

Being part of it – design inside NPD teams

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Abstract

This paper investigates the role of design and design thinking within multidisciplinary new-product development teams (NPD teams). The investigation is based on a case study in which the designers are core members of the NPD teams. The main findings concerning the contribution of designers to NPD teams are:

- 1. Designers are valued as team members and will remain part of the team. Nevertheless the relationship needs to be developed.*
- 2. Through language and visualizations, the presence of designers mediates a shift in the focus of the project, from modules and technical functions towards integrated products and systems. Having designers in the NPD team also serves to bridge the worlds of developers and business.*
- 3. The main problems which designers encounter are dilemmas arising out of assumptions regarding the different orders of design, and the fact that design has only 'soft' targets, which contrasts sharply with the quantitative 'hard' targets of other developers.*
- 4. The main competencies required for designers in this role are the ability to translate users' needs into R&D language and product concepts, and vice versa. Designers also require considerable persuasive powers in order to sell 'soft' values!*
- 5. The main risks of embedding designers within teams are loss of consistency across projects, and disconnection of designers from their occupational context. Both risks, though, can be addressed through collaborative design efforts.*

1. Introduction

Designers often act as consultants, providing specific expertise. Recently designers, or rather design thinking has come to be regarded as contributory to business success (Green, 2007 and Nusbaum, 2005). But what is this contribution? This case study explores the role of design and design thinking within large new product development (NPD) teams, in which – quite exceptionally – the designers are genuinely integrated into the teams. The designers in this company are neither outside consultants, nor part of an in-house design department at a separate location (itself suggestive of a consulting role). The design department is part of R&D; the designers are members of the NPD teams, and remain so throughout the project. Being in the team implies being seated there, designing there, debating there, and trying to make a mark there. In this case study, selected projects are reflected upon in terms of how the presence of designers impacted on project outcomes and organization.

2. Theoretical framework

2.1 The complexities surrounding NPD

New Product Development (NPD) is a complex task, especially when the outcome is an advanced technological product (Tomiyami, 2007). This complexity translates into two typicalities. First, NPD processes are not contoured clearly right from the outset and not all requirements can be known at this stage – but instead are articulated and brought to clarity as development progresses. *“The outcome of a product development process is a unified whole that is neither arbitrary nor is it determined at the beginning of the design process.”* (Junginer, 2008)

Second, complexity requires different disciplines, organized into large multidisciplinary teams of developers. The NPD process can be described as essentially a social process, in which all participants have a different perspective on the goals and inputs of the project, their own ‘object worlds’ (Bucciarelli, 1995). These perspectives differ depending on participants’ education, interests and his or her professional history; the NPD process is a way to reconcile these diverse perspectives by finding mutual or overarching principles. Accordingly, alongside ‘rational’ aspects such as requirements, the

project outcome will also be determined by the composition of the team: who is a member, and their individual 'object worlds'. Design as a full-grown discipline, in all its diversities, is becoming part of these teams, thereby contributing a new perspective and different 'object worlds' within the NPD process.

2.2 Defining design

Design is hard to define, as it is used in a range of different meanings depending on the context. Often it is used as an adjective ("a design watch"), or as a noun ("the design") to refer to a plan or blueprint. It can just as easily appear as a verb ("to design"), referring a process. In this paper we discuss design as a discipline ("design-ers"), comprising specific competencies and abilities.

It should be noted that, within the community of designers, there is a tendency to define a wide range of different sub-disciplines such as graphic design, 3D design, interaction design and product design. Sub-disciplines focus on the differences, instead of what is shared, creating a cultural differentiation perspective (Martin 1992). However for understanding the contribution of designers within NPD teams, what is relevant are the commonalities among designers:

1. The typical way of dealing with complexity, referred to as 'design thinking', is a creative approach in which the problem is not scientifically analyzed, but realistic solutions are explored, evaluated and improved (Buijs 2005, Vice, 2007). This requires the capability to be comfortable with ambiguity and complexity.
2. Comparative qualitative valuation is an inherent part of design thinking – the 'go'/'no-go' approach is not sufficient; instead valuations such as 'worse' or 'better' are used.
3. Designers have an interest in improving conditions for *other* people – users or consumers, not just for themselves (Margolin 1995). The designer must in some way gain an understanding of the needs and wishes of people. Yet there are fairly major differences between designing a product with a consumer in mind and with a user in mind (Morello 1995). The term 'consumers' refers to people at the moment of choosing and buying products, whereas 'users' are the people who interact with the product, and are not necessarily the 'buyers'. Designers often use these terms interchangeably, probably because mostly the consumer is the end user

as well. But the assumptions which frame consumer-oriented and user-oriented design can in fact be mutually exclusive. Consumer-oriented design focuses on differentiation, seduction and the first ‘wow’ experience; user-oriented design focuses on support of users in their activities and the lasting experience of everyday use, beyond the scope of first impressions.

