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Community Building through a Theme-based Living Lab

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ABSTRACT
Societal, scientific and technological developments are changing the field of industrial design. The field expands towards designing for intelligent systems, products and related services. If one truly likes to design such systems, it implies a specific view on and attitude towards science, education and organisation, which we describe in our transformative theoretical framework. The framework stresses the importance of multiple, temporal, and complex systems, it incorporates self-directed and life-long learning, it values 'meaning is created in interaction' and it explores social networks and mini-companies. At the department of Industrial Design of Eindhoven University of Technology we have concluded that identity, expertise and community building are essential pillars in this process. In this paper we show one of the mechanisms to facilitate this process and describe its rationale: our theme-based living lab. Our first experiments with the themes Wearable Senses and Playful Interaction seem promising with respect to community building and competence sharing.

INTRODUCTION
During the last decades, design has slowly shifted its focus from one person – one product (technology) interaction, to several persons via a product (technology) interaction, and is now shifting more and more towards a network of interaction between people and intelligent products (technology) within the context of use.

At the Department of Industrial Design, Eindhoven University of Technology, we focus on this latter circle by educating prospective design professionals to design intelligent systems, products and related services for social/societal transformation, which addresses aspects such as adaptive behaviour, context-awareness and highly dynamic interaction. Instead of designing “closed” products and human-product interaction, designers are now developing open systems that are not finished anymore when they leave the factory, but evolve in interaction through e.g. services and adaptation.

Since technology is changing so rapidly, it is potentially capable of transforming our lives and society in ways that we cannot know of beforehand. Therefore we want to educate future designers who are able to apply these new technologies in ways that are new and daring, driven by a design vision of how our world could be, and validated by solid user research. We want them to explore and develop highly disruptive products, where the term "disruptive" implies the absence of a well-established frame of reference for users or the market. This implies that our students do not only need to develop the next generation of systems, products and services with which people can pursue their lives, but also investigate what kind of life and society we (designers, users, industry, society, …) want these systems to support. This requires a central place for creating a vision on social/societal transformation next to user/market explorations and validation. Moreover, it requires support for exploring opportunities instead of solving problems (Hummels and Frens 2009). All in all, it demands a holistic, creative, flexible and open attitude, in which designers explore new opportunities.

In this paper we will first explain our transformative theoretical underpinning and starting points in the areas of science, education and organisation, which we consider essential for educating future designers. Thereupon we will explain that identity, expertise and community building are essential pillars in this process. Finally, we will describe and show one of our mechanisms for identity, expertise and community building: our theme-based living lab.

I. TRANSFORMATIVE THEORETICAL FRAMEWORK
Dealing with the complexity of our society, including political, economical, social, cultural, ethical, technological, managerial and scientific domains, requires in our opinion specific forms of organisations that value aspects such as creativity, exploration, self-regulation, continuous learning, and responsibility. We consider several theories/models extremely suitable for our approach, and we will explain four of them in the following subsections.

A. Multiple, temporal, complex system: Order through Chaos
Prigogine and Stengers (1984) show that the history of western thinking can be divided into three paradigms: 1) the classical-Christian view developed by e.g. Aristotle, Ptolemy and Thomas Aquinas, 2) the classical-scientific view
developed by e.g. Newton and 3) quantum physics / dissipative & self-organising structure view developed by e.g. Einstein, Bohr and Prigogine (Doll 1986:10)

Einstein’s theory of relativity dismantled the notion of objectivity and predictability as initiated by the classical-scientific view of Newton. Where Newton’s world is essentially simple and closed: it can be modelled through time-reversible laws and all complexes can be reduced to simples, Prigogine’s reality is multiple, temporal and complex. It is open and admissible to change.

According to Doll (1986:14) this paradigm requires a different educational model with a transformative curriculum, instead of a measured and uniform curriculum with tests that are considered objective and predictive, and with teachers that have a God’s-eye view. In such a transformative curriculum for example teachers discard the God’s-eye view, and emphasise and support a variety of positions, procedures and interpretations.

We wholeheartedly embrace this ‘new’ paradigm. Key point of this paradigm is that development follows an equilibrium – disequilibrium - re-equilibrium pattern (Piaget 1971), where one goes from one stable state to another, in which the disequilibrium is often chaos through which one reaches order. The disequilibrium is the driving force of changing behaviour and development. Reflection and action are essential elements to regain order because they can change personal structures and ways of looking at the world and dealing with it. Therefore it’s important to have an organisation that supports the construct – unconstruct – reconstruct process. (Doll 1986:15).

B. Life-long Learning: Self-regulation and Responsibility

Society in the twenty-first century is characterised by rapid changes, including science and technology, which is turning this era into a ‘knowledge age’. The amount of knowledge is increasing very fast and is expected to go on growing at an even higher pace. Together with the advances in information and communication technology, this increases the volume of easily accessible information beyond imagination.

Functioning effectively in this society requires the ability to deal creatively and flexibly with large amounts of constantly evolving information and the ability to learn continuously. Life-long learning, in turn, requires the ability to direct and regulate your learning. The notion of self-directed learning refers to the degree in which people are behaviourally, meta-cognitively and motivationally active in their learning (Hummels and Vinke 2009:10).

