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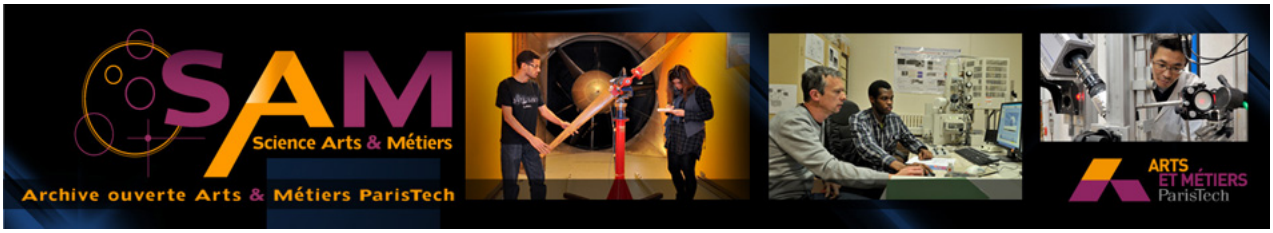

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UNDERSTANDING THE IMPLICATION OF AN ENVIRONMENTAL STRATEGY ADOPTION

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ABSTRACT

The objective of this paper is to follow the consequences on the product environmental impact of the industrial strategy through the product development process. Students were observed while designing a bicycle luggage carrier for tracing a cause-effect network that would link the strategy to the designed product and its environmental impact. The results show the strategy's influence through the design process at a macro-level.

INTRODUCTION

Companies are particularly concerned by environmental issues due to legislations, cost benefits and new markets (Dewulf, 2003). To increase the performance of this integration, some authors point out that sustainable aspects (i.e. environmental, social and economic) should be embedded at all corporate hierarchical levels: strategic, tactic and operational (Hallstedt, Thompson, & Lindahl, 2013). This paper deals only with environmental aspects.

In a common top-down approach, environmental path is initiated and spread from strategy over the other levels. A shortcoming of traditional management systems is that companies are unable to link long-term strategies and short-term actions with appropriate measurement tools (Kaplan, 1996). There is clearly a need to improve that feedback for improving the development of an adapted and effective environmental strategy.

This paper aims to demonstrate the implications of the strategy's choice through the product development process (PDP) and consequently towards the environmental impact of a product; concluding about the feedback that could nurture the sustainable strategy definition.

PROPOSITION

The main objective of the proposal is to indicate the impact of the industrial strategies during the design process. For that, the designers are asked to justify their choices during a PDP. The arguments for a choice could be a constraint, a previous decision in the process or any external influence (e.g. personal experience, background).

The analysis of this designer's input should allow building a cause-effect network; ideally to

link the strategy to the specifications, the specifications to the functions and so on, finishing by the environmental impact of the product. This connection of each phase of the process associates the strategy to the environmental impact. Finally, the analysis of this network points to conclusions about the relevance of the environmental strategy adopted.

CASE STUDY

For demonstrating the proposition above, five students of the University of Technology of Troyes (UTT) were recruited to design a bicycle luggage carrier in a given context. They had 2 sessions of 3 hours to design the product, starting from the interpretation of the context (i.e. available tangible and intangible resources) and definition of the specifications. During the design, they were asked to fill out tables with information about the product development process (e.g. specifications, functions), justifying each input. Besides, the sessions were fully recorded.

Context of the experiment

La roue verte is an organization located at the university that promotes the use of bicycles by, mainly, renting it to students. Interviews were conducted to understand the organization's policy and strategies and, to draw a map of internal and external tangibles and intangibles resources (e.g. partnerships, economic fluxes, workforce, knowledge).

Summarizing, *la roue verte*'s long-term strategy can be declined into three points: to increase the offer of new products and services (e.g. on-line services, new products renting); to measure and communicate on socio-environmental benefits of their activity; and to maintain existing partnerships. These three strategic axes were declined into a tactic roadmap (i.e. the steps to be followed to reach these strategic goals) for the project presented here.

A survey was made to understand the needs and preferences of their customers (i.e. students) for a new product/service proposition. The results pointed in the direction of a product for the biker to carry groceries from the supermarket to home once a week. Following the tactical module for environmental tool choice of the project *Convergence* (Zhang, Rio & Allais, 2013), the free online tool Ecodesign pilot[1] was chosen to support this activity. *La roue verte*, in accordance with their partnership strategy, chose to manufacture the product using student's workforce in a class of UTT where they learn how to handmade wood and metal based products.

Once established the strategy and the tactics, the students were asked to design an artifact that meet both the customers' needs and integrates constraints from the different partners. To identify the specifications, it was given to the students the strategic and tactic information as customers' willingness to pay, needs and preferences about the product (e.g. robustness, size) and constraints from the partners.

