New craftsmanship in industrial design towards a transformation economy

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Abstract

Historically, design focused on 'the giving of form and meaning,' taking place in design studios, workshops or laboratories. Grown from a traditional craft (artisan) activity, design was often about creative problem solving. Meanwhile technology has been advancing, allowing designers to create highly complex interactive and intelligent products and systems in our everyday life. Through these new technological possibilities, new design opportunities can be explored.

In our society we are currently facing a number of complex major challenges e.g., healthy living, the economic recession, safety and attaining a sustainable level of energy and material consumption. Disruptive innovations are needed to create structural and sustainable societal change to face these challenges. In many cases these innovations cannot be obtained through traditional problem-solving design approaches. This brings new challenges for modern designers and inevitably entails questions about design, the role of the designer and the design process. In this conceptual paper, we describe our proposal for a new craftsmanship of the designer, based on taking the design process into the wild towards real people in their own environments. By using a Research-through-Design approach we see new roles for designers and accompanying crafts, competencies and design processes.

KEYWORDS: craftsmanship, societal transformation, paradigm shifts, Experiential Design Landscapes, Experiential Probes

Introduction

Design is an old profession. Craftsmen have always been making objects. Industrial design, however, can be seen as a product of the industrial revolution, although the division between the creation of the product (idea) and the manufacturing process already started in the beginning of the 16th century when workshops specialised and trade expanded (Heskett & Giorgetta, 1980).

Industrial design came to existence when a single craftsman could no longer be responsible for every stage from conception to sale. The use and development of new 'technology', production techniques and materials in the eighteenth and nineteenth century enabled the development of mass production, standardisation, modularity and diversification of designs for new target groups. This also required new forms of collaboration of different experts and new business models to stimulate mass consumption (Forty, 1986).

Although industrial design was commonly incorporated in industry at the end of the nineteenth century, the profession of the industrial designer was still rather blurry, meaning that the activities of artists, architects, craftsman, inventors, engineers, technicians and personnel of larger companies were all labelled as industrial design. Only in the beginning of the twentieth century the legitimacy of the industrial designer surfaced as a person who integrated all these activities, incorporating e.g. technology, user, aesthetics and business aspects (Sparke, 1986).

Shifting economy paradigms

From the turn of the 20th century, societies in advanced industrial economies developed a shared aspiration to modernize their lives, which gave rise to the *Industrial Economy* (Ayres, 1952). Most of the economic value was delivered through cycles of industrial production and mass product consumption. The company offered the consumer a commodity, which aimed at fulfilling functional needs. Design was aimed at finding and understanding those needs in order to create a product that, according to the designer, was the best solution. The relationship between company/designer and consumer was one-directional; top-down (Forty, 1986).
Throughout the 20th century the role of design changed in relation to changes in society and relating economic paradigms. Brand and Rocchi (2011) describe four economic paradigm shifts: the *Industrial Economy*, *Experience Economy*, the unfolding *Knowledge Economy* and a possible upcoming *Transformation Economy*. Through each shift the character and role of design has changed.

Experience Economy

When competing products became increasingly similar from a functional, price and quality standpoint, together with a societal change, which advocated individualism and freedom in the sixties, the *Experience Economy* (Pine & Gilmore, 1999) emerged. Companies started to look for differentiation, which lead to brands and brand experience (Klein, 1999). Design had to become more consumer oriented, aiming at different market segments and target groups (Versluis & Uyttenbroek, 2011). The emphasis in design shifted from mere functionality of products to their meaning. Semiotics (Barthes, 1973) and product semantics (Krippendorf & Butter, 1993) became new areas of interest in design.