2.3 Four orders of design

To explore the impact of design (as a discipline) and design thinking within NPD teams and on the final artifact, this paper uses the framework of the four orders of design (R. Buchanan 1995, 1998, 2001, Breslin 2008, Body 2008). The framework is based (1) on the *abilities* of designers (inventing, judging, deciding and evaluating), thereby elegantly circumventing the classic differentiation between design disciplines, and (2) the *goals* of designers. What goals a designer pursues has not so much to do with the skills associated with a specific type of design, but more with the ‘forethought’ of the designer. “*Forethought in making is a kind of universal art, in the sense that it is independent of any particular art of making and therefore, able to range over all potential considerations and subjects that may enter into the making of this or that kind of product*” (Buchanan, 1995, pg 31). It is precisely this premise that makes possible a model which integrates all the disparate sub-disciplines of design. The assumptions which a designer has (“a product fails if it is hard to be used”) does not depend so much on what specific skills the designer has (e.g. graphic design), as there are many options to consider, such as ergonomics, crisp clear graphics, intuitive interface concepts or even the functionality.

The four orders are in short:

1. *Signs and symbols* (such as logos, icons and manuals). Design at this level aims at communication, either to explain (user-oriented) or to persuade (consumer-oriented).
2. *Artifacts* (products). This is the area of ‘classic’ product design, aiming at tangible products, focused on the embodiment of technology.
3. *Action*. This concerns both (1) the interaction between humans and products and (2) what actions are possible by means of the products. The first category is not restricted to the design

of interfaces, as all interactions with the product are meant. The second category is about what a product can mediate (P.P. Verbeek, 2005), i.e. what people can and wish to do with it.

4. *Systems and environments*. Design at this level concerns the environments, systems and organizations in which humans act or with which they interact: how people achieve ends and goals.

3. Research questions and method

The research questions in this paper are:

1. What is the expected contribution of design (thinking) within NPD teams?
2. What can design (thinking) mediate within these teams?
3. What are the fundamental problems which designers encounter within this role?
4. What competencies does this team role require from designers?
5. What are the risks inherent in this role?

Methodologically this is an explorative, single-case study, considered appropriate in this instance as it gives revelatory insights (Yin, 1994, pg 40). It is highly unusual to explore design within a company (Breslin, 2008). Both authors work at the company being studied, so could choose freely from an extensive range of cases. It was decided to use only those cases about which participating designers were very positive. The rationale is that, for an explorative study which investigates the contribution of design, the cases are most relevant where designers feel positive about their contribution.

4. Company description

4.1 Océ

Océ is a large multinational company and develops printing systems, scanners, copiers, software applications and services to share information effectively amongst people. It has a long history, spanning 135 years, and operates in different markets, ranging from offices, CAD and display graphics (posters, billboards), to book-printing. It is active in more than 90 countries, has a workforce of 24,000 employees and achieves annual revenues of over \$ US 4 billion. Many of its products are developed

by one of the company's eight R&D sites, with in total 1,800 employees. Océ has undergone a rapid process of renewal over the past decade, as its business perspective has evolved from mainly a product-driven organization towards a service-driven organization.

4.2 Integrating the design discipline within NPD processes

Océ develops products in large multidisciplinary NPD teams, mostly conveniently grouped in large and open project rooms. A project can have anything from five to 150 individuals on the team and last for between two and over ten years (addressing the development of groundbreaking new technology). All sorts of disciplines and specialists collaborate, including chemists, physicists, mechanical, electrical and software engineers, strategic marketers and designers. Though this part of the company is a matrix organization, it can be better characterized as a project organization as all work, including development of knowledge, is organized around these projects.