[1] http://www.ecodesign.at/pilot/

Results

There were difficulties regarding the cause-effect network set up, i.e. to give a justification for each decision. That is because, the student's justifications, written in the tables, were too fuzzy (e.g. "decision taken after a group discussion").

To overcome that difficulty, there was an attempt to point the reasons for the decisions by looking at the observations, notes and recordings. A transcription of each discussion and the arguments expressed was made.

Information about the influence at a macro-level of strategic and tactic constraints has been observed during the experiment. The students were able to integrate a large amount of resources and constraints to propose a detailed design. Notably, it was possible to identify the arguments that came from the strategy constraints in the discussions. From the transcription, each one of the 88 arguments were classified as issued from a constraint that came from a strategic decision, from the biker's needs or from the designer background (see table 1).

	Source	Example of argument
54%	Background of the designers	The compartment for frozen food was not considered because Troyes is a small city; it takes less than 20mn to go to the supermarket by bicycle.
35%	Strategy and tactic	There are limited manufacturing resources from the TN04 class.
11%	Customers' needs and preferences	The customer does not find important to cover the groceries.

Table 1 – Arguments' classification

It is possible to say that the strategy has an impact on the input data (passive resources) and on the goals (e.g. maintain existing partnerships), with consequences over the design. Even if we did not succeed to trace it in the micro-level of the decision making through the product development process (PDP), a macro-level view of strategy influence on PDP is proposed (see figure1). Figure 1 is a map of stakeholders' contribution (solid arrows) and feedback (dashed arrows).

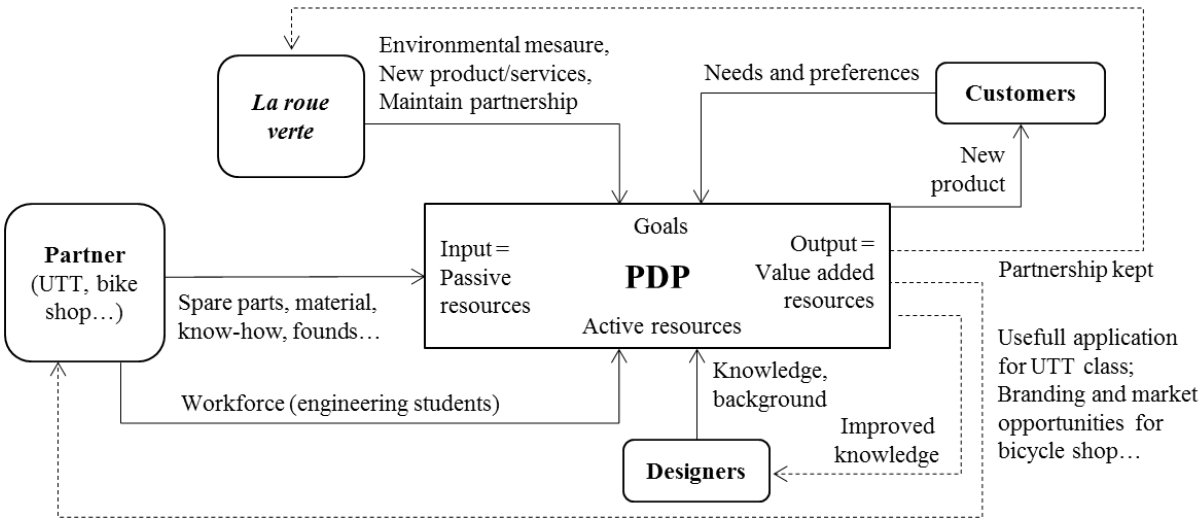

Figure 1 – Strategy influence on the PDP, stakeholders' contribution and feedback.

DISCUSSION AND PERSPECTIVES

Even if the arguments could be allocated to a constraint, the results are only representative of the observations. This means that table 1 is about the constraints that were spoken out loud during conversation, but it does not mean that it had a more important role in shaping the product. It could be that a constraint was so clear in the briefing (e.g. 100€ limit of cost) that all members of the team knew about it and there was no need for recalling it.

To validate and complete the experiment, the product created by the students should be validated by the partners to verify its feasibility and to judge the pertinence of the strategy.

In summary, two problems were found when modeling the cause-effect network: the fuzzy justifications and the random and unclear discussions. The former could be explained by the lack of awareness of the students about the importance of storing more precise justifications. It is believed that if the students were confronted to the reuse of information, they would notice the usefulness of writing more precisely the why of their decisions. The later could be explained by the lack of organization, a moderator who holds the discussions and summarizes the decisions, like in a project meeting.

For a next case-study, it is intended: to improve the interface (instead of the tables) for being more appealing for use; to nominate a moderator or to develop case studies with only one designer, in a protocol of think-aloud; to reduce the complexity generated by communication issues between the designers; to make a series of designs making available the past designs, in a case-reuse approach.

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