Analysis of parallel collaboration assignments in smart textile design

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Abstract

Many interesting smart textile concepts have been developed, however there are only a few relevant examples of concepts that are producible and valuable for our society. The so-called 'killer application' has not been found yet. That is why it is extremely important that multi-disciplinary parties team-up during the ideation process to come up with innovative solutions (Toeters, 2007). The goal of STS CRISP (Crisp, 2011) is to integrate existing knowledge from partners in the separate domains of textile (soft materials), technology and service providers. To investigate the different kinds of expertise necessary for the development of Smart Textile Services we initiated an assignment to develop new Smart Textile Services concepts for elderly that can be used during rehabilitation (ten Bhömer, Tomico, Kleinsmann, Kuusk & Wensveen, 2012) and executed this project in 2 different institutes: Saxion University of Applied Sciences and Eindhoven University of Technology (TU/e). Through some pre-set contact moments, the use of a gatekeeper (Vertooren, 2007) active in both institutes, and analyzing the final reports we are able to acquire an insight in the different approaches and focus preferences of the institutes.

The analysis lead to the following observations: 1. Saxion students spend more time researching existing technologies and how to implement them in their concepts. A more theoretical approach from what is already there, applying existing materials and opportunities that are already there. 2. The TU/e students consistently focused on on user research to find out their perspectives. More user-centered. 3. Saxion students start with ideation and validate this by analyzing what is available in the market at the beginning of the process. 4. TU/e students work from a societal perspective towards user focus and an idea.

TU/e students found out that there is a lot more steps after prototyping. Saxion takes the next step: where TU/e students stop, they continue. Out of these observations we can conclude that the institutes are active on different levels on the time-to-market line. We have to take into account that every collaborator has a *different time-to-market horizon*. For the STS CRISP consortium this means that efforts have to be made to define the time-to-market expertise of the partners.

As a next step, we will continue to explore this concept of *parallel collaboration assignments* and start a new *collaboration assignment in sequence* in different institutes. Test the time-to-market approach and gather strategies to create a more in depth approach to relevant marketable products can speed up the process of bringing concepts to the market, so that it can have a true added value for society.

Introduction

While in 1950 the Dutch textile industry accounted for 20 percent of manufacturing value added, in 2002 this decreased to 2.3 percent (Scheffer, 2012). The production companies that remain in the Netherlands are struggling to stay profitable by, for example, changing their business models towards more high value products and extending the body of knowledge for advanced technical materials. Competition, high technological knowhow and a culture of cost-focused SME companies make it difficult to collaborate and combine the strengths of different companies and industries. There are signs, however, that this is changing, considering the joint effort of the industry to join forces in the execution of the MODINT innovation roadmap program (Wintermans, van den Berg, van Hooijdonk, Luiken & Brinks, 2011) and the establishment of OICAM (oicam).

The combination of soft materials and high technology is the area of smart textiles. Smart Textile Services (STS) are value propositions in which the smart textiles are part of larger services in which profit is not only based on the sales of physical products. STS require a network of different partners, not only textile partners, but also technology partners and service providers. Within the framework of the Dutch Creative Industry Scientific Program (Crisp, 2011) a network is created that will support the development of innovative Smart Textile Services. The goal of STS CRISP is to integrate existing knowledge from partners in the separate domains of textile, technology and service providers.

To investigate the different kinds of expertise necessary for the development of Smart Textile Services we initiated a research question and project assignment and executed this project in Saxion and TU/e. We will show the results and processes of four projects. By ordering all process activities in 6 different competences (Hummels & Vinke, 2009) we will analyze the differences in competence focus and process approaches in relation to the expertise of the institutes to develop Smart Textile Services. Finally, we will discuss how the STS CRISP consortium and the textile industry can benefit from this knowledge.

Method

We developed a parallel design challenge for Saxion University of Applied Sciences and Eindhoven University of Technology (TU/e). Ten students were involved during the assignment, of which four processes will be evaluated.

Design challenge.

Both education institutes work with a project based learning approach in which students work 50% of their time for one semester on a practical project. The design goal of the participants is to develop new Smart Textile Services concepts for elderly that can be used during rehabilitation (ten Bhömer et all, 2012). Possible research questions are: Which applications emerge by enabling textile products to connect to other products, people and services? How to integrate networking capabilities in intimate products? What

are the social implications? How does a connected garment application for a specific user influence the eco-system of products, people and services around that user?

Expertise TU/e.

