcome resulting from the completion of FE-ID. Hence the process is almost wholly pre-brief, being positioned at the front end of NPD. At the start there is no product, there is no idea. There is simply an imperative to 'be innovative'. Hence, this process can be regarded as strategic within early stages of NPD.

The aim of FE-ID is to arrive at a highly focused value proposition which makes a clear, attractive offer to a target user group, and which is aligned with a brand. These ideas and opportunities can be utilised as starting points for industrial design product conceptualisation and realisation.

This is a brief, brisk 'walk-through' of the FE-ID process

The 'change driver' is the starting point. It is commonly a phenomenon or event in one of the following areas; political, environmental, economic, societal or technological. These so called PEEST factors can be global or local in potential impact.

A theme is then formulated along with a context of likely users, stakeholders, experiences, scenarios and related PEEST factors.

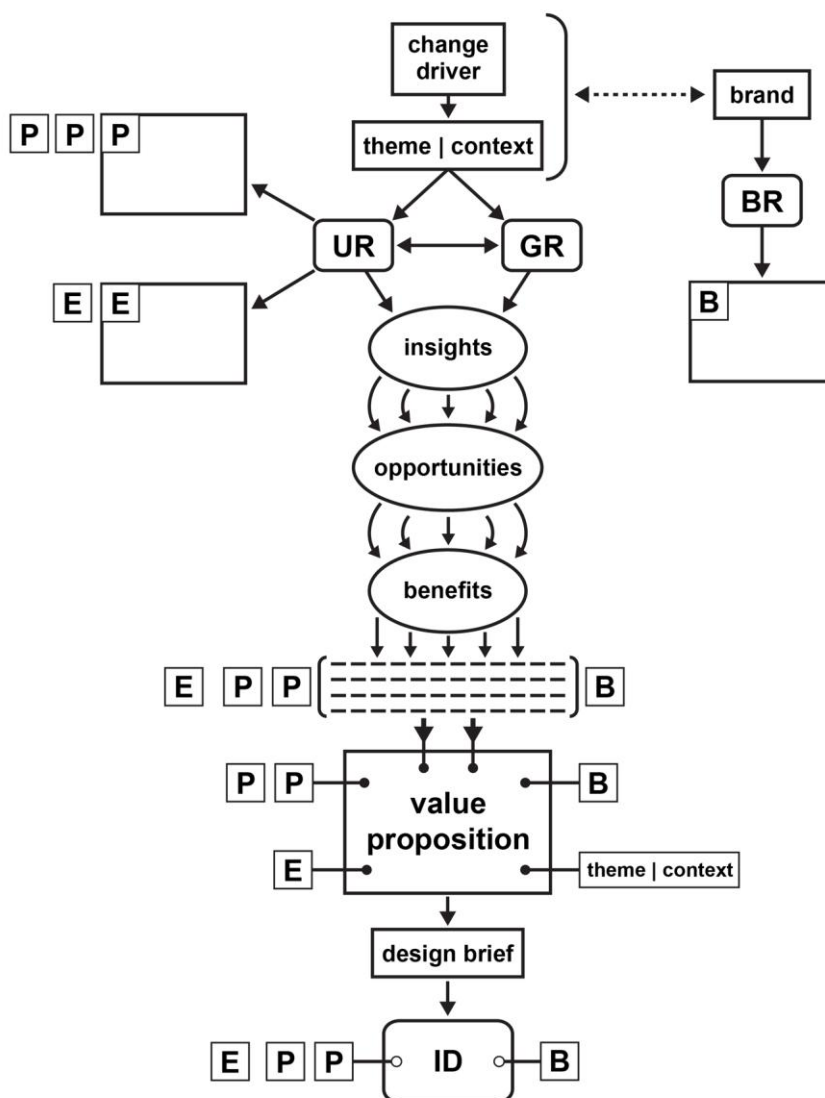


Figure 1: Front End Industrial Design (FE-ID) diagram.