At Océ in the Netherlands, design has been part of NPD teams for a long time. The first (product) designer was recruited in 1964. In 1988 a separate department was established as part of the Dutch R&D. This has since grown to 25 persons, comprising multiple sub-disciplines including graphic designers, product designers, interaction designers, usability researchers and model-makers. The turf of the department within the Dutch R&D has extended considerably, starting as a consulting role which projects were free to make use of or not, and has evolved into a fully integrated part of NPD teams. Nowadays it is unthinkable to have a project without the involvement of designers, regardless of which stage the project is in. Approximately half the designers are based in a studio on the R&D campus; the other half are in NPD projects. It is the personal choice of the designers where they are located, depending on the goals to be achieved.

5. Case descriptions

5.1 First order: Ocean style guide

Océ originally developed mainly standalone copiers and printers, but over the last decade has rapidly expanded its software portfolio, in part by means of a range of acquisitions. Many applications had different origins and were therefore, to put in mildly, quite disparate in their look and feel. This was however not an issue for either Océ management or the industrial design department, as the main focus was on delivering functionality for Océ's professional customers. The first generations of *desktop* applications and *web* applications were therefore straightforward, reflecting either Windows 2000 or plain HTML. In both cases the use of color, graphics and layout variations was restricted by technology.

In 2003 a project was launched with the purpose of addressing two issues: firstly, to develop a graphic skin that would better communicate the developed interaction concepts and second, to create a graphic style that *potentially* could craft consistency and identity into the wide array of software applications (and thus stem the proliferation of different 'looks' which technological development now made possible). Several graphic and interaction designers started a brand eye routine (Debijs-Meesen 2004, Stompff 2008). The resulting sketches made clear that the ambition was to create a strong, Océ look that would dominate the standard Windows look. The final design is characterized by (1) an application window header in a specific Océ style, (2) a color palette combining blue headers with a fresh core of yellow colors with light purples and grey tones and (3) a minimum of 3D effects, opting instead for basic, sloping lines. The entire icon collection was adapted to this new style.

It took some persuasive argument, but eventually the so-called 'Ocean Style Guide' was internally embraced and adopted by many projects. Eventually it was even implemented on the operator panels of the products themselves, setting new standards in the market. For the first time there was an instantly identifiable style for all interaction points with Océ systems, including software, web

applications and products (see figure 1). It became an important sales item, particularly for Océ software suites.

Reflection: first order

It can be argued that this adaptation of the Ocean Style Guide was merely pragmatic, as for software engineers it is easier to use crisp, clear templates and a database of icons. Yet there was another, less trivial reason: it inspired management and all participating teams to be a ‘one brand company’ again. Interestingly, despite beginning as an aesthetical concept to balance the focus on functionality, the Océ look evolved far beyond being just a graphic style guide: ‘Ocean’ became a synonym for Océ interface design in the widest sense, including interaction concepts. Essentially, the strict aesthetical concept determines that all Océ systems should have similar interface points, which effectively imposes consistency on other orders of design, including interaction design and strategy. The involved designers argued that their intentions also concerned third-order design, but by initially focusing strictly on the first order – the ‘skin’ only – they reckoned they would meet (much) less opposition.

5.2 Second order: ‘just styling’?

In 2007 the German Océ R&D¹ asked the Industrial Design Department to draft a design for a follow-up development of an existing product, the Océ VarioStream 9000. The successor, the Océ ColorStream 10000, extended the functionality significantly, becoming one of the fastest available color printers and ideal for printing products such as books. Strategically, the management understood that the existing VarioStream design did not communicate the radically innovative nature of the ColorStream, and therefore was looking for differentiation. The project was in the end stage of development, so the design was essentially about replacing the existing set of covers with another.

¹ The designers are part of the Dutch R&D, and the role of designers at the German site corresponds more to that of a conventional design office. This configuration did however enable exploration of what strict second-order design does accomplish.

It was decided that four product designers should be tasked with devising ideas and concepts, in order to obtain a wide variety of ideas. However, despite general agreement beforehand to have a significant step to enable differentiation, there was no shared vision amongst the stakeholders as to *how* the product should be differentiated. The designers facilitated this strategic choice by asking three questions (Person et al, 2008) for managers to answer, combined with visuals of concepts:

1. *To what extent should the design be in line with other recently introduced high speed printers in the portfolio?*

A 'flagship' product with clear resemblances will enhance the image of other products in the portfolio by means of brand recognition (Kapferer, 1998), yet reduce the novelty.

2. *To what extent should the design be different from that of its predecessor, the Océ VarioStream 9000?*

A radical new design of the ColorStream, would immediately outdate the existing VarioStream, even though this product would remain on the market.