The Industrial Design department of TU/e and the Technical Commercial Textiles department of Saxion are both involved in the CRISP consortium. TU/e works with a self directed learning approach where a set of competences leads students from awareness of their profession towards in depth skills to develop themselves as visionary designers (Hummels & Frens, 2008). TU/e students have experience in the design of intelligent products, systems and related services. The students in this assignment specialized in the Wearable Senses theme, where interaction with or between human bodies via textiles as medium is an important topic.

Expertise Saxion.

The teaching principle in Saxion is based on the 'roof tile' method; first, students get a theoretical base on a specific topic, then they apply their knowledge in projects (de Bie & de Kleijn, 2001). The involved Saxion students study the topic of textile engineering and management during the first two years of their study, and later specialize in the topic of technical textile development. Saxion students are offered a fixed package of skills. The students who participated in the assignment are following a project aimed to intensify the confrontation with the professional practice (Engelen, 2012).

Structure.

Bi-weekly there is contact with a project coach to discuss the developments. The project coach also functions as a gatekeeper (Vertooren, 2007) in both institutes to make connections where necessary. Students are challenged to follow an iterative design process including different activities in an order they prefer. The students have to keep a logbook and in the end they categorize all activities in 6 areas of expertise or competences. These six competences are involved during designing intelligent products and used to evaluate the processes (Hummels & Vinke, 2009).

Results

By arranging all activities we analyze the difference in competence focus and process approaches in relation to the expertise of the institutes to develop Smart Textile Services.

Process 1.

Figure 1: Saxion students Melissa Wagner and Franca Schneider developed an exercise-glove that helps people with hand-arthritis, a painful inflammation and stiffness of the joints.

Process 2.

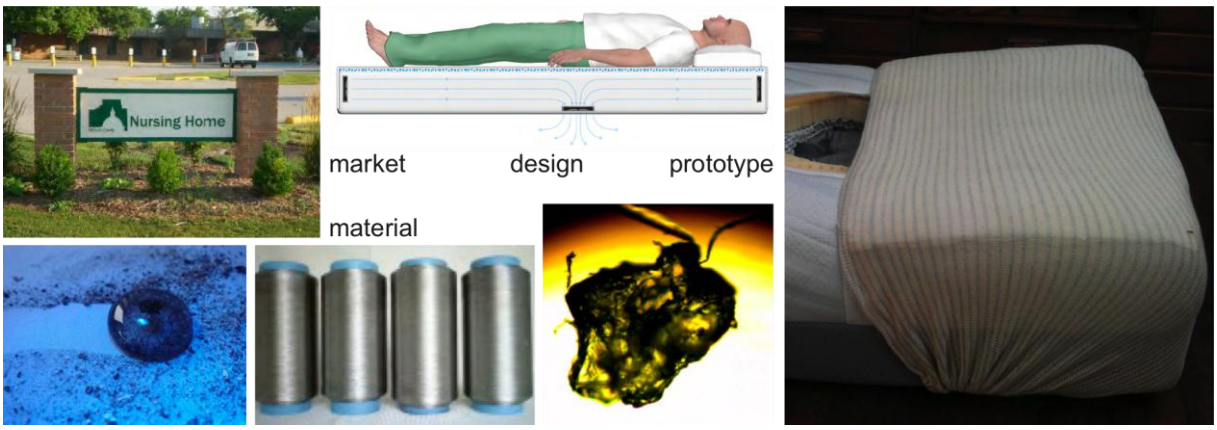


Figure 2: Saxion students Tessa de Vries and Nicole Cuijpers developed a mattress system to prevent bedsores.

Process 3.