Knowledge Economy

Nowadays, in the *Knowledge Economy* (Rooney et al., 2005), people freely shape their own lives. Instead of belonging to subcultures and identifying with brands, people choose and mix from their personal, relational, educational and consumptions options to shape their own unique life. The introduction of the Internet has further helped people to see and find their personal place in society. People are able to create authentic representations of themselves on their own blogs, web pages or social media platforms such as Facebook or Twitter. Essentially, increasing numbers of people are now less interested in brands, brand experiences or products, but more interested in building their own personal brands on social media platforms, or sharing, developing and selling their own value to peer communities. For the first time since the start of the *Industrial Economy*, the tools of value production are not owned by companies and factory owners, but are easily accessible for ordinary people (Gardien et al., submitted). This has a major impact on the focus of industrial design and the competences of the designer. No longer can the designer make the decisions for consumers, he/she must be able to manage open innovation where both users and experts are able to collaborate and where the creation of meaning is done together within multi-stakeholder networks. Designers can no longer see themselves as the expert on what 'good design' is by taking a third person perspective (looking at the user), but need to take a first person perspective (being one with the user) (Hummels & Frens, 2011) and decide together with all involved stakeholders. New competencies relate to managing open innovation networks and the ability to rapidly explore interactive products and systems through quick iterations with users in co-creation sessions (Abel et al., 2011).

Transformation Economy

Our society is faced with a number of major challenges, which include the aging society, increase of sedentary lifestyles, the economic recession, healthy living, safety and attaining a sustainable level of energy and material consumption in light of the available resources. These issues are growing in magnitude, affecting people on a global scale. Many of these issues are too complex for any single stakeholder to resolve.

Brand and Rocchi (2011) propose to tackle these societal challenges and move towards a sustainable world by accomplishing a paradigm shift towards a *Transformation Economy* (Mermiri, 2009), where stakeholders work together on designing local solutions for local issues, that stem from our large global issues. Solutions to the big collective issues, leading to e.g. true sustainability and well-being, typically require behaviour change on a societal level, where the collective is more important than the individual. This is a salient difference with the *Knowledge Economy*, which is still very much aimed at the individual.

We believe that involving all stakeholders including citizens (or people, clients, users, consumers, depending on the frame of reference one takes) and aiming at individual/societal behaviour change, require that we move into the wild during the development process (Hummels, 2012). This move into the wild is essential since the complex societal challenges mentioned previously

cannot be solved by small incremental solutions that are developed behind the drawing board; they require more disruptive innovative solutions to realise behaviour change on a societal level. With disruptive we mean the absence of a well-established frame of reference for people or the market. Not only the product as such is new, but it also enables the creation of radical new meaning for the user, the market and society. And due to this disruptive character, we cannot predict this meaning or any behavioural change; we have to explore it in the wild, in the everyday context with all stakeholders involved.

The call to open up to 'radical' new skills and meaning to enable societal transformation and realise behavioural change on a societal level is getting stronger every day. Designing is perfectly suited to play an active role in this shift towards societal transformation, since design is about localising (making a matter concrete), questioning (reflection on its quality) and opening up (expanding its sense) (Sennett, 2008).

The transformation paradigm will require designers, together with other partners, to be able to envision and explore a new society from an unfamiliar context. By creating propositions and involving people an understanding has to be developed into the behaviour of individual people as well as society as a whole. This asks for new competencies in design as well as a shift in the application of existing design skills. Since the *Transformation Economy* is still to come it is still unclear what changes to design and competencies it will hold. At the department of Industrial Design of the University of Technology in Eindhoven we have developed the Reflective Transformative Design Process (RTDP) (Hummels & Frens, 2011) to give envisioning new societies, design action and transformation an equal role in the design process. Next to this, we developed the Experiential Design Landscapes (EDL) method (van Gent et al., 2011), to take design into the real life towards behavioural change and societal transformation. These are our first attempts at shifting design from a *Knowledge Economy* to a *Transformation Economy*, on which we elaborate in this paper.