3. *To what extent should we follow market conventions considering these high end printers?*

Due to the tight timeframe the designers had to anticipate what would be decided. The extreme concepts were dropped, but none of the remaining concepts stood out. Nor was another dimension of the design problem addressed: the limited number of products to be produced. This imposed technical restrictions that had so far been deliberately ignored so as to promote creative thinking. Another concept was developed, specifically designed for the low series. This concept gained favor with all the designers, since it would be possible to define two distinct versions without major investment. It also created the opportunity to give the Océ VarioStream 9000 a 'midlife kick' – an aspect that had not been considered by management. The first two questions were neatly resolved: with an iconic new design for two 'flagship' products in the portfolio, creating a new separate product family but without outdating existing products (see figure 2). Though the designers had to sell their ideas, the management were reasonably enthusiastic, since the proposal basically resolved a strategic issue concerning the product portfolio and 'product narratives', beyond the scope of design.

Reflection

The perspective of designers focused mainly on differentiation: how the product should be positioned in the market and within the portfolio. This appears typical for second-order design such as car design, and can be attributed to the strict focus on visual perception². Yet the solutions of the designers to resolve the dilemmas inspired management, mediating the product narrative that was ultimately sought after – albeit unconsciously. Second-order design constitutes the business strategy of the organization, as is described more often (McCullagh 2006). It also bridged – by means of visualization and questioning – the worlds of the developers and business.

5.3 Third order: enveloping a printer around the user

In 2002 a new productive color printer was developed, specifically for commercial sites such as copyshops. One of the main objectives for the designers was to create a ‘professional image’ (second order), as at that time most potential clients did not consider color printing technology to be reliable.

However, another challenge emerged, both overtaking and resolving the image problem. In professional color printing, it is common to have a dedicated ‘controller’ to ‘rip’ the large color files before sending them to the printer. These color controllers are developed by specialized companies, and they are usually supplied in special tables complete with their own interfaces. As a result, every professional color printing *system* typically consists of two more or less independently functioning units with their own interfaces (see figure 3).

The designers made a number of on-site visits to clients, and were puzzled by two things. First, the clients did not use these tables, but instead positioned the interfaces of the controllers separately, e.g. on a shelf mounted above the printer. Was the table too expensive, or did it require too much space? Secondly, large parts of the printer interface functionality were not used at all, though the printers

² It should be mentioned that second order design can be user-focused as well, to ‘explain’ a product to the user by means of semantics. This has been investigated in detail in the past (e.g. Vihma 1995, Monö 1997)

were used intensively and highly appreciated. For the designers, it was like having designed a car which is valued by the customers, but in which for some reason no one uses the gearbox...

Understanding these two seemingly unrelated issues required a paradigm shift. So far the controller had been considered as a 'point of transformation', where print jobs were translated and submitted to the printer. The interface of the controller was only required to intervene in special cases, since the operator was presumed to control the entire system via the printer operator panel. Research at customer sites revealed a different picture: the controller interface played a much more prominent role than expected, functioning both as a 'gatekeeper' (protecting the expensive printer from error-laden jobs) and as a tool for fine-tuning the colors. The interface was preferably placed next to the printer to enable easy evaluation of results. Though it requires a specialist to work this way, there was one important advantage: once a job was good, it could be saved together with its color profile. Clients might want a reprint of exactly the same print product at a later time – so there was a virtual taboo on doing color management on the printer.

Accepting the way the operators liked to work, the idea was to shape the printer like a desktop, enabling people to position the interface of the controller precisely where it was most needed: on top of the printer. This sparked heated debate, with some people considering it ridiculous to design a product as a table to support third-party equipment. With this unusual desktop metaphor in mind, the entire printer was designed around the operator, influencing strongly the technical product lay-out to get e.g. the delivery of prints within arm's length of the operator's preferred position. The interface was optimized to support the workflow as it was witnessed, impacting system behavior considerably. This desktop metaphor was unique in the market, easy to explain, and therefore become an important sales narrative (see figure 4).

Reflection

On this level, the prevailing design paradigm is 'user-centered', and inspiration comes from real life observations. Two aspects are at the forefront of designers' considerations: time and experience

(Buxton, 2008). This is evidenced by the focus on the flow of activities, and the foresight to start with the experience of the operator, instead of the 'product paradigm'. As the designers are part of the NPD teams, they can influence underlying technology to shape products that optimally support users.

