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The specification of a consumer design toolkit to support personalised production via additive manufacturing

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CASE STUDIES IN THE USE OF DESIGN PRACTICE BY PHD RESEARCHERS

DPR case studies

THE SPECIFICATION OF A CONSUMER DESIGN TOOLKIT TO SUPPORT PERSONALISED PRODUCTION VIA ADDITIVE MANUFACTURING



RESEARCHER: Dr Matt Sinclair

INSTITUTION: Loughborough University, UK

DATE OF AWARD: 2012

SUPERVISOR(S): Dr. Ian Campbell

EXAMINER(S): Dr. Richard Bibb
Professor Deon de Beer

CREATIVE DISCIPLINE: Industrial design

RESEARCH METHODS:
A mixed-methods strategy, primarily involving
- case study of a project undertaken by my own professional practice
- reflective practice, using design diaries to document work undertaken

NUMBER OF DESIGN CASE STUDIES UNDERTAKEN BY THE RESEARCHER: 2

LENGTH OF THESIS: 74000 words

EXAMINATION FORMAT: Thesis and Viva

DURATION OF STUDY: 5 years full-time

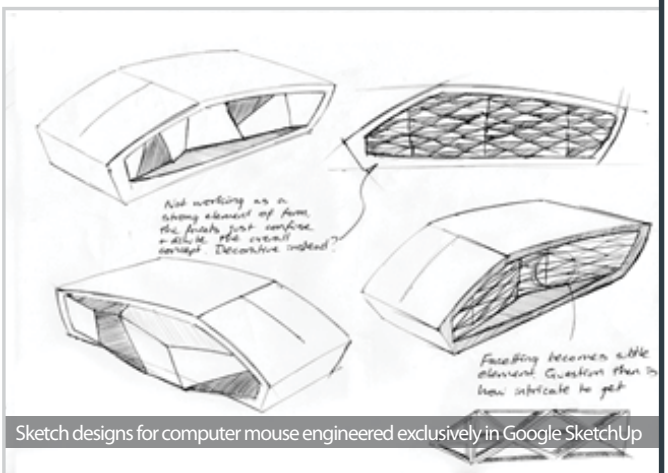
EXPERIENCE OF DESIGN PRACTICE BEFORE START OF PHD:
BA (Hons) (Loughborough University), MA (Royal College of Art)
1995 – 2001, Designer, Senior Designer, Nokia Mobile Phones (UK)
2001 – 2003, Category Design Manager, Nokia (Finland)
2004 – Present, Creative Director, Matt Sinclair Design

PERSONAL MOTIVATION FOR UNDERTAKING PRACTICE DURING PHD:
I would not have been able to sustain interest in the research if it had not included an element of practice. And so I would not have undertaken the PhD if practice based research had somehow been precluded.

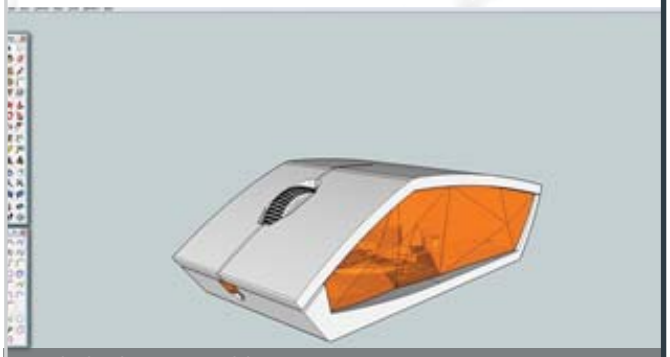
AIM OF THE RESEARCH:
In mass customisation literature, much of the work focusses on the needs and wishes of consumers engaged in customisation (which, often is called 'design'). However it appeared to me that very little research had been done to understand how the equity tied up in a brand's design language is affected when consumers begin to modify a product's three-dimensional form. Thus the primary aim of the research was to investigate whether the opportunities for personalised products which additive manufacturing promises can be reconciled with brands' requirements for recognition and control of image.

RESEARCH QUESTIONS:
- What were the new and emerging approaches to Industrial Design, and what degree of consumer involvement was expected or advocated?
- What were the limits of what was currently achievable in the customisation of consumer electronics devices?
- How were brands' product design languages managed, and what conflicts existed between consumers' involvement in design and the maintenance of brand equity?
- Which activities and processes were preferred by consumers engaging in the design of their own products, and how were consumers best enabled to communicate design intent?
- What could be learned from existing consumer-oriented 3D modelling software?