Experiential Design Landscapes

In response to the global societal challenges we are facing and the foreseen *Transformation Economy* paradigm, we proposed the design research method Experiential Design Landscape (EDL), for developing and probing new radical innovative concepts in everyday life with people towards behavioural change and true sustainable transformation. Experiential Design Landscapes (EDLs) are infrastructures that are created to stimulate the creation of new, disruptive propositions in a (semi-)open environment. In EDLs these new propositions, which we call 'Experiential Probes' (EPs) (Megens et al., submitted) are used as 'propositions for change' to facilitate new and emerging behaviour (i.e. transformation) and designers can involve people into the development of new products or systems by allowing them to use the propositions in their everyday living environment. In parallel the EDL and the EPs enable detailed analysis of the emerging data and

behaviour patterns as a source of inspiration for designers of future products, systems and services.

The essence of an EDL is that it, on one hand, allows and encourages the creation of fundamentally new and disruptive concepts in a given context. On the other hand, it enables the analysis of new, emerging interaction patterns using multi-modal data capturing instrumentation (Vastenburg & Romero, 2010) embedded in the EDL. In an EDL people get, in contrast to a lab or field setting, the freedom or time to try new proposals this freely and long enough to let new types of behaviour and interaction patterns evolve. The dual nature of the EDL relates strongly to C-K theory (Hatchuel et al., 2004), which also describes a strong relation between the conceptualisation and knowledge based character of design and also aims for (radical) innovation. The difference is that the EDL method puts people central in the process; meaning is created in the interaction. The designer is no longer solely responsible for the creation of new ideas and knowledge; he/she has to rely on the participation of people in the EDL (Megens et al., submitted).

Many attempts have been made to involve stakeholders directly in product creation and innovation via co-creation (Thomke et al., 2006)(Sanders, 2008), empathic design (Leonard & Rayport, 1997) and participatory design (Schuler & Namioka, 1993), and to validate products in a near-real-life environment via Living Labs (Bergvall Kareborn et al., 2009). While these methods work for developing products and systems tailored towards users' (functional) needs, they do not accommodate processes where the value, meaning and impact of the design solutions can change and get redefined during prolonged use. Moreover, intelligent products and systems have the ability to adapt to individual users and situations, often over a longer period of time. As a consequence it is likely that also users will adapt themselves to these products and systems. As a second consequence the diversity of product-market combinations can grow to the level of individual user/product (system) combinations while, in the meantime, all kinds of, often unpredicted, usage patterns may emerge.

So, when designing for behavioural change and transformation in response to the societal challenges we are facing (such as in an EDL), one is asked to design products where the value, meaning and impact are uncertain, and can change and/or gets redefined during prolonged use. How does this affect design practice? What kind of design activities, skills and tools are desired? How can you design for products, systems, services and even users that can, and most probably will, adapt over time? Below we explore these issues by means of the Experiential Design Landscape 'Social Stairs'.

Social Stairs - an example of an EDL

Figure 1. People playing together on the Social Stairs EDL

The project of Social Stairs (figure 1) aimed at decreasing people's sedentary lifestyle (global health issue) and increasing their daily activity throughout the day by making the stairs a more appealing place. Through triggering people to use the stairs more often instead of the elevator a positive change for increased health can be made.

'Social Stairs' is an intelligent staircase in an EDL built at the university's main building that makes sounds as you walk up and down. When people walk together on the 'Social Stairs', it bursts into a different, more orchestral chime echoing up the stairs. 'Social Stairs' was developed as an open public accessible EDL (everybody could enter and use it). Through experiential probing it was found that people would engage and invite each other to the stairs. Therefore, these louder and orchestral sounds were designed to play into this social aspect. The designers did not predict the behaviour of people inviting other people to the stairs and playing with it together, but it did fit their aim for making more people more active even better. Through this reflection, more explorations through probing were made to find ways to further strengthen this social aspect towards a structural behaviour change, for instance echoing sounds of people who visited the stairs a little earlier.