Yet this user-centered 'mantra' can create tensions in two ways. First, it risks overlooking commercial aspects, though in this case there was no problem. Second, it can create a dilemma for designers, who attempt to balance second-order (especially aesthetics) and third-order design (which appears to be mostly about pragmatic considerations). This need not be a problem, as it is possible to design aesthetically pleasing products that are also highly usable. The printer in this case received two design awards in 2003.

5.4 Fourth order design: reinventing printing

In 2005 a combined copier-printer-scanner was developed specifically for large workgroups (over 30 individuals), targeted at large companies and universities. It was a 'midlife kick' development, and the objective for the designers was to create something that would visually differentiate the product from its predecessor (second order) and enhance its usability (third order).

At some client sites a genuine mess was visible around the copiers and printers: prints that were never collected, reject copies, posters, the odd emptied toner bottle, scissors, coffee cups..... These areas are considered to be 'public space', implying no one feels responsible. Still prints and copies can be confidential, either due to the nature of the organization (consider social security) or the content of the document (managerial information). The only way to resolve this issue in the past was to equip users with personal desktop printers, thereby ignoring cost and sustainability aspects.

By reinventing and developing the print workflow, another valuable scenario emerged: the smart mailbox. This is a digital, personal mailbox that stores all the print jobs for a particular individual. Only when this individual personally activates the mailbox at the printer are the jobs printed at high speed. The mailbox is activated by means of an integrated fingerprint reader, which not only identifies

the user but also immediately prints the jobs in his or her mailbox (see figure 5). It is also possible to collect the prints at any Océ system, as jobs are shared across devices. This approach is known as ‘follow-me printing’.

It may seem logical after market introduction, but this new approach to printing was not at all simple to implement, requiring a new architecture and business model. It is considered to be a valuable innovation within the company, as it truly differentiated Océ from all its competitors in this market. Some unexpected side effects were noted afterwards: a 15% reduction in print volume, for instance. Prints which for some reason are not that important are simply no longer printed!

Reflection

Whereas the third-order case showed how a design is intended to support the user optimally, there was no intention to change the actual nature of the work of the operators. The smart mailbox illustrates that design thinking can go beyond ‘just’ user-centered design, entering the fourth order. First of all, the allocation of functionality – *where* and *what* is done by the user – has changed. Second, it changes the user experience. Instead of having to rifle through a pile of prints to find what they are looking for, users can rely on the printer to perform the role of a ‘personal assistant’. Still, there was a learning curve involved, and several improvements had to be made before people liked the function (Bouwmeester and Stompff, 2006). Thirdly, and most intriguingly, the smart mailbox changes the way people work: people can send email, documents, webpages – anything they want to see on paper – to the printer, but can collect it only when it is convenient. Or not at all – if they change their mind....

Was this smart mailbox an invention of an individual, a genius designer? No. It was a team effort with contributions from many disciplines. The idea of a fingerprint reader came from researchers (even though they considered it a gadget). Integrating it completely into the product and designing the ‘one touch’ interaction were contributions of designers. Designing the architecture in such a way that printing is no longer addressed to a specific device came from software developers. It is precisely this

multidisciplinary teamwork which is apparently a prerequisite for arriving at and implementing these breakthrough ideas, mediated by an overarching shared vision.

6. Conclusions

We return to the five research questions stated in chapter 3:

(1) What is the expected contribution of design (thinking) within NPD teams?

Interpreting the cases, the good news is that design is here to stay as an integrated element of NPD teams, suggesting that design as a discipline is – through collaboration – understood and appreciated. It often starts at the first or second order, but it is fairly easy to extend the contribution to the level of action (third level). In the company described, this is what is mostly expected nowadays from design as a discipline, reflected in the fact that half the team is comprised of interaction designers. Indeed this sometimes even overshadows the more aesthetically driven first and second orders (Debije –Meessen and Jansen, 2004). Once key project members have confidence in the contribution of designers, senior designers will be involved in discussions concerning strategy, architecture, layout and product vision, making the leap to the fourth level.

The bad news though, is that this relationship needs to be developed. The second case showed that an R&D site with no designers in its teams begins with first and second order questions; due to the late involvement, it had to stay on that level.

(2) What can design (thinking) mediate within these teams?

