

Designing with data: A framework for the design professional

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ABSTRACT

The world of design is constantly changing. There is a variety of methods for gathering data during different phases of the design process. With emerging technologies (such as sensors in autonomous vehicles or the Internet of Things), data is becoming more valuable but also more complex to understand and translate into knowledge. Products become tools that deliver a complete experience within a complex system for the user. How can a designer stay relevant in this process, where users have the ability to design for themselves and even entire market segments (e.g. kickstarter.com, Indiegogo.com)? Moreover, if data is capable of designing itself, will the design professional become irrelevant? This paper explores opportunities within emerging methodologies and the combination of different kinds of data. It delivers a framework for future research, where a combination is made between different perspectives of the design process. As a result, *big data* can be used by designers after the launch to continuously improve the product, service or system. The design professional has the role of a Fusionist, working across disciplines solving complexity.

Keywords

Design methodology, data, design professional

INTRODUCTION

Data-driven design has become increasingly popular (Kusiak, 2009). “As a designer, you no longer need to convince your clients of ‘elegance’, ‘simplicity’, or ‘beauty’. Instead of those subjective measures, you can give them data: click-through and abandonment rates, statistics on the number of installs, retention and referral counts, user paths, cohort analyses, and A/B comparisons (Chawla, 2015). A client does not have to decide whether the design is desired, the data speaks for itself. Furthermore, the profession of design changes when they have so much data to design with. Finally, what is the relevance of the design professional when systems can design themselves? “Design has matured from a largely stylistic endeavour to a field tasked with solving thorny technological and social problems, an evolution that will accelerate as companies enlist designers for increasingly complex opportunities” (Labarre, 2016). This paper will take an explorative look into the changing role of the designer, by looking into emerging design methodologies, with the technological trend of big data. The scope of the paper entails the nearby future for digital products. This gives

data a whole new meaning because of the quantitative data that is created by these products. First, an overview is made to explain current and new design methodologies. This is followed by an analysis on different types of data. Finally, the design professional is linked to these topics and a framework is created to support this.

DESIGN METHODOLOGY

A design methodology is “a plan of action that links working steps and design phases according to content and organisation” (Pahl et al., 2007). It includes strategies, as well as methods, to solve individual design problems or partial tasks. This is rapidly changing into the field of co-design (or actually, participatory design) (right side of Figure 1) where the user has an important role to play in the design process (Sanders & Stappers, 2008). Sanders elaborates that the traditional methods of designing products (e.g. visual communication design) are changing in designing for a purpose (e.g. design for experiencing).

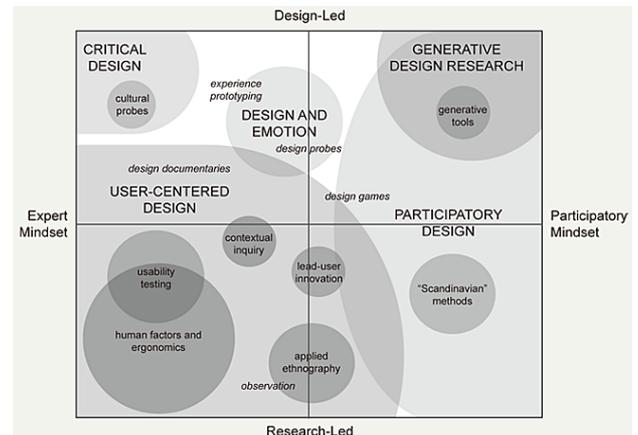


Figure 1: Different design methodologies (Sanders & Stappers, 2008)

A design professional with an ‘expert mind-set’ believes in his ability as a design professional to create the design. He sees the user as a subject. While a ‘participatory mind-set’ believes in making the design together with the user, seeing users as partners in the process (Sander & Stappers, 2014).

However, Bogers, Frens, van Kollenburg, Deckers and Hummels (2016) state that the results of co-design are, always subjective and they strongly depend on the information the participants decide to provide. Bogers et al. (2016) continues stating new tools for remote research (e.g., webcams, screen sharing, video and

audio recordings) emphasising screen based interactions and showing its powerful ability to collect both opinion-based and behaviour-based data. Although often used for validation or optimisation purposes, it could be interesting to implement this in a data-driven design approach.

Design phases

For this study, which is looking into the use of data in design methodology, a model (Figure 2) was chosen to connect different design phases that are linked to different kinds of data.