Within our university setting we base our educational system and our curriculum on this starting point. In our competency-centred self-directed learning model, learning and working are coming together. Students learn to learn (what, how and why) and we facilitate their learning. Attitude plays an important role. Our students need to develop the ability to reflect, to self-regulate their learning, to take responsibility, to learn from experience and to assess themselves. Staff-members need to make a shift from teacher-focused to learning-focused, and their role needs to change from being an authoritative source of knowledge to facilitating students’ learning.

Our students create their own individual curriculum. At the start of the semester, they select their learning activities, depending on their individual learning needs and in compliance with the ID competence framework we offer (Hummels and Vinke, 2009: 52). Between 50-60% of their time is dedicated to integrative design projects. During and at the conclusion of learning activities, students reflect on their activities and they invite staff members involved to provide them with (written) feedback on their process and outcomes. At the end of the semester, students create a showcase, which forms the main part of their assessment. In this showcase they demonstrate their development of their overall competence of designing, vision on designing and growth as a designer, underpinned with evidence.

C. Creating Meaning in Interaction: Doing and Thinking

When educating our future design students we stimulate them to learn by doing because, similar to Prigogine, Doll and Piaget, we consider learning to be an active construction of meaning by the learner in its context. It is about learning and performing through practical application, while simultaneously acquiring theoretical skills. It is a unity of theory and practice, where experience plays a crucial role (Dewey 1938).

Not only the learning process, but the design process too benefits from the reciprocal relationship between thinking and doing/making. Developing design solutions can be seen as a process of taking decisions based on too little information. The whole process of achieving insight into the design opportunity and solution domain revolves around continuous information gathering (Hummels and Frens, 2009: 2658). There are two strategies to generate information and that reciprocally provide focus for each other:

- **Thinking:** analysis and abstraction, providing a more formal kind of information, e.g. formal scientific notations based on mathematics or analyses of user behaviour.
- **Making/doing:** synthesising and concretising, providing a more experiential kind of information, e.g. knowledge that is harder to formalise such as aesthetics and creativity, or physical prototypes.

Finally, we can use the same rationale for human product interaction. Meaning is created in interaction, as Paul Dourish stressed by coining the term embodied interaction, which refers to products, objects, conversations, and actions etc. that unfold in the world and are meaningful in the social and physical world. So, “the ways in which we experience the world are through directly interacting with it, and that we act in the world by exploring the opportunities for action that it provides to us - whether through its physical configuration, or through socially constructed meanings. In other words, they share an understanding that you cannot separate the individual from the world in which that individual lives and acts.” (Dourish 2001:16-17). This closely fits in with theories such as the ecological theory of perception by James Gibson and phenomenology from Merleau-Ponty, which emphasise the primacy of the body and action (Overbeeke, Wensveen and Hummels, 2006).

D. Networking: Joining Forces and Sharing Information

Design is per definition about integration and multi-disciplinary teams. Designers are bringing different perspectives together and are bridging the worlds of new technological and business strengths on the one hand, and the
societal and user desires, needs and opportunities on the other. Since the complexity of design is increasing rapidly, the need for integration and joining forces of different fields of expertise are becoming paramount. Designing intelligent systems, products and related services requires an extensive pallet of competencies including e.g. integrating technology, (interaction) design, user focus and perspective and designing business processes.

This requires not merely an attitude of life-long learning, but also an infrastructure that supports information sharing and collaboration between the different stakeholders, in our case students, staff members, professional designers, industrial partners, governance, and last but not least prospective users. New social media like Facebook and Twitter appear to be increasingly important to make communication transparent, quick, participating, direct, social, anti-hierarchical and omnipresent (Koeleman 2009).

Networks and mini-companies seem valuable types of organisations for our design community because similar aspects appear important such as stimulating learning, creativity, flexibility and inventiveness. Instead of a hierarchy with rules and control, the network organisations and mini-companies are based on flexible ‘self-managing’ teams who, given their context, share knowledge and expertise and collectively come to decisions within the overall framework of the organisation. These types of organisations especially aim at supporting self-directed and long-life learning, and stimulate creativity and innovation. Such organisations create an open structure where information can flow, where valuable content is more important than hierarchy of position, and where there is room for exploration next to operation (Roose, 2002).

Next to these four theoretical areas, we use other theoretical areas, e.g. within the area of design processes and methods. More information on these processes can be found in Hummels and Frens, 2009, and Hummels and Vinke, 2009.

II. IDENTITY, EXPERTISE AND COMMUNITY BUILDING

Our focus on intelligent systems, which are highly complex and thus require the merger of a large variety of expertise, and which are embedded in our transformative theoretical framework described above, has resulted in three main pillars of the department: identity building, expertise building and community building. This process of building refers to an individual level (student and staff) as well as to the departmental level (we as Industrial Design).

Identity building is tightly connected to our approach of self-directed learning. We focus on the growth as a designer and very importantly the development of identity as a designer and as a school. Similar in the way that Bauhaus has a clear identity, we are working towards an ID/e way of designing including the diversity of identities of our students.