'Social Stairs' was designed by means of a Research-through-Design approach (Hengeveld, 2011) and RTDP of Hummels & Frens (2011), driven by a vision (i.e. transforming society). This is how it differentiated itself from a traditional design process of analysing the (functional) needs of users in existing product ecologies and applying traditional problem solving. The designers went through continuous loops of design (synthesis) and reflection (analysis) in which making formed the basis of design action.

Interpreting and designing with the returns

While exploring and validating in context with the people in the EDL the designers acquire sensitivity to the subject of how to design towards the aimed transformation. The behavioural change is key here. The designer has to both trigger and understand new and changing behaviour, for example the above-mentioned new social behaviour in the Social Stairs EDL. This emerging behaviour is mirrored to the designer's vision how to make society more active and healthy, and may spark new ways to create a structural and sustainable future behaviour change. The process and accompanying tools and methods of triggering and understanding behaviour will be part of the core competencies of this new role of design.

In an EDL, and for instance the Social Stairs example, it is hard to understand beforehand what the meaning of such a concept would be and how it could affect people's behaviour. By building an intelligent staircase in an EDL, designers can probe different ideas for behavioural change. It therefore is important for designers to be able to fully understand the behaviour in the EDL and its accompanying meaning and values for the people. Through an example of emergent playful behaviour in the Social Stairs EDL we would like to discuss several methods and tools for understanding behaviour in the Social Stairs.

Observations, interviews and questionnaires in the EDL

The designer is part of the EDL and the process of designing takes place in the EDL itself, together with the people present. Through observing, interviewing and questioning the people in the EDL, the designer can find and address specific examples of behaviour and learn more about why people express this behaviour. Herewith the designer attempts to deepen his/her understanding and obtain a first person perspective on the occurrences and behaviour in the EDL (figure 2).
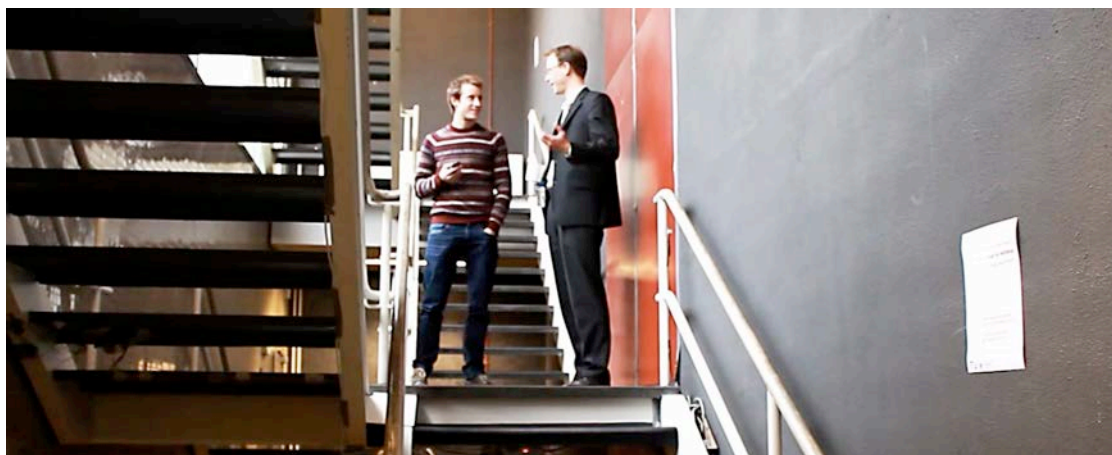

Figure 2. Interviewing people in the Social Stairs EDL. The designer is part of the EDL observing, interviewing and questioning people about their behaviour.

Data mining and visualisation

The EDL is instrumented to a high degree with smart sensor agents, behaviour recognition algorithms and data mining techniques to allow analysis of new behavioural and usage patterns that (may) emerge as a consequence of a variety of design interventions. EDLs allow real-time as well as longitudinal capture of individual, social, and environmental data and this way provide a rich continuous characterization of (emergent) behaviour.