First of all what designers do is introduce a new language into NPD teams, reflecting their consumer or user-oriented way of thinking. Terms such as ‘perception’, ‘ease of use’, ‘system behavior’, ‘flow’, ‘comfort zones’, ‘usability’ were introduced by designers but are now broadly used within the NPD projects. These create a different ‘user / product’ perspective: it is impossible to design a product around the user without considering the entire layout, just as it is impossible to design an element of a system without considering the entire system and how elements interrelate. And that is precisely

what happens when designers act *within* NPD teams: attention is shifted from ‘modules’, ‘parts’ and ‘functions’(Bucchiarelli, 1994) towards integrated ‘products’, ‘users’ and ‘systems’.

Second, another sort of language is introduced, namely visualization – in the widest sense including dynamic interface visualizations. This is a powerful and valued tool in NPD projects. It obviously facilitates easier communication of designers’ ideas, but more important is its mediating role: visualization bridges the world of R&D and business. Trying to capture the essence of what a project is all about is hard to describe in terms of technical requirements or business plans. What is understood by everyone is the product itself, well described by means of the embodiment design and the interface design.

(3) What are fundamental problems which designers encounter within this role?

The third-order case described a classic problem which designers encounter: the dilemma when considerations on different orders conflict. More often than not, ergonomics do not lead to aesthetically pleasing products, just as ‘beautiful’ cars are seldom very usable... Particularly amongst designers this can spark heated debate – and not just in the organization under study. ‘Pleasure’ and ‘aesthetics’ have only recently entered the vocabulary of user-centered design (e.g. Norman, 2004). In consequence, the focus of the different orders appears to vary. Whereas first-order design strives for consistency, and therefore favors house styles, standards and rules, second-order design strives for differentiation and therefore often explores ways to get past the rules.

Another difficulty is that, in the heat of the debate, design-related themes simply go under. Design is considered ‘soft’, implying there are no crisp, clear targets, whereas engineering targets or functionalities are ‘hard’. As an example: it is difficult to maintain even ergonomic quality when a major ‘no-go’ technical problem could be solved by simply taking an entire product “just a little” beyond the level of comfort zones.

(4) What competencies does this team role require from designers?

Besides skills related to design itself, the main expectations nowadays – not only in this company – concern usability. Designers should be able to translate the needs of users into R&D language and product concepts, as can be best seen in the third case. This ‘translation’ between user needs and R&D language is bi-directional: it is also about anticipating the impact of technology decisions on the NPD process which affect the product experience and – if necessary – attempting to influence these decisions. Yet this requires two more typical design – competences. First of all being rather visionary, as to be able to influence e.g. a technical lay out, one needs to have clear ideas concerning what the product is about – years before actual introduction! Second: they need to be fairly convincing if they are to sell ideas in an environment that likes quantitative targets.

(5) What are the risks inherent in this role?

First: one important goal of any in-house design department at a large company is to achieve consistency across all products. Though not visible in these cases, designers often tend to value project goals above consistency. Second, the user-centered mantra, prevalent within this company but also dominant in design-related literature, may overshadow aesthetics and commercial thinking. It is possible to combine these aspects, but the ‘forethought’ of the designers shapes the direction in which designs are explored. Third, in-house designers become highly specialized in a product category, but risk losing sight of what is happening outside their domain – above all with contemporary design in the widest sense. Designers in consultancies work in a wide range of categories, keeping them fresh and innovative.

7. Managerial implications

To address the risk of losing consistency, two pragmatic policies are applied at the company in the case study: the company rotates designers every now and then between the projects, and stages projects in which designers collaborate (e.g. as in the second-order case). The latter option is particularly valuable, as collaboration not only delivers better results, but also develops a shared understanding over the duration of the project that effectively syncs all the participating designers.

The risk of the usability mantra overshadowing other issues in the thinking of designers can be addressed by either defining strict 'aesthetical' study projects (like the first case), or by designating specific roles within teams of designers. Indeed nowadays three researchers are part of the Océ Industrial Design Department (in total 25 persons), specialized in usability testing and conducting field research. The risk of having designers that eventually disconnect from their occupational context is acknowledged within Océ by both management and the involved designers. The designers need to be refreshed and re-inspired every now and then. This is accomplished by collaborating with design consultancies on strategic projects. These are not outsourcing projects, but really entail teaming up and collaborating, debating, sketching, deciding and syncing.

8. Discussion

In the original frame work of R. Buchanan, a fifth level was discussed (Buchanan 2005), namely expression. It was perceived as the core of design thinking on all levels, and therefore is not addressed on a separate level: "*expression does not clothe design thinking, it is design thinking in its most immediate manifestation, providing the integrative aesthetic experience which incorporates the array of technical decisions contained in any product* (pg 46)."