The theme|context combination initiates activity of user research (UR) and global research (GR). UR aims to understand users and their experiences. GR continues to uncover in more detail related PEEST issues and further influences ongoing UR.

It can be seen that FE-ID incorporates some design research activities which are common for industrial design students to engage in. These include user research which can be pursued with a multitude of well-known tools and methods, such as ethnography. The FE-ID model does not attempt to be prescriptive in the choice of these standard, 'internal' processes.

The change driver and the theme|context will have some connection with a commercial world of products and services. It is at this intersection that certain companies and their brands can become part of FE-ID. Brand research (BR) aims to understand everything about a brand, such as values, positioning and personality.

Models of users and their experiences are generated from UR data. Multiple persona boards [P] and Experience boards [E] are produced. A brand board [B] aims to bring the brand to life. These boards stand as valuable research outputs in their own right.

Data from UR and GR are mined for insights. Insights lead to opportunities. Opportunities and associated product ideas can be analysed to extract emotional and functional benefits which may be offered to users and relevant to the brand. These benefits are 'filtered' through continuous reference to the multiple persona, experience and brand boards so that only those benefits which are strongly aligned with user goals, needs identified in experiences, and those connected to brand values and positioning, will make it through to be included in the value proposition.

Some notes about brand research versus branding. Much of the work which supported the development of FE-ID at a curriculum level was completed in collaboration with corporations in the UK and Singapore. These were companies such as Diageo, McCain, Mars Inc, Orange, OSIM, and Kenwood. The work was primarily through product innovation and development, and generating new products that fitted into the corporations' brand was critical, and a key component of the student learning. It is common for industrial design students to learn about brand, and then utilise that learning in some form of branding activity for new ideas and products. This is fine, when the product design work is divorced from commercial, corporate-driven new product development. For FE-ID purposes the alignment of new concepts with a current brand is one of the cornerstones of the process. FE-ID expects deep understanding of a brand, and abilities to analyse and

explain a brand. Understanding the activities of branding is part of that learning, but 'doing' branding is somewhat outside the remit of the process. It has been observed, however, that students who have successfully embraced the FE-ID process have gone on to show great promise in product branding. The learning about brand embedded with FE-ID clearly can be exploited in other areas of design and innovation activities.

It should be noted that there is nothing which dictates the size or status of the brand that is utilised. Students are asked to research both 'big' global brands and 'little/local' brands. The local brands tend to be known to a much smaller population and geography, and make for some interesting comparison work.

3. MICRO DETAILS OF FE-ID

Throughout the developments of the FE-ID model there has been regular reflection on its effectiveness. What has been realised is the critical importance of some of the steps, or part-processes, within the overall process, and the fine detail of taking those steps. These part-processes are:

- The starting point of the 'change driver' and its relation to users, global issues and brand.
- The make-up, and multiple usage of the research outcomes, namely Persona, Experience, and Brand boards.
- The formulation of insights from research data.
- The transition from insights to opportunities.
- The articulation of emotional and functional benefits (arising from opportunities/ideas and product concepts).
- The construction of a robust value proposition.

These can be identified within the overall FE-ID map in figure 1.

These micro areas are really not the broad, over-arching activities found in descriptions of 'Design Thinking' or 'Front End Innovation' - activities such as co-creation, prototyping, user centricity. Even specific methodologies exploited within FE-ID, such as ethnographic research, require much unpacking and working on before they become useful and effective to the industrial design student.

It is at a granular level of working that successful work and learning is fostered. The author has continuously sought out ways, means, examples etc. of the above part-processes, from the professional and academic worlds, in the hope of informing

teaching, and to refine and improve the FE-ID model. Companies such as Echo Brand Design in the UK were useful seeing a link between product and branding. An experienced video ethnographer, Siamak Salari from the company EverydayLives provided detailed guidance on writing insights (Salari 2011). Large design companies sometimes make available parts of their innovation processes. An example is IDEO, which offers its Human-Centered Design Toolkit (IDEO 2010). This toolkit has proved useful in the teaching and learning of the steps between insights and opportunities.

