Innovative techniques for engaging users in food processing equipment design in developing world contexts: The case of Benin

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1. Introduction

In Benin, as in most Developing countries, there is a lack of method in the design of small-scale agricultural and food processing equipment. To improve the efficiency of the design of production equipment, an original methodological framework was initiated: CESAM Method (Marouzé 1999). Although the CESAM method, which has already been applied in several developing countries by local design teams (DT), certainly improves project management, it also underlines the need to develop specific tools to better integrate use in the design. There is actually a break in this user integration, with users only being included at the launching of the design process (analysis of the need), by answering surveys, and then at the end when they are provided with a prototype of the designed equipment and asked to say what they think about using it. Throughout the entire interim period the DT works alone, with important risks involved in taking decisions in place of the users (Godjo, Marouzé and al. 2003). It is therefore imperative to improve user integration in the design process. To promote better user integration, two design experiments were carried out in Benin. The design activities were performed according to the recommendations of the "CESAM" method and with the additional back-up of Participatory Design. For both projects, the role of design intermediary objects (DIO) was studied in order to understand interactions between the users and the design team. To prevent any issues arising from the users' wishes not being taken into account, a tool was proposed to provide better understanding of the conventional process and therefore the need.

2. The two case studies

The first project consisted in designing machinery to peel cassava roots and the second to make peanut paste sticks. The design teams (DT) working on each project were made up of a mechanical engineer, an agro-food engineer, an economist, a sociologist and a project manager studying a PhD degree in industrial engineering as recommended in CESAM method. ¶This composition had already shown its interest ¶at the time of projects . The members of the DT met periodically to share information and make decisions. Meetings took place once a month. Between meetings, the designers worked alone and/or in small groups, and the information collected during this time was used to provide documentary back-up in DT meetings and decision making. The data collection and analysis method was based on an approach inspired by ethnographic techniques. For the design objects, two data collection techniques were used to draw up the proposal: *participatory observation* and *individual or group interviews*. The role of *participatory observer* (Hales 1991) was played by the project leader, who was also a designer and an observer. Furthermore, the different process sequences were collected through audio and video recordings.

3. Results

An model of interaction between designers and users

An model of interaction between designers and users was formalized. The graph in figure 1 tracks how the convergence between problem and solution develops over time. After the first project meeting, the DT goes out to visit the users in order to identify their expectations (DIO1). The data collected are analysed and translated by the designers in order to prepare the first FS (DIO 3). During the second meeting with the users, the DT presents this DIO to the users for assessment and also shows the first drafts of a solution (DIO2). The outcome of this meeting is the final functional requirements document even if this is actually drafted after the meeting. The exchange continues along a similar vein for the digital models. These are prepared by one of the designers following a bout of team work. They are then presented to the users. The users discuss the proposals and choose the one that seems to be the most user-friendly and easy to handle. The PD is reflected in the designer-user interactions: each party assimilates the information coming from the other party, adds to it and translates it so that decisions can be taken. This is an iterative phenomenon. The design intermediary

objects provide mediating support during the search for the final solution. They help the users to participate in the design decision process and allow both parties to converge towards the final equipment. It can be said that the designers need an *analytical* vision of the design whereas the users require a summary (or global) vision of it.

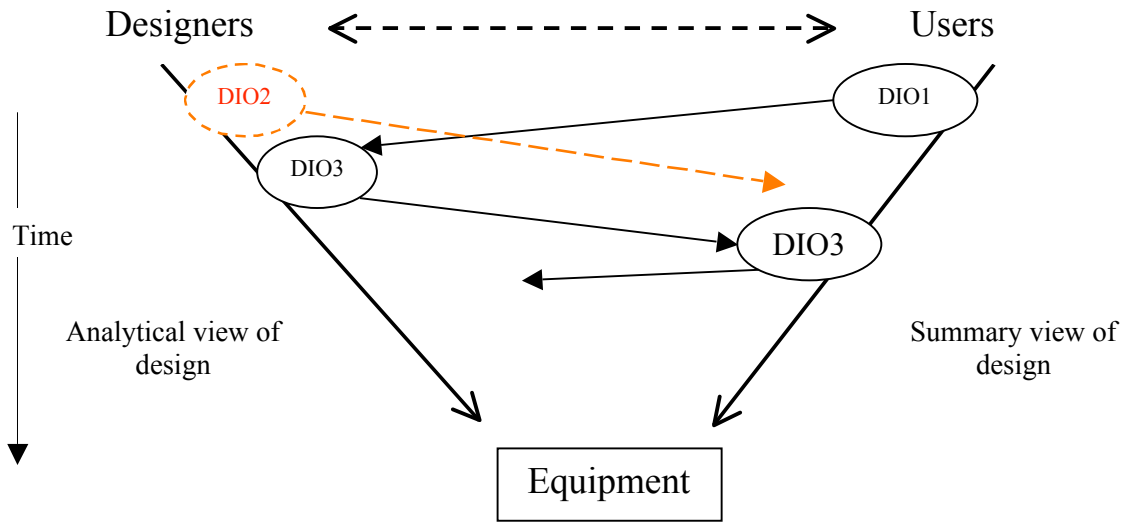

Figure 1: Designer-User Interaction

A tool to provide better understanding of the need: FUD

To enable the designers to obtain a more precise representation of the need, and above all to have a better understanding of the operation traditionally carried out by the women, we suggest using a tool called the *Functional Understanding Diagram (FUD)* (Godjo, Marouzé and al. 2006), presented in figure 2.

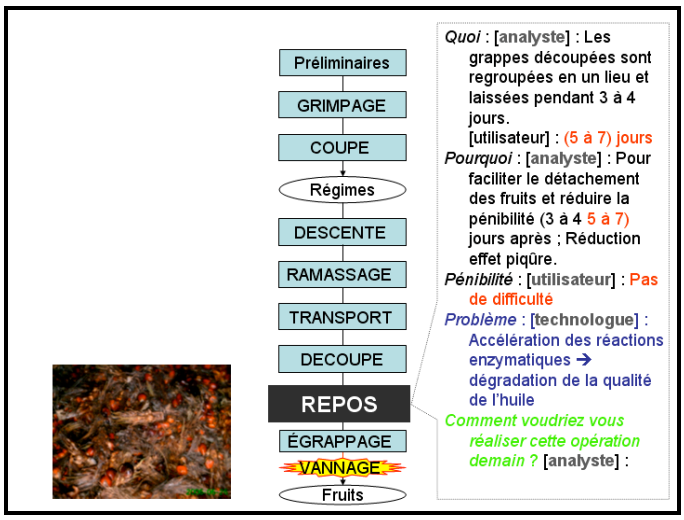

Figure 2: Functional Understanding Diagram (FUD)

The FUD is made up of three columns. The middle column gives a description of the operation performed manually by the women. The right-hand column contains text pointers with a summary description of the technical functions and text explaining why the function exists. The left-hand column contains digital pointers to photos and videos of the operation.

4. Conclusion :

The research is ongoing using the concept of scenarios in order to build a global vision of the product at various stages of the project.

Reference

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