Design for Sustainability in the Fuzzy Front End

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A grey water system for residential homes, which reuses rainwater to flush the toilet, is a sustainable product, even if it is made of the same material as a normal drainage system. Its sustainability is in its function and not necessarily in its design.

Current Design for Sustainability tools and methodologies strongly focus on fulfilling a given functionality in a sustainable way. Although manuals for sustainable design occasionally mention the potential for innovation through fulfilling a sustainable function, guidelines to identify such potential are only few, in particular at the level of the individual company. Based on current methodologies, companies have little guidance in considering and finding opportunities to solve or reduce third party environmental or social problems by providing sustainable-function products or services. A sustainable-function product (or service) is defined here as a product (or service) that reduces a negative impact in its surroundings to such an extent that the reduction exceeds the impact caused by the product's lifecycle itself.

General design theory defines the start of an innovation project as the Fuzzy Front End. In this phase the company realises its need for innovation through changing or expanding its product portfolio. However, there is not a clear idea yet of the product or service that needs to be developed, nor has a decision been made on the target group of customers.
General design theory presents several tools and methods for the Fuzzy Front End, such as SWOT analysis, road mapping, trend analysis, and scenarios.

In education, industrial design engineering students typically become acquainted with these types of tools during their education. Although there is no obvious reason why sustainability issues could or would not be part of such tools and methods, they are, in many cases not. At most, general trends like the ageing society, safety issues, or the increase in one-person households – issues increasingly connected with sustainability, are to some extent incorporated in for example trend analysis.

This paper is written in the context of a revision of an industrial design engineering curriculum, where the aim is to change from 'stand-alone sustainability courses' to courses with integrated sustainability content in 'regular' courses. It will discuss whether the lack of 'sustainability content' in the results of the aforementioned tools is a tool issue, or rather a tool *use* issue. Conclusions show that both aspects play a role; there is room for extension of existing tools with added sustainability content, but the main prerequisite for integrating sustainability issues in the fuzzy front end of product design is the willingness and ability to address sustainability issues with conventional FFE tools. In this light, the role of involved academic staff will also be addressed.

Empirical material for this study will be drawn from student work in a design course at Delft University of Technology, in which students form design agencies which are hired by SMEs, typically in the B2B market, to do an innovation process, aiming at sustainable innovation. This design project focuses on the fuzzy front end of the design phase ending at the point of a detailed concept product. The object is to find good combinations of environment and business, i.e. greening the product portfolio. Prior to this course students will have followed introductory courses in design for sustainability (focussing on the strategies categorised as 'green fulfilment of functions') and general New Product development. Many of the products developed in this course are examples of sustainable-function products. Hence, based on years of project results, an overview can be presented of what sustainable-function products could mean for companies in different industries. These include the building industry, such as companies specialised in building and installation components and accessories.