Numerous other contacts and commentaries have provided sufficient glimpses and insights for processes and tools to be re-built for the purposes of FE-ID. More significantly, there has been long-term collaboration with a few design and business professionals in the UK and Singapore. They have contributed very generously to the development of teaching material, module design and curriculum shaping. These external contacts, more than just occasional visiting speakers, have influenced the students. Students have been encouraged to realise that they have opportunities beyond the traditional artefact/product design world.

Some part-processes have not appeared in any literature or been part of any conversation with design professionals. An example of this is the delicate balance between ideas and products (e.g. ideas *about* products vs. concepts *for* products). It seems to be that the productive, creative management of this balance is a differentiator between the experienced design professional and the still-developing design student.

The diagram in figure 1 indicates how the various research outputs of Persona, Experience and Brand boards are fitted into other parts of the FE-ID process, and beyond into downstream industrial design realisation.

Informative literature, useful to the development to the macro and micro of FE-ID has come from the areas of business and entrepreneurship. An example is the Business Model Generator (Osterwalder and Pigneur 2010). This offers a 'canvas' for businesses (often start-ups) to map out their business model - utilising nine building blocks as key components of any new business plan. In the weblog connected to the website of Business Model Generator there is a popular discussion around a Value Proposition Canvas (Osterwalder 2012). This offers a template for developing a value proposition that a business can offer to customers. It goes on to explain how the value proposition can be tested, advising the business to consult customers, adjust assumptions based on discovered insights, finally re-creating the value

proposition based on those insights. This is not unlike FE-ID, other than, when utilising FE-ID, the consultation with users and the discovering of insights takes place *before* a value proposition is formulated.

4. DISCUSSION

It is interesting to note how much of the working processes of FE-ID are not 'designerly' in a traditional sense. Ball and Overhill (2012) note how industrial design students don't like to write. This is one example of the non-design abilities that are required in innovation practices. However, it has been said that "Writing is designing with words. Designing is writing without them" (Hoekman 2010). This illustrates a point concerning industrial design students' immersion in this front end of innovation. Although there are many designerly activities and outcomes, and designers have much that can be contributed to the process, there is very little actual design that goes on.

It has been observed that certain dichotomies exist periodically when working through the FE-ID process. Some dichotomies observed have been:

- Visual vs Verbal
- Abstract vs Concrete
- Tacit vs Explicit
- Design vs Non-Design
- Ideas vs Product

In the abstract, and verbal worlds, the design student needs more attention and guidance. Examples are great, but very scarce. A theory, with a visual model is powerful for the student to put into context what she/he is doing. Learning aids and exercises are useful when dealing with the micro FE-ID activities.

Handling issues in the abstract, whether written or otherwise is difficult. Working at the 'front end' this is necessary as almost everything is abstract, nothing is really concrete. Building on the visual, people-centred DNA of the student industrial designer is an effective differentiator for this process.

There is a contribution FE-ID can make in the development of capabilities in judgement, and abstract thinking amongst students of design. This is partly because the work is deliberately separated from the processes of product embodiment. The currencies being generated and worked on are mostly abstract ones such as insights, ideas, opportunities, and benefits.

The echoes and overlaps with entrepreneurship are marked. There is obviously much that is not included in FE-ID which business and entrepreneurship training and activity requires. FE-ID was never envisaged as a tool to aid design students to become CEOs. There was the intention that industrial designers should see the business context in their work, and that that may have a potentially positive influence on future career paths. A recent visiting speaker to a class of industrial designers following the FE-ID process made a special effort (unsolicited) to point out to the undergraduates that such brand, business, and design processes can logically lead to a successful career in the field of business consulting.

There are also useful overlaps with other design disciplines and activities. In the author's experience Service Design teaching and learning draws significantly, and successfully, on many of the elements of FE-ID. There is nothing in FE-ID which dictates the nature of any opportunity, idea or product.