This assumes that all technical decisions are embedded within an integrative perspective, design thinking, putting the experience upfront. This might hold true as long as a product is designed entirely by one person. Yet within large NPD teams many, many technical decisions are made without much consideration as to what the expressive manifestation of that decision is. This addresses a new design challenge: how to inspire teams with what a product has to express, how it should manifest itself, so that developers can reflect on the impact of their decisions on the final product. One idea for exploring this is to articulate product and/or brand-related assumptions within these teams (Stompff 2008).

9. References

Body, J. (2008) *Design in the Australian Taxation Office* Design Issues 24 (1), pg 55-67

- Boland, R. J., Collopy, F., Lyytinen K., and Youngjin Yoo (2008) *Managing as Designing: Lessons for Organization Leaders from the Design Practice of Frank O. Gehry*, Design Issues 24 (1), pg 10-25
- Bouwmeester, K. den, Stomppff, G. (2006) *Bridging the gap between literature and practice: usability testing*. Proceedings 16th IEA congress 2006, Maastricht (CD-Rom Elsevier)
- Breslin, M.. and Buchanan, R.(2008) *On the Case Study Method of Research and Teaching in Design* Design Issues 24 (1), pg. 36-40
- Buchanan, R. (1995). *Rhetoric, humanism, and design*. In R. Buchanan & V. Margolin (Eds.), *Discovering design: Explorations in design studies* (pg. 23--66). The University of Chicago Press.
- Buchanan, Richard (1998). *Branzi's Dilemma: Design in Contemporary Culture*. Design Issues, 14 (1), pg 3-20.
- Buchanan, Richard (2001). *Design Research and the New Learning*. Design Issues, 17 (4), pg 3-23.
- Bucciarelli, Louis L. (1994). *Designing Engineers*. Inside Technology series, MIT Press.
- Buijs, J.A. and Valkenburg A.C (2005) *Integrale productontwikkeling 3rd edition*, Lemma, 2005.
- Buxton, Bill (2008). Website <http://www.billbuxton.com/>
- Debije-Meessen, A. E. J., Jansen, J.A.H. (2006). *The balance between Aesthetics, Usability and Corporate Identity: Graphic User Interface design within a commercial company*. Proceedings of the conference on Information Visualization 2006, pg. 357-361
- Green, L (2007). *Design has a Seat at the Strategy Table. Now What?* The 32nd International Design Management Conference: Thinking Ahead, The Changing Role of Design and Design Management in Business.
- Hekkert, P.P.M, Mostert, M and Stomppff, G. (2003). *Dancing with a machine: a case of experience-driven design*. Proceedings of the 2003 international conference on Designing pleasurable products and interfaces Pittsburgh, PA, USA (pp. 114-119).
- Junginger, Sabine (2008) *Product Development as a Vehicle for Organizational Change* , Design Issues 24 (1) pg 26–35

- Kapferer, J.N. (1998). *The New Strategic Brand Management - Creating and Sustaining Brand Equity Long Term 2nd edition*. Kogan Page London and New-York.
- Manzini, E. (1995). *Prometheus of the everyday: The ecology of the artificial and the designer's responsibility*. In R. Buchanan & V. Margolin (Eds.), *Discovering design: Explorations in design studies* (pp. 219--243). The University of Chicago Press.
- Margolin, V (1995). *The product milieu and social action*. In R. Buchanan & V. Margolin (Eds.), *Discovering design: Explorations in design studies* (pg. 121 --145). The University of Chicago Press.
- Martin, J (1992). *Cultures in organizations, three perspective*. Oxford University Press, New York.
- Monö, R. (1997). *Design for product understanding: The aesthetics of design from a semiotic approach*. Stockholm: Liber.
- Morello, A. (1995). "Discovering Design" Means [Re]-Discovering Users and Projects" In R. Buchanan & V. Margolin (Eds.), *Discovering design: Explorations in design studies* (pp.69-76). The University of Chicago Press.
- Norman, D.A. (2004). *Emotional Design: Why we love (or hate) everyday things*. Basic Books.
- Nusbaum, B (2005). The Empathy Economy. Business week March 8 2005
http://www.businessweek.com/bwdaily/dnflash/mar2005/nf2005037_4086.htm
- Person, O., Snelders, D., Karjalainen, T.M., Schoormans, J. (2007) *Complementing intuition: insights on styling as a strategic tool*. *Journal of Marketing Management*, 23 (9-10), pg. 901-916
- Stompff, G. (2008). *Embedded brands –the soul of product development*. *Design Management Review*, 19 (2), Forthcoming.
- Stompff, G. (2003). *The forgotten bond: Brand identity and product design*. *Design Management Journal*, 14 (1), 26-32.
- Tomiyama, T. and D'Amelio, V. (2007). *Toward Design Interference Detection to Deal with Complex Design Problems*, in F.-L. Krause (ed.): *The Future of Product Development*, Proceedings of the 17th CIRP Design Conference, Springer, Berlin, Heidelberg, pg. 473-482.
- Verbeek, P.P. (2005) *What Things Do: Philosophical Reflections on Technology, Agency, and Design*. Penn State: Penn State University Press