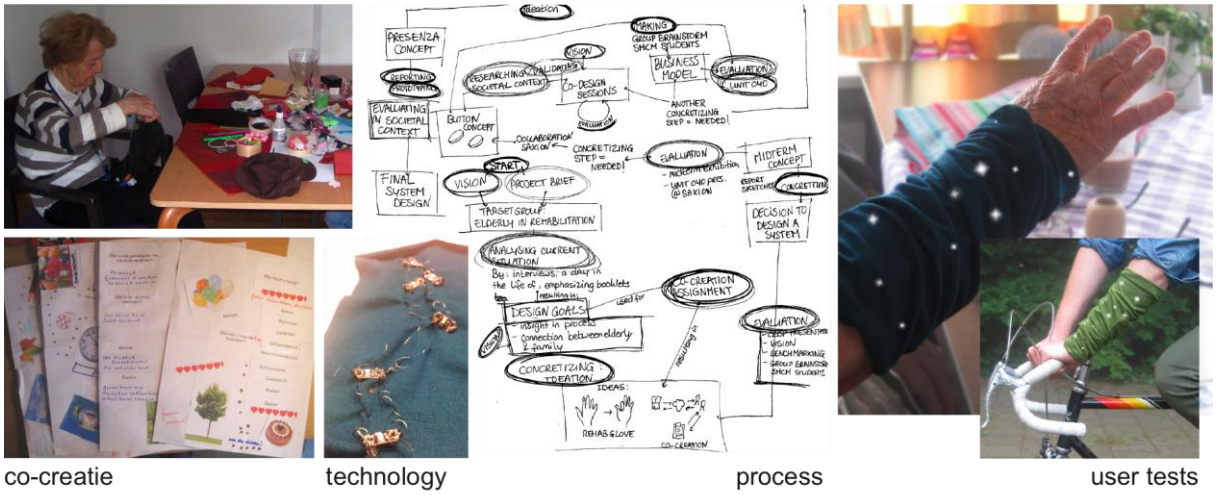


Figure 3: TU/e student Lisa van der Voort developed sleeves to let elderly in rehabilitation feel connected to their family at home and to give them more insight into the rehabilitation process.

Process 4.

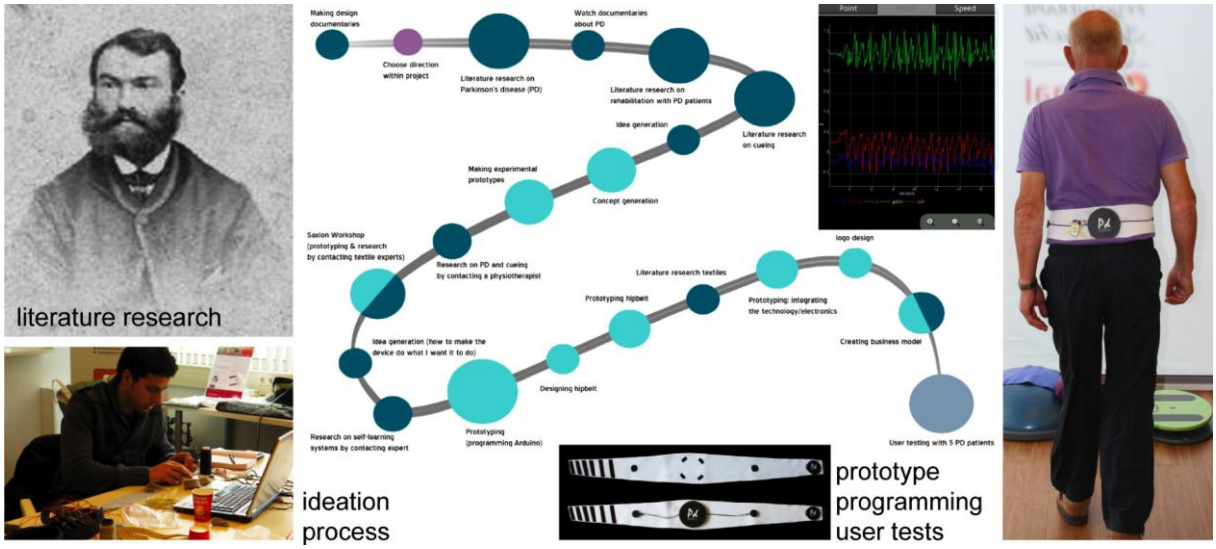
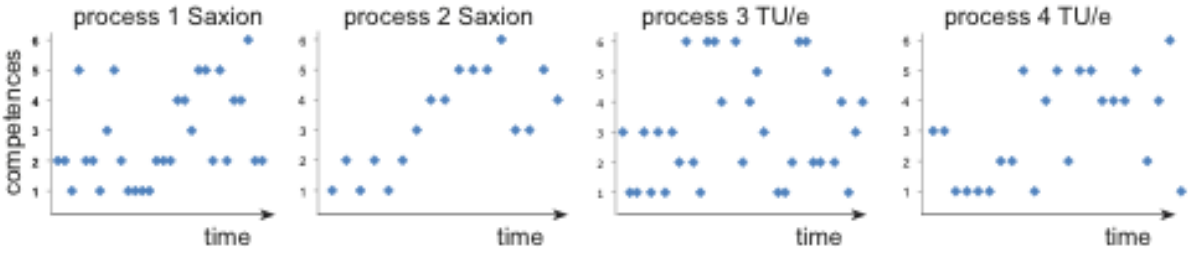


Figure 4: TU/e student Ardjoen Mangre developed a vibrating strap for people with Parkinson Disease to keep walking and prevent freezing-up.