A point worth making is that from beginning to end, to work on FE-ID to a reasonable depth, even with a team of designers, can take more than a typical module/semester of student time. This becomes even more acute as the model, and its internal mechanisms become more explicit and detailed. There are a multitude of different, but interconnected tools and processes. This needs careful management by the design educator as it can be problematic as well as advantageous.

Following FE-ID can ensure that a design proposal is aligned to the business. The value of a product is conveyed in the context of a business environment (rather than its 'pure design' values, or its value to people). In this way FE-ID in design education can be doing its bit in raising the business awareness of design students, and offering them a route to bringing more of design into business.

Design researchers recently argued (Norman 2012) about the place of design history in the curriculum of design schools. Some argued for the embedding of design 'theory' to replace the more traditional modes of design learning. FE-ID can be seen as a unifying 'theory' of front end design research practices, processes, connections and tools.

Ultimately, FE-ID offers the following to industrial design education:

- A vision of a place for industrial design in the front end of new product development.
- A link to downstream industrial design from the 'fuzzy' front end.
- A route through the 'fuzzy' front end for industrial designers.
- Context and focus for micro front end research, design, and innovation activities.

Finally, the author welcomes any contact from design educators and professionals who may be interested in collaboration in furthering knowledge in the theory and practices of the 'front end' of design - especially when it comes to educating future design professionals.

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REFERENCES

- Ball, R. and Overhill, H., (2012), *DesignDirect - how to start your own micro brand*, PTEC, Hong Kong.
- Brown, T., (2009), *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*, HarperBusiness.
- Echo Brand Design, <http://www.echobranddesign.com/>.
- Hoekman, R. (2012), *Writing is designing with words*, <http://www.inspireux.com/2010/03/17/writing-is-designing-with-words-designing-is-writing-without-them/>, (accessed 14 September 2012).
- IDEO, (2010), *Human-Centered Design Toolkit*, <http://www.ideo.com/work/human-centered-design-toolkit/>, (accessed 7 October 2012).
- Norman D., (2012), *Hurrah! Re: Design Education - Rethinking the role of Design History*, PHD-DESIGN Listserv, <http://www.jiscmail.ac.uk/lists/phd-design.html>, (accessed 23 August 2012).
- Osterwalder, A. and Pigneur, Y., (2010), *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*, Wiley, USA.
- Osterwalder, A., (2012), *Achieve Product-market Fit with our Brand-New Value Proposition Designer*, <http://www.businessmodelalchemist.com/2012/08/achieve-product-market-fit-with-our-brand-new-value-proposition-designer.html>, (accessed 17 September 2012).
- Roscam Abbing, E., (2010), *Brand-driven Innovation*, Ava Publishing.
- Salari, S. (2011), *How to write an insight statement*, <http://www.ethnosnacker.com/2011/04/how-to-write-insight-statement.html>, (accessed 5 October 2012).
- Verganti R., (2009), *Design Driven Innovation: Changing the Rules of Competition by Radically Innovating What Things Mean*, Harvard Business Press.
- Wormald, P.W. and Rodber, M.J., (2006), *Preventing the designersaur syndrome: realigning product design education to the way that wealth is created in the West*, in *Enhancing Curricula: contributing to the future, meeting the challenges of the 21st century in the disciplines of art, design and communication*, Davies, A. (ed), pp 381-392, London, The Centre for Learning and Teaching in Art and Design.

Wormald, P.W., (2009), The pedagogy of pre-brief activities for industrial design undergraduates operating at the 'fuzzy front end' of new product development, in Proceedings of ICED'09, Volume 10, Design Education and Lifelong Learning, Norell Bergendahl, M., Grimheden, M., Leifer, L., Skogstad, P., Lindemann, U. (eds), pp 81-88, Palo Alto, The Design Society.

Wormald, P.W., (2011), Positioning industrial design students to operate at the 'fuzzy front end': investigating a new arena of university design education, International Journal of Technology and Design Education, Vol.21 No.4, pp 425-447.