- Vice, C. (2007) *Design Thinking: How this Concept Creates Opportunities within the Integrated Practices of Design and Business*. The 32nd International Design Management Conference: Thinking Ahead, The Changing Role of Design and Design Management in Business.
- Vihma, S. (1995). *Products as representations*, University of art and design Helsinki, UIAH
- Yin, R.K. (1994). *Case study research – Design and methods 2nd edition*. Sage Publications London.
- McCullagh, K. (2006) *Strategy for the Real World*. Design Management Review, 17 (4), pg. 48 -55

Figures

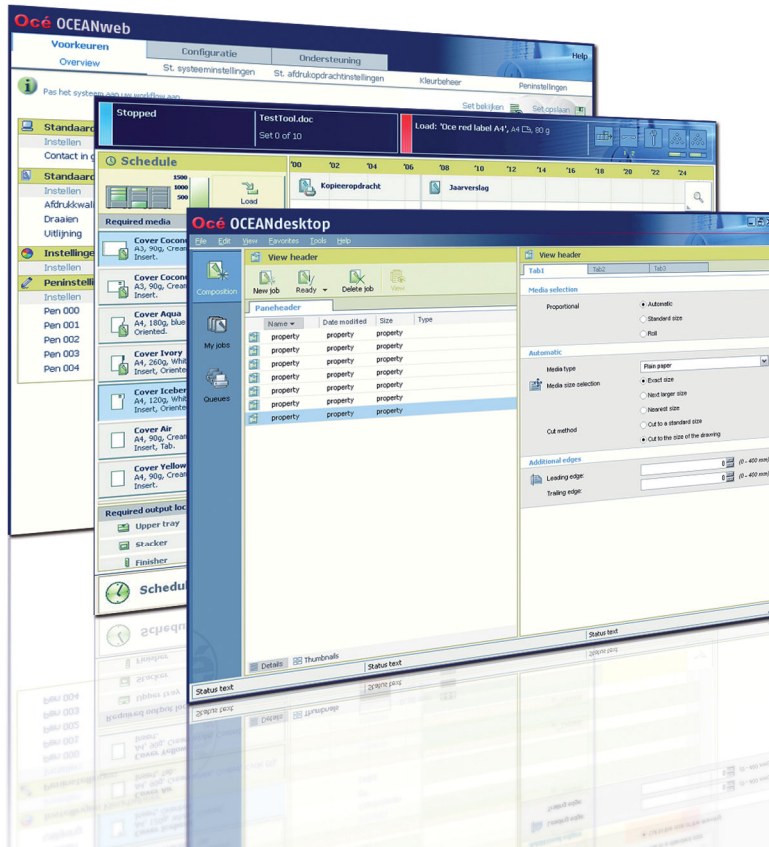


Figure 1: The Ocean styleguide, an consistent and contemporary look and feel for software applications, operator panels of printers and web applications. Started as strict first order project, it eventually became the engine for considerable change.



Figure 2: The Océ ColorStream 10000, to be launched May 2008. Embodiment design in its purest form, yet affecting the strategic portfolio.



Figure 3: A professional color printer and the separate controller, both with their own interface.



Figure 4: The Océ CPS 900, a professional color printer. Designed as a desktop, with all relevant interaction point within arms reach, impacting underlying product lay out considerably, an example what 3rd order design mediates.



Figure 5: Océ Touch-to-Print: a new approach towards printing on shared devices. With only one stroke, users are identified, get access to their personal digital mailbox and can print (or scan) documents with a wide range of possibilities. This seemingly small and logical step – requiring a serious development effort, changed the way how people work