PhD Description: Contribution to the engineering of Information Systems for collaborative eco-design

Sustainable development is nowadays a mandatory social problem but also an essential stake for the manufacturing companies. This leads them to take an interest in eco-design approaches also called DFE (Design for the Environment). Eco-design aims at providing customer and business value whilst significantly decreasing environmental impact. According to (Tukker et al. 2000), the factors influencing the willingness and need to apply eco-design are mainly linked with regulations policies and business considerations more than environmental concerns. However, when putting eco-design into practice it may not result in a longer product development process (negatively affecting the time to market). Furthermore, higher costs cannot be tolerated since the consumer seems unwilling to pay a significant premium for environmentally friendly products. From this point of view, it represents numerous challenges because it requires a global design approach enabling to integrate sustainable development principles (Reyes Carrilo 2007).

According to (Handfield et al. 2001), les main barriers hindering eco-design integration are the following:

1. Conventional tools are poorly understood and rarely used;
2. The perception that doing eco-design yields no rewards, only pitfalls;
3. A large gap exists between eco-design proponents and those that have to make it operational;
4. The integration of environmental issues in the design process is limited to the use of checkpoints and exit requirements;
5. The primary measures of eco-design activities are material related, with only limited focus on cost and time-to-market;
6. Eco-design is primarily evaluated in terms of environmental performance, specifically recyclability.

Most of the current researches focus on point 1 to 3, through the description of the integration vehicles of the environment into design or the proposition of methods and supporting tools. These one, according to the review made in (Ljunberg 2007) include aspects such as analysis of the environmental impact of a product (Life Cycle Assessment - LCA), definition of conditions for reuse or recycling (Design For Recycling – DFR). Points 4 to 6 are less approached in the eco-design research field. This is linked to the fact that performance evaluation of design in general remains a relatively new research topic. Among the works there are (Robin 2005), who proposes a global performance model of design or the CodeKF project aiming at coupling performance and quality in design (Poulet et al. 2010).

However, in the eco-design field, there are the ISO TR 14062 (ISO/TR 14062 2002) or the works listing the eco-design success factors like (Johansson 2002, Boks 2006, Pujari 2006). The norm offers a set of options to integrate environmental concerns into design. These could potentially help as a basis to
put a real eco-design process into practice. The success factor lists emphasize the fact that efficiency in eco-design is closely linked to: (i) an alignment between the business strategy and the company’s eco-design strategy; (ii) the setting up of company networks, integrating eco-design experts able to share their knowledge with the designers. According to the literature in collaborative design (Littler et al. 1995, Noori and Lee 2004), the success of such networks is linked to the design and deployment the corresponding supporting Information System (IS).

In this boarder, this PhD work tries to answer the following question: which kind of IS to design to support collaborative eco-design processes while integrating global performance models. The expected results cover all the design and development lifecycle of an IS project. They can be detailed as follow:

1. Features and specificities of such IS;
2. Global performance models for eco-design;
3. Definition of methods and tools for the design of such IS. These should integrate the models from point 2;
4. Impacts of such IS on the eco-design activity.

The research is led according to a research-action approach, during which research results and real study cases take benefits from each other. Therefore, it is proposed to apply the PhD results on the GT3 project of the CREER cluster (Cluster Research: Excellence in Eco-design and Recycling). This cluster, founded in spring 2007, CREER brings together today over sixty members, which range from large corporations and SMEs to technical centers of excellence. CREER’s first objective is to promote non-competitive research in eco-design and recycling of products. Joint research efforts and field tests aim specifically at improving SME’s knowledge in eco-design and recycling. The cluster research is structured through different projects proposed by its members as needed. The GT3 project consists in designing and deploying an IS supporting the cluster’s activities, like the information mutualisation and technological watch activities. This project enters currently into its test and deployment phases. The analysis of the first phases of this project ex post facto would enable to verify the results from point 1. Following the test and deployment phases would contribute to the point 4.

References:


Recent publications of the PhD supervisor on the topic:

