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Design jeans for recycling: A supply chain case study in The Netherlands

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Abstract

Because the insight is raising that waste prevention needs an integral product chain approach, a product chain project was awarded with an International Solid Waste Association grant. The project decided to focus on jeans because of the large environmental impacts of cotton and the low recycling rates. The project used an open innovative approach by involving many actors from the different phases of the chain and included student and applied researchers. In a 'design jeans for recycling' students' workshop, prototypes of jeans that are easier to recycle have been developed. Integrating the new generation from different disciplines in the project proved to be very successful. The results show that an open innovation process can lead to very creative ideas and that lessons learned from this project could be used to develop new chain projects for other products. An important condition is that key actors are willing to cooperate in an open innovation approach.

Keywords

Waste prevention, product chain, jeans, recycling

Introduction

The traditional waste policy does not focus on waste prevention and the insight is raising it should (Gentil, 2011). Waste prevention asks for an integrated life-cycle approach stretching out over the total material chain of products and involves many different actors in the product chain. To address this topic, a product chain management project was developed and an International Solid Waste Association (ISWA) project grant was made available for this project in 2012/2013. The NVRD (Dutch Solid Waste Association) was responsible for the project management and Saxion University was involved for the applied research aspects.

The project decided to focus on the textile chain, because textile showed to be a material with a very high environmental impact and a very low recycling rate (Allwood, 2007). Within the textile sector 'jeans' were selected for this project. Jeans are known and used by many consumers in the whole world and they are responsible for a large environmental impact. The project's aim was to develop ideas, approaches and business models to decrease the environmental impact of jeans.

The project used an innovative product chain approach, where all the environmental impacts of jeans during the production, use and end-of-life phase where evaluated and discussed with representatives from the different parts of the jeans production chain. The aim of the project was, besides improving the environmental performance of jeans, also to learn lessons from the product chain approach used and to evaluate if this approach can be used for other products and their supply chains.

In this short report, first the innovation approach used is explained. The content and the results of the 'design jeans for recycling' project are then presented. The approach used is evaluated, experiences are summarised and conclusions and recommendations for follow up projects are finally presented.

Methodology and the innovation approach

The philosophy that stimulating innovations in systems will become more successful by integrating different elements in a comprehensive approach is gaining interest (Omta, 2004; van Bommel, 2011). The approach used in this project contained elements of applied research, knowledge from different disciplines, brainstorm sessions, participation of students for development of creative ideas, supervision by senior-lecturers/researchers of Universities of Applied Sciences, a pressure cooker challenge with competition, participation of important actors in the field and publicity towards the market and the sector. It was an 'open' innovation process, where no information was left behind and kept secret.

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In the first phase of the project, the environmental impacts of jeans during its life cycle were evaluated based upon literature and research by a textile expert. In a brainstorm workshop with representatives from different parts of the value chain of jeans (fabric producing company, jeans manufacturer, fashion institute, retail representative, textile and fibre experts, charity organization, waste expert), these results were discussed. The following areas of improvement were established.

- Improving recyclability by changing the design and/or production methods.
- Improving the collection and separation system of discarded jeans and other textiles.
- Improving customer awareness and behaviour towards washing and cleaning of jeans.
- Technological improvements and optimisation during the production process.

The decision was that a focus on improving the recyclability of jeans by changing the design was the most feasible option to increase the environmental performance. Exploratory research by students gathered more insight in the bottlenecks and opportunities to achieve this. To address this and to illustrate new possibilities and creative ideas students have been working in a two-day 'design' workshop in competition. The ideas were used to develop prototypes and to stimulate the actors in the market to catch up with these ideas. The prototypes were shown at fashion events and the ideas were published at websites, in magazines, etc.

The 'design jeans for recycling' project

The project ran from January 2012 until September 2013. During the different phases of the project, actors like designers, spinners/weavers, producers and waste/recycling companies, situated in the Netherlands, Italy and Turkey, were involved and the students worked under supervision of senior-lecturers/researchers from Saxion University of Applied Sciences and ArtEz Institute of Arts, both in the Netherlands.