This the data can also be analysed and visualised in ways that show change, emergence and even unexpected behaviour during one or several days or on the long term, creating immediate insight and possibly providing new inspiration for new ideas (figure 3). Mining data to enable the insightful and aesthetic visualization of data thus become part of the designer competency (Maeda, 2001)(Fry, 2008).
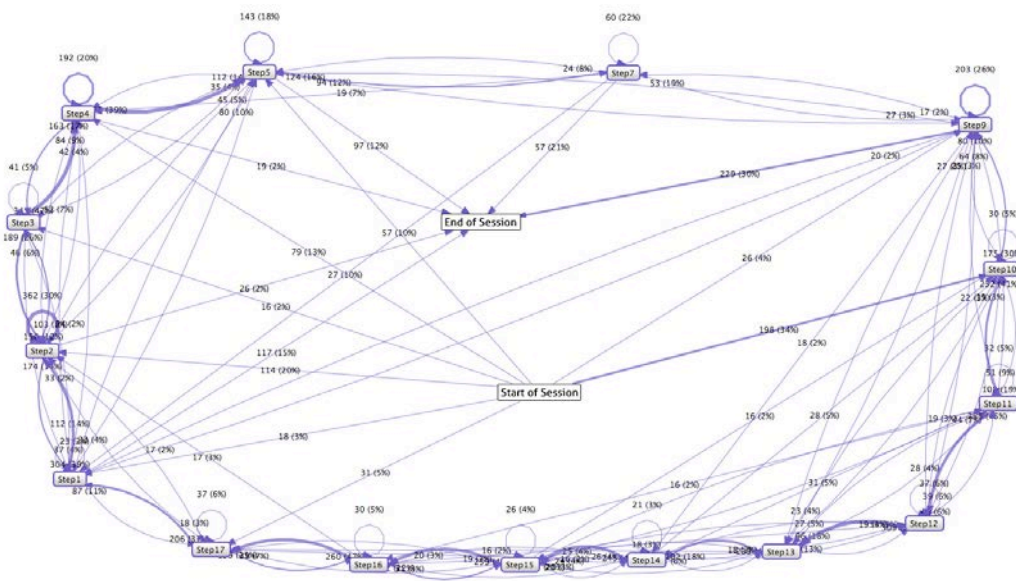

Figure 3. Data mining and visualisation. In this visualisation you can see the order of steps during one day. Through these visualisations insight can be gained in the amount of playfulness that occurred that day. Low sequential steps and more loops means people played around and jumped around in a non-sequential order. The visualisation is made in such a way that it for instance becomes easy to compare different days to each other, showing the triggered playfulness of different Experiential Probes.

Video Observation

In the Social Stairs EDL a miniature camera was installed to observe and study people's behaviour more in-depth. As designers cannot always be present the recorded video helps to see key moments of new or unexpected behaviour (figure 4). This way occurrences that surface in for instance the data visualisations or the interviews can be observed in hindsight.

Figure 4. Video observation footage. Through this video the behaviour of the people could be observed and studied more in-depth. Both the data and the video are time-stamped, so matching video of interesting data points can be found.