Expertise building is needed in order to be able to design and handle the complexity of intelligent systems. Designers need to be able to work in multi-disciplinary teams to tackle the breadth and depth of today complex social issues.

Finally, and maybe most importantly, people are the most important asset of our department. Together, so all students and employees, we are Industrial Design. We have an extensive body of knowledge and skills we like to develop further, and we have highly motivated and passionate people. By working together, sharing our expertise and becoming an even stronger community, we can reach our ambitions for the education of ID. For example, we stimulate an enable our coaches to set up joined projects with colleagues who have different competencies, we organise at least 4 IDentity weeks per year with different learning activities for the entire community, we have 4 internal exhibitions per year showing all students projects and we have one large public exhibition during the Dutch Design Week, and we offer technological platforms and use social networks to share information such as our Library of Skills, blogs, Facebook and YouTube.

One of the mechanisms to enhance community, expertise and identity building is our theme structure, which is now moving towards theme-based living labs. In the remaining part of this paper we will elucidate this set-up and reflect on 1,5 year experience with it.

III. THEME-BASED LIVING LABS

Themes are fields of interests, which we use as carriers for joint research and education within the department, e.g. Wearable Senses, Health Care, Discovering and Learning, and Playful Interactions. Themes comprise several education /research projects, and they can incorporate other learning activities as well, that reflect the vision and direction of that particular theme. We believe that close collaboration in projects is a powerful mechanism to learn to understand each other and benefit from each other’s expertise, thus stimulating the growth of our department and the design field. Therefore we use Themes to strengthen this link between research and education, the link between the different research groups with their own expertise, between Bachelor, Master and PhD students and employees, as well as the link between the university, industry, commerce, government and potential users and other external partners. By working together, all participants can expand their body of knowledge on this topic. Moreover, we assume that themes tap into the intrinsic motivation of all persons involved, with strengthen a positive outcome. Since we want an authentic learning environment, almost 40% of our coaches are professional design practitioners and well over 60% of all projects are in collaboration with an external client.

The set-up and characteristics of themes

When setting up the themes in 2008, we tried to borrow characteristics from social networks and mini-companies. The employees together with our professional designers / coaches from the field developed 12 themes in several workshops, based on e.g. their own interests and expertise, as well as societal trends and opportunities. Every semester they decide in which of these theme(s) they want to participate and base their activities upon this decision, e.g. writing projects and finding clients. Likewise, students indicate every semester their preference for joining a specific theme or project. The different participants all have their role within the theme: initiator (champ), partner, link, supplier or user (Poorthuis, van der Bijl, and Hoogerwerf, 2004).

Themes are not exhaustive nor exclusive, but flexible and develop over time based on the mission statement of the department, our research, societal trends, industrial focus, our
competency framework and last but not least the motivation, goals and expertise of our coaches and students. Themes grow over time thus expanding the body of knowledge and expertise and bringing all participants at a higher level.

Since the design of intelligent systems is complex, it’s essential that themes cover different areas of expertise, include coaches from our different capacity groups, and include design practitioners and experts from industry.

Theme members can organise their own meetings to share information and knowledge within the theme. In order to enhance sharing between themes, we have 4 exhibitions per year where students present their work and coaches and fellow students act as peer reviewers.

The Living Lab of Wearable Senses

In September 2008 we started working with 12 themes, of which two (Wearable Senses and Playful Interaction) also link students and staff by making one space per theme that is used as education/design studio, research lab and workshop. Students and staff perform projects within these theme-based living labs. Figure 3 shows a schematic overview of a theme-based living lab in which ID students (from 1st year Bachelor to PhD students), staff (both internal staff members from ID and the TU/e as well as external professional designers), clients (industry, commerce, non-profit organisations, …), government and users are working closely together.

In the theme Wearable Senses for example we apply the mission statement of the department with our special focus on those interactive products, systems and services that are close to, near or on the body. The challenges are multiple, e.g. how to combine hard electronics with soft materials, traditional craftsmanship with innovative technology and smart textiles and functionality with fashion? Moreover, how do these products fit the body, measure bodily parameters and behaviour, and how do these products give meaningful feedback? Wearable Senses has a strong network of partners (e.g. Adidas, DSM and EE-labels), excellent facilities, high-end materials and the main application areas are expressive clothing and accessories, sports garments, interior textiles and interesting deviations. Wearable Senses is becoming a real living lab, with test beds both within the department, with test beds in the city of Eindhoven.

Despite challenges such as the variety of backgrounds of our employees, which sometimes makes it hard to speak each other’s language, the close cooperation on projects and the integration of research and education (e.g. Bachelor students are writing conference papers on their work done within the Theme) appears to have a positive influence on identity, expertise and community building, even though we have not yet had the time to fully evaluate the impact of using theme-based living labs.

All in all, the introduction of themes has put us one step closer towards a open and flexible organisation with more responsibility for employees. By working together, sharing expertise and learning from each other, we can raise the overall level of quality, become an even stronger community and, most importantly, design for innovative intelligent systems, products and services.

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