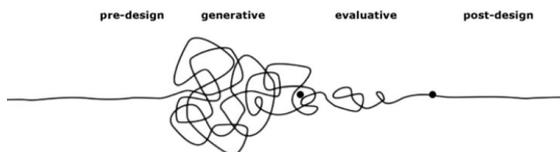


Figure 2: Design steps (Sanders & Stappers, 2014)

1. *Pre-design*: Defining and exploring the context of the user.
2. *Generative*: Create design opportunities.
3. *Evaluative*: Further development of the design.
4. *Post-design*: How people are actually using the product.

There is a lot of theory about different design processes (e.g. Roozenburg & Eekels, 1995; Pahl & Beitz, 1984), mind-sets, methods and tools to create successful products, services, or even systems. These processes also focus more on the product level of design, the model of Sanders & Stappers (2014) is generic and it easily embeds different kinds of data for this study.

WHAT IS DATA?

There is a lot of literature about different kinds of data and how to categorise them. First, a definition is given on the terminology of ‘data’. Then, I look into the scope of different amounts of data. Finally, data used in design is explained.

Data can be translated into different levels of understanding (Figure 3). Bellinger, Castro and Mills (2004) state that *data* simply exists and has no significance beyond its existence, whereas “*information is data that has been given meaning by way of relational connection*” (Bellinger, 2004). This “*interpretation differs depending on who is analysing. Knowledge therefore, is the appropriate collection of information, such that its intent is to be useful*” (Bellinger et al., 2004). Also, *knowledge* is internalized by the knower, and as such is ‘shaped’ by their existing perceptions and experiences (Hey, 2004). Hey (2004) continues that there is a level between knowledge and wisdom, understanding. *Understanding* (learning) is the process by which we can take knowledge (memorising) and synthesise new knowledge from the previously held knowledge. Furthermore, *Wisdom* deals with values, which involves the exercise of judgment (Ackhoff, 1999). Therefore, wisdom also is the process by which we also discern, or judge, between right and wrong, good and bad (Bellinger et al., 2004).

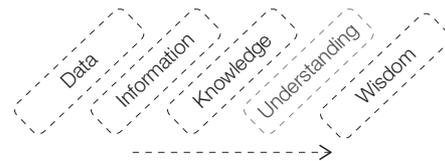


Figure 3: Structure from data to wisdom

Amount of data

For this research, I focus on the data that has a relationship with human behaviour, interaction, and experiences. Mortier, Haddadi, Henderson, McAuley and Crowcroft (2014) describe three different *amounts* of data: *data trail* (electronic record of the transactions or activities of a particular person), *data smog* (confusing mass of information, which cannot easily be separated in valuable information) and *big data* (computing data of a very large size, to the extent that its manipulation and management present challenges). Within digital products, we see more and more big data sources (e.g. data created by cars, social networks, smartphones and internet search engines). Without having a pre-defined focus, it is very hard to make sense of big data.

I see data as a personal record of your life (observed or self-generated), which shows who you are as an individual. Design professionals could utilise this data as they collect insights from them to design.

Data driven design

There is a growing body of literature about data driven design. The usage of data within design methodology is changing in the same way data gathering changes through technology. Bogers et al. (2016) state two types of data enabled design. The ‘contextual step’ and the ‘informed step’. The contextual step (mostly qualitative) explains how the designer should define the context, users’ behaviour, and experiences. The informed step (mostly quantitative) affords opportunities for quick remote iterations of the design prototype. Note that these are mainly digital products. Bogers et al. (2016) state the importance of direct contact with the end user in creating valuable qualitative data. However, newly arising technology such as sensors and the IoT (internet of things, Kopetz, 2011), give flexibility and new opportunities in collecting (rich) quantitative data.

Another way of defining data within design is to create a separation between the input designers need from the data. The input can be divided into two sections: data for exploration and data for validation (Boeijen, Daalhuizen, Zijlstra & van der Schoor, 2014). Often, explorative data is *qualitative* (e.g. ethnographic data) and is used in the early stages of the design process (detailed and observed data, e.g. interviews, Bogers et al., 2016). Whereas validating data is mostly *quantitative* (e.g. usage data) and used to study desirability and functionality at later stages of the development (a static component to optimise the design instead of creative material, Bogers et al., 2016).