Automated video analysis

Video cannot only serve a purpose for observation, but also for more detailed analysis. Besides tracking basic behaviour video can see things that sensors miss or don't cover. Through movement recognition algorithms behaviour can be understood from video (direction of movement, speed, etc.). As the EDL runs for a long period it is important to automate some of these processes (figure 5) to both capture and understand behaviour change on the long run. Moreover, analysing and matching large amounts of data are being facilitated this way.
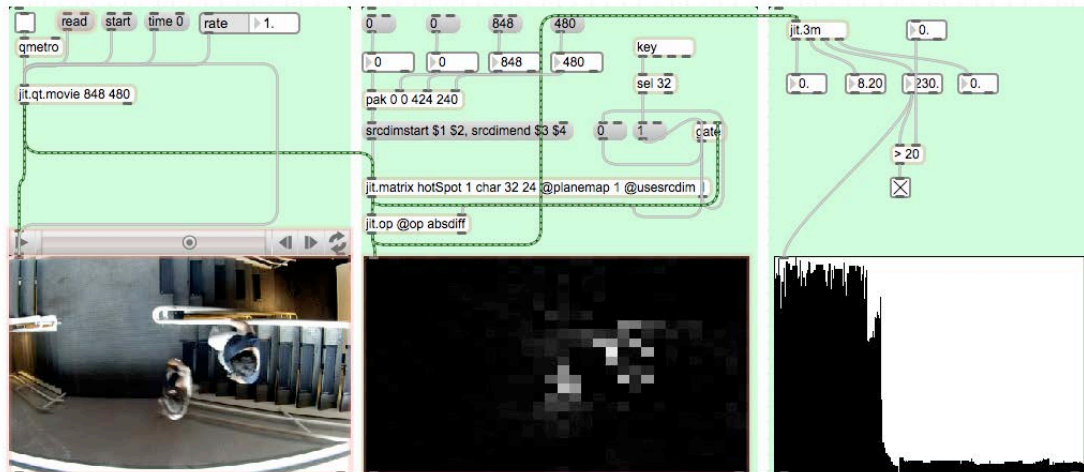

Figure 5. Automated video analysis. The video of the Social Stairs is analysed through image recognition. Next to the data of the steps this can be used to recognize the direction of the people on the stairs, which parts of the stairs they use and their speed. Next to this, it can also recognise people who deliberately use the other staircase, choosing not to use the Social Stairs. In the future we hope to even monitor the amount of people on the stairs at the same time.

Combining multiple returns

In the example of the Social Stairs case it became clear that the different ways of gathering

returns can support each other. Through combining different returns a deeper understanding of the behaviour in the EDL can be gained. One type of returns can tell only so much on what is really happening in the EDL, but for instance by combining data visualisations with the recorded video the designer can deliberately search for examples of behaviour that can spark new creative ideas.

Dealing with these multiple returns is not easy at first. Each individual method has a learning curve to get the right and insightful returns. Data mining and visualisation is a good example of this. Collecting the data from the sensors can easily be done. Processing this data can however be done in numerous ways, as is also true for visualising the processed data. Depending on the specific question(s) the designers ask themselves, a proper approach to find the answers to these questions has to be found. This asks for designers to build expertise to fine-tune and search behaviour in the data based on their gut feeling of what might be there.

These competencies have not been part of the design profession in the past. However, when designing for societal transformation these types of competencies become of high importance in the process of designing valuable propositions. In their nature, these new design competencies resemble much of the craftsmanship competencies, as they are too about building expertise and sensitivity to localise, explore and open up in great detail to create new value (Sennett, 2008).

Discussion

In the beginning of this paper we stressed the relation between crafts and design. We discussed the role and character of design throughout history (and possible future) by means of the different economic paradigms: *Industrial, Experience, Knowledge* and *Transformation Economy*. Currently we are facing major societal challenges and there is an appeal to design to come up with (disruptive) innovations to create structural and sustainable societal change. The traditional problem-solving design approach (i.e. serving human needs) will not solve these societal issues. Modern designers will have to move towards designing for meaning and (societal) transformation. New design competencies will be required and new craftsmanship will be indispensable.

The societal challenges we are facing are highly complex. The influx of emerging technologies adds complexity as well but also offer opportunities for design. The size and amount of computing power we carry with us is increasing everyday. More and more products and systems are becoming intelligent, networked and designed to be part of our everyday life and society. Designers have never been this close to being able track people and record behaviour and context real-time, longitudinal and in their everyday life. Design experimentation can now take place anywhere and anytime in the real world. In this paper we have described new competencies and craftsmanship for design to deal with this new way of designing. It will change the way we practice design and the impact it will have on society. As designers we can and should now embrace this new role and responsibility in society.