OBJECTIVES:
- To review the literature and critically analyse the role of the consumer in design processes outside of those traditionally employed by professional industrial designers
- To explore the process and outcomes of bespoke design and customisation, and understand how these might be applied within a design toolkit
- To understand how a product design language affects brand equity, how design languages are developed and maintained, and what conflicts might arise from consumers' interventions in design
- To investigate, through user trials, non-designers' abilities and preferences with regard to a number of design methods
- To develop a specification for a toolkit capable of being used by consumer-designers, which at the same time satisfies the requirements of professional designers and brand managers



Sketch designs for computer mouse engineered exclusively in Google SketchUp



Google SketchUp CAD model





3D Printed prototype and working product

SUMMARY:
The research stemmed from the future scenario that as additive manufacturing (AM) technologies become cheaper and more readily available, consumers without formal design training will begin to customise, design and manufacture their own products. Much of this activity is likely to infringe on brands' intellectual property. My research explores the feasibility of a situation in which, rather than attempting to prohibit such activity, manufacturers engage with consumers to facilitate it, thus retaining control (albeit reduced) over their brand's image and the quality of products offered.
The PhD involved looking at existing and emerging approaches to industrial design, and understanding the difference between how designers and non-designers engage in design activity. It included a case study from my own professional practice to document the state-of-the-art regarding the design-for-customisation of consumer electronics, together with a number of practice-based research tasks undertaken to analyse the strengths and weaknesses of consumer-oriented 3D modelling software. Findings from these key areas informed the design and specification of a prototype Consumer Design Toolkit, which was tested using both consumers and senior design professionals.

RATIONALE FOR THE INCLUSION OF DESIGN PRACTICE UNDERTAKEN BY THE RESEARCHER:
Since much of my research involves those who are not trained as designers, testing and validation would have been problematic, and ultimately less useful, without the use of designed prototypes. It is my belief that the quality of feedback derived from testing the prototype toolkit was a direct result of the quality of the design of the prototype – if the toolkit had been less well designed, more focus would have been placed on the toolkit itself, rather than the interactions it was demonstrating.
The work undertaken for Ulysse Nardin was not intended to be part of the PhD when it was instigated, though somewhat ironically the reason I was awarded the work was partially because of my PhD research. However, as I worked on the project it became increasingly clear that by working on the project, I had unique access and insights into a corporate design strategy that was highly relevant to the research.

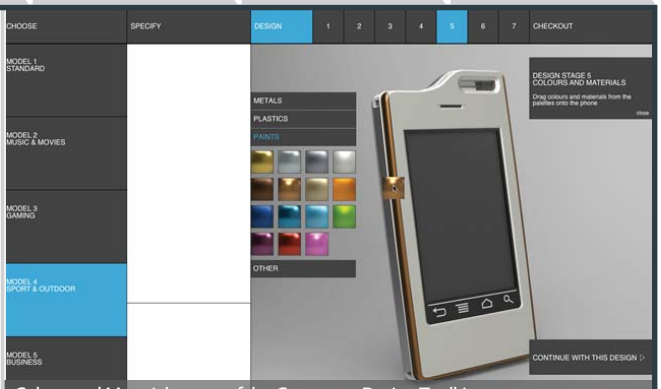
Finally a number of methods were considered for analysing the consumer-oriented modelling software, however all those which included users (which initially seemed the most obvious strategy) ran up against the problem of the amount of time needed for the participant to become proficient in the software. Thus it was realised that to maximise the value of the findings, the software should be tested by myself. A design task (the modelling of a computer mouse) was devised as a way of pushing the software to its limits in a way which simply following official tutorials would not.

HOW THE PHD DESIGN PRACTICE DIFFERED FROM THAT OF COMMERCIAL PRACTICE:
Arguing the validity of practice based research, and identifying how it differs to commercial practice, comprised a significant part of my methodology. The main differences as I perceived them were:

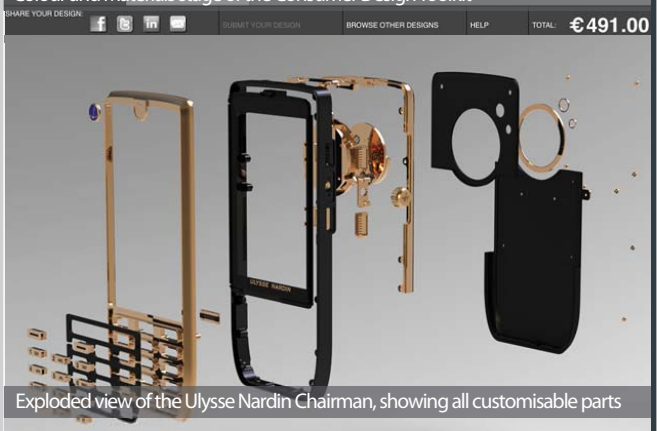
- The degree of analysis required: the design diary method entailed writing up the day's work in significant detail, something I would never bother with professionally
- Recording for review by others: for example when sketching, annotations were required not just for myself, but so that others, external to the work, could understand the process
- Justification: as the creative director of a consultancy, at times the only justification needed for a decision is my own authority. This was never the case in the PhD!
- Learning 'on the job': particularly when analysing the modelling software, I was required to learn skills whilst engaged in the design task. This would rarely happen in my practice, where existing skills would be called on to maximise output in a given timeframe

THESIS AVAILABLE AT: https://dspace.lboro.ac.uk/dspace-jspui/handle/2134/11051

CONTACT DETAILS: Loughborough University, UK (m.sinclair@lboro.ac.uk)



Colour and Materials stage of the Consumer Design Toolkit



Exploded view of the Ulysse Nardin Chairman, showing all customisable parts



Ulysse Nardin Chairman in rose gold and ceramic

Design Practice Research Case Studies have been compiled by the Design Practice Research Group at Loughborough Design School. If you would like to work with us or contribute a case study, please contact the Design Practice Research Group Leader, Dr Mark Evans (M.A.Evans@lboro.ac.uk).

DPR group

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