Data has an influence on the design process, so it needs to be clarified which kind of data can be used and at what time. Speed and Oberlander (2016) state that three different kinds of data are utilised within the design process (Figure 4):

- Design *from* data: When systems are designed by people, inspired by measurable features (e.g. products with no direct feedback, such as a chair).
- Design *with* data: When systems are designed by people, taking into account the flows of data through systems (e.g. mobile apps).
- Design *by* data: When systems are designed by other systems, largely autonomously (e.g. the ‘Nest’ smart thermostat).

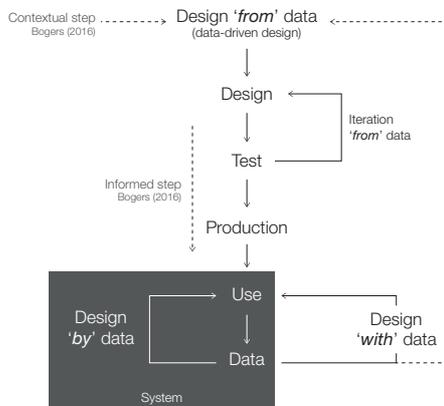


Figure 4: Different kinds of data within the design process

With designing *by* data becoming more and more relevant in design systems (e.g. Facebook cookies, giving personalised unique advertisement), designers are becoming irrelevant after the initial concept design: the system optimises itself. So where is the future of the design professional?

THE DESIGNER

In the traditional design process, the researcher served as a translator between the users and the designer (Sanders & Stapper, 2014). The designer having an expert mind-set (Figure 1) and the researcher collecting large amounts of data from (passive) users. With the participatory field of design stressing the importance of the direct contact with the user, Sanders and Stappers (2008) created a framework where the user is central during the process and is used for gathering diverse insights. The user is the expert of his/her experience (participatory design). The designer plays the role of creating an environment where the users can express their creativity.

Visualised in figure 2, the design process is not linear. Some design professionals use strict methods, others draw from their experience and intuition. I see design as a conversation over time. The design professional engages in multiple relevant fields to converse with experts and users to co-create a solution to a complex problem. Bogers et al. (2016) stating the importance of users only giving information they want to give. One strength of the design professional is to filter data (qualitative or quantitative) into usable knowledge for the design.

FRAMEWORK

Co-design has proven to be a valid method in practise and education. How can we implement this into new opportunities for using (big) data?

Traditional methods state that design methodology ends with launch of the product or service, which has been tested several times and is ready for the market. With the arrival of smart products, the methodology of design needs to be revised. Together with methods such as Agile (Schwaber, 2004) and Lean Start-up (Eisenmann, Ries, & Dillard, 2012), the design process does not stop at the launch, because the product or service is far from optimal. The design process becomes more complex as