In the shift of the *Knowledge Economy* towards the *Transformation Economy* we see new competencies and craftsmanship emerge for both designers and other stakeholders in a design project. As the complexity and intention of design projects change, so do the actions and reflections of the people involved in the process. In the end we made a big leap from the first craftsmen before the *Industrial Economy* and what we now perceive as the industrial design practice. In this leap we cannot leave the other stakeholders in the design process out of this scope, as they too have to shift their focus and activities towards projects that achieve societal transformation.

Act of designing

Already in the *Knowledge Economy* the designer has become a facilitator in multi-stakeholder projects with an open innovation aim. In the *Transformation Economy* we see this develop further. The global societal issues are of a complex nature, leading towards a need for broader knowledge and thus new stakeholders from other fields to interpret, understand and envision opportunities and solutions towards structural change. The competencies belonging to the *Knowledge Economy* paradigm are not sufficient since in the *Transformation Economy* the focus is on meaningful living, empathy and cooperation, instead of self-actualisation and the pursuit of personal aspirations. This shift in focus also leads to different design processes and output. The design process is based on a vision on how to change society (e.g. towards more meaningful living, a more active lifestyle) so the outcome cannot be a fixed product at the moment people are involved in the design process. Early involvement of, and introductions of the probes to people in their own environments are necessary to create understanding on behavioural changes, both expected and unexpected. We already have mentioned the design output Experiential Probes. Their character, especially in the beginning of a design project, is different from finished products or product prototypes. EP's are 'propositions for change' which only goals are to create a (longitudinal) dialog with people to create a first person perspective and understanding. This asks for a different approach in design. Experiential Probes work best at probing when they are based on 'open scripts and intentionality' (Megens et al., submitted). The intention and meaning of the probe is preferably not fully defined by the designer. As we want to find out what values and meaning are important to the people using the probes this can best be left open for them to define. In this way unexpected use will happen a lot easier, since the designer doesn't fully define the expected use in the Experiential Probe.

Role of the designer

The shift to the *Transformation Economy* also leads to not only the designer, but all the stakeholders having to take a first person perspective. In case of 'Social Stairs' for instance a data analyst could help a designer with the processing and analysis of the returning data, but only when he/she is also looking for emergent or unexpected behaviour towards social change which can lead towards new design directions. In order to do so both the designer and analyst must have an aligned scope and a good understanding of each other and the people in the EDL. We found

numerous ways to process the 'Social Stairs' data, so it takes a sensible decision and understanding of the larger context of the people in the EDL for direction to find what you are looking for in your design. Everybody is then involved in the design process; the designer, the analyst but also the people using the 'Social Stairs', as they give meaning to the design. This brings new competencies into the field of design, also because both the designer and other stakeholders are now part of this process.

Design activities, skills and tools

This will also mean the designer will need a broader perspective in his skills in order to understand and discuss with these new competencies. We think the role of the designer therefore also expands, towards a careful listener and collaborator. Verganti (2009) already raised the importance of interpreters in order to envision and take a broader perspective. In order to deal with the complexity in projects in this paradigm a designer has to become really sensible and skilled in interpreting returns towards valuable propositions for the future.

To be able to make these interpretations designers will also need new tools and skills to develop propositions where people and their interaction with products, systems and services adapt over time. By using the intelligence we develop into our designs datasets can be returned. However in order to get rich datasets with multiple-angled measurements we see a need for intelligent platforms built around people using the EP's. Creating a dialog with these people also asks for other skills than interviewing and observations, as you are monitoring them in their own homes, work places and other environments. How do we ask appropriate questions at the right time and place without invading personal lives too much? These are still questions and developments we are working on and hope to develop in the near future.

Acknowledgements

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