Analyses

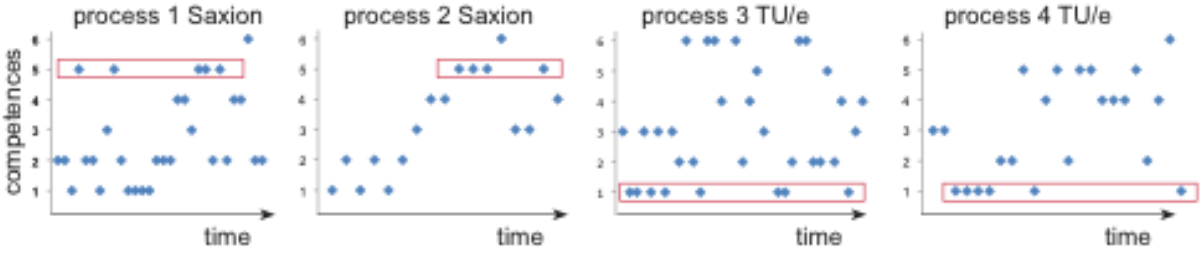


Graphic 1: Four different processes are shown. The blue dots are the activities. Horizontal is the timeline from the -left- beginning till the end of the process. The 6 competences are placed on the vertical line:

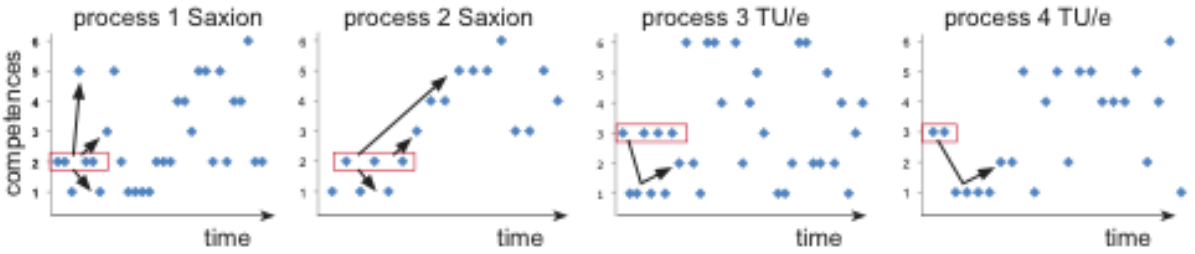
1. User Focus & Perspective: Getting to know their user.
2. Ideas & Concepts: Creating ideas and transform them into concepts.
3. Social & Cultural Awareness: Feedback moments with relevant partners to reflect on the specific medical context and the existing products currently used.
4. Form & Senses: Design explorations for the actual products.
5. Integrating Technology: Research, develop and implement (existing) technology.
6. Business: Find out how to create a valuable business with the project.

Conclusion

The analyses of these four processes lead to the following observations;



Graphic 2: Observation 1. Saxion students spend more time on researching existing technologies and how to implement them in their concepts. The Saxion students applied a more theoretical approach from what is already there, applying existing materials and opportunities that are already there.
Observation 2. The TU/e students spend continuously time on user research to find out their perspectives. Probably the TU/e students have more design approach of looking for design opportunities. More user-centered.



Graphic 3: Observation 3. Saxion students start with ideation and validate this to what is available in the market right in the beginning of the process.
Observation 4. TU/e students work from society towards user focus and an idea.

The educational approach of both institutes differ in scope: The main topics in Saxion as educational institute are: functional innovation of textiles, technical requirements, the make-ability and applicability of in the technical knowledge by the current industry. This knowledge will be applied in the final stage of a product development process: time-to-marked: 5 till 1 year. Future scenario's, technology close to the body and their social applications and suiting requirements are the main topics for TU/e students. This knowledge will be applied in the first stages of a product development process: time-to-market 10 to 5 years.

Because of this project TU/e students discovered that there is a lot more work needed to get a product on de market after prototyping. They thought a prototype could be sold, but realized that there are a lot more steps after design. Saxion takes the next step: where TU/e students stop, they continue. This is interesting because finally a product needs to get into the market. For example, Saxion students look at the materials very specifically in application terms, what is possible to make in the factory and what isn't. TU/e students only want to make one product, and it doesn't matter if it takes two weeks to make another.

It can be concluded that the observations made are consistent with the differences in educational approach, and that the institutes are active on different stages on the time-to-market line. We have to take into account that every other collaborator has a different *time-to-market horizon*.

For the STS CRISP consortium this means that efforts have to be made to define the time-to-market expertise of the partners. As a next step, we will continue to explore this concept of parallel collaboration assignments to discover how partners optimally benefit from each other's expertise. We will start a new collaboration assignment in sequence in different institutes to test the time-to-market approach and gather strategies to create a more in depth approach to relevant marketable products. This knowledge can speed up the process of bringing concepts to the market, so that it can have a true added value for society.

Acknowledgements

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