The analysis of environmental impacts of jeans during the life cycle showed that the environmental impacts of the production of the cotton fibre are very dominant and that, therefore, recycling of the denim can reduce the environmental impact drastically (Kozlowski, 2012). Recycling already takes place at a small scale and, therefore, experiences and bottlenecks concerning the recycling of jeans were gathered. This was done by literature review, analysis of company reports/websites and interviews held with actors involved in the recycling processes. This research was conducted by a student of the Environmental Science programme together with a student of the Textile Engineering and Management programme. The conclusion was that many bottlenecks could be prevented by changing details during the design phase, like zippers, buttons, labels, seams, etc. Therefore, new better-recyclable designs were developed (in a design workshop) to reduce the bottlenecks for recycling.

The design workshop was held in March 2013 and practical ideas for redesigning jeans for recycling have been developed. In the workshop, 20 students from four different institutes (five each) participated. Besides students from the Bachelor Textile Engineering and Management programme from Saxion in Enschede and the Master of Fashion Design students from ArtEZ, Institute of the Arts in Arnhem, students from two German institutes also participated. They came from the Akademie für Mode und Design (AMD) in Düsseldorf and Hochschule Niederrhein, Fachbereich Textil- und Bekleidungstechnik in Mönchengladbach. The programmes have different focuses (technical, design, marketing/management) and this made it possible to form four interdisciplinary groups with students from the different institutes. After presenting the results of the research of the first two stages and the explanation of the assignment, they have been working for one and a half days in competing groups on the designs. They illustrated their design ideas by handmade elements and prototypes of the new designed jeans. They have been using fabrics based on recycled denim donated to the project by one of the spinning companies in Turkey (Bossa, 2013). In a small conference where all the actors were present, the groups presented their designs and ideas. Two groups won *ex equo* the price, and all the actors involved were present and very enthusiastic about the results. The workshop and the results received a lot of public attention and the companies indicated they were very inspired by the ideas and that they will integrate them in their research and innovation programmes.

After the design workshop, students from the two winning ideas together developed an integrated prototype. This prototype has been presented in a workshop at the international Arnhem Fashion Biennale in June 2013 (MoBA, 2013) and also at the Dutch Innovation Relay in November 2013 (Innovation Relay, 2013).

The students also won the German Lifestyle Award for young talents in the category 'Design-Nachwuchs' at the Krefeld Fashion World 2013 in September 2013 (Krefeld Fashion World, 2013).

Lessons learned

As mentioned in the 'Methodology and the innovation approach' section, an innovation approach containing different new mixed elements was used for this project.

Students, under supervision of the staff of the universities, together with actors in the supply chain, showed that applied research to describe and evaluate environmental impacts of denim, and the bottlenecks and activities concerning recycling in the sector, was very practical. It led to very concrete results that were directly applicable in the following phases of the project.

During the brainstorm session, the involvement of the different actors made the decision to focus on design for recycling, which was supported by the actors and had a positive influence on the cooperation.

The interdisciplinary mix of students in the project groups during the design workshop proved to be very successful. They

were able to create new ideas concerning 'design jeans for recycling' and could make some prototypes with the (partly recycled) garments offered by one of the actors involved in the project. The combination of students with a technical/engineering background, together with students having a design/fashion background, proved to work out very well.

The presentation of the prototypes at fashion and innovation events received a lot of attention from different companies and stakeholders in the fashion industry. They all seem to be searching for new innovative, sustainable approaches and were inspired by the creative ideas from the new generation.

During the execution of the project, it became apparent that the project was able to reach out to influential stakeholders who were inspired by the project and who had large networks into relevant sectors of the fashion industry and the jeans production industry. Through these networks, the impact of the project could be expanded.

Conclusions and recommendations

The awareness that waste prevention and increasing the recycling rate of materials should incorporate the whole life cycle of products and all the actors involved in the product chain, is rising. These complex system innovations ask for a more integral, holistic approach and the involvement of all actors. Integrating the new generation (students) from different disciplines in these projects showed to be very successful in the 'design jeans for recycling' project. They were able to bring new creative ideas in the project and, because the project was an example of 'open innovation', all actors could learn from each other and benefit.

That the lessons learned from this project should be used for developing new 'waste prevention' projects for different products and sectors of industry is recommended. Even though products and sectors differ from each other, the experiences from this project do not seem to be unique and could, therefore, be very useful for new projects. A very important condition is that key stakeholders are willing to cooperate in an open innovation approach.

Declaration of conflicting interests

The authors declare that there is no conflict of interest.

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