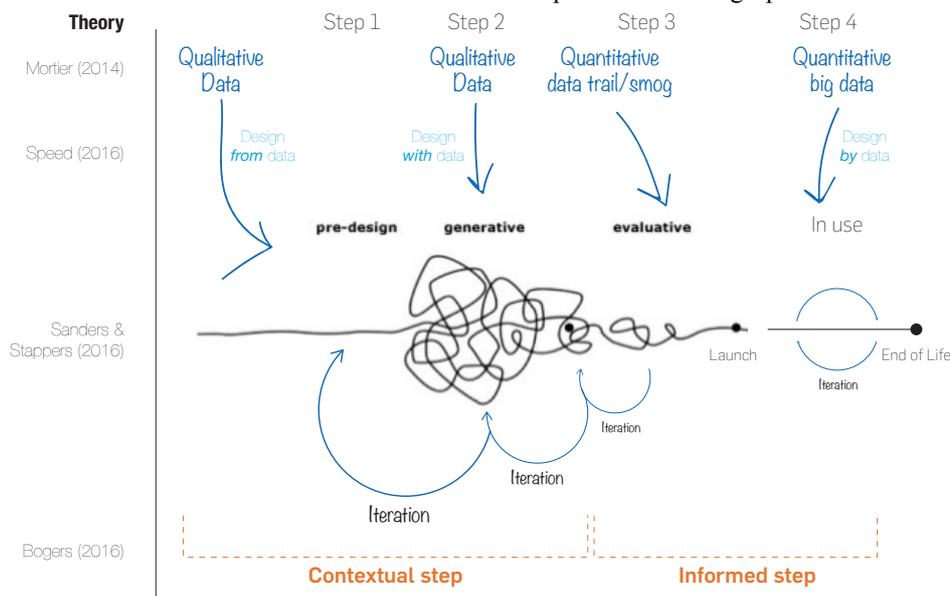


Figure 5: Framework of designing with data

users' needs develop from products to service to system designs for an even better experience. To keep the process flexible for the designer, a framework is suggested, where different theories are applied (Figure 5). The design process runs for the product life time cycle. With a continuous loop of data-feedback to the designer, there is no final design. Iterations take place at any time within the use of the product in the market (e.g. Tesla's cars were already equipped with autonomous driving sensors, only the software needs to be updated). With current technologies, large amounts of data are gathered by sensors or intelligent products (Holler, Uebnickel, & Brenner, 2016). The designer needs to know what insights they need, before going into the data. Data smog or big data (Mortier et al., 2014) are not useful in every part of the design process, as it is too hard to conclude insights. In the pre-design and generative phase, (qualitative) direct contact with the user is still necessary because rich data is needed such as emotion, feelings, reactions and interpretations.

The 'In use' step (Figure 5) is added (design *by* data) into the process of Sander & Stappers (2016) because it is relevant for the added value of big data. Within digital (screen-based) products, the design process is not finished at the launch (and possible reflection) of the product. It is the responsibility of the designer to create a flexible environment so iteration can occur as fast as possible. The book 'Nooit af' ('Never finished') (Witteveen & Aslander, 2015) state this example of a permanent BETA phase where the product is never finished, but is constantly developed and optimised. This is even the case in governmental and large insurance organisations or educational systems.

IMPLICATIONS – THE ROLE OF THE DESIGNER

In this study, the aim was to assess the role of the designer within the emerging methodologies like co-design and technology trends such as big data. *"Designers will be needed because they hold highly developed skills that are relevant at larger levels of scope and complexity"* (Sanders & Stappers, 2008). In the near future, designers will find themselves involved not only in the design of stand-alone products but also in the design of environments and systems (Sanders, 2008). Being a facilitator in the early stages of the design process, the relevance of designers does not end there. When systems become self-improving and stand-alone, designers still need to understand the amount of data that flows through the system. By understanding the complexity, designers will know how to create knowledge out of data because of their involvement through the entire process.

Asta Roseway (Labarre, 2016), principle research designer at Microsoft, states that the designer's role therefore will be *"to act as the 'fusion' between art, engineering, research, and science. The ability to think critically while working seamlessly across disciplines, blending together their best aspect, is what will make the design professional a 'Fusionist'. The challenge and reward for the Fusionist will be in her ability to*

communicate, comprehend, and connect all parties through design" (Labarre, 2016). I believe this captures the essence if the design professional of the future. To involve users in the creative and iterative process but also to be able to create valuable knowledge from big data.

DISCUSSION

As mentioned before, this study explores the emerging field of designing with (big) data with emerging technologies (e.g. sensors, webcams). Although this study focusses on the design of digital screen based products, Bogers et al. (2016) also speak of the necessity of implementing the *contextual* and *informed* step into the physical domain, but more research on this is needed. Further investigation is needed to test whether designers can use big data as a tool to optimize the user experience.

For the profession of design, Bogers et al. (2016) state that consumers only share what they want to provide. Henry Ford explains: *"If I had asked people what they wanted, they would have said faster horses"* (Hekkert, 2016), therefore, the design professional should not abandon the skill of developing ideas and only focus in the *'fusion'* between different fields. Design professionals are able to deal with complexity and interpret users' latent needs (Sanders, 2002). For future research, the combination of *'fusing'* different parties as translating user needs into a design should be investigated.

CONCLUSION

This study set out to find a solution for the changing role of the designer with the use of data. It shows an overview of design methodologies (Figure 1) where the model provides a solid base to look at the influence of data within design processes. As a consequence, this process is linked to different kinds of data: data-definitions, amounts of data, and data within design. The combination of participatory design methodology and big data provide new opportunities for the design professional. With big data, systems are being optimized until the 'End of Life' phase. This creates a faster design process as extensive testing can be done after the launch of the system. The suggested framework (Figure 5) gives an overview of the impact of big data on design methodology. Where design professionals have been an expert in creation, and the profession of design shifts in the direction of facilitating creativity, mapping user needs and solving complexity.

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