User Centred Design for eco-efficient behaviors in home appliances’ industry

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1. Introduction

The search for new ways of fostering healthy lifestyles within our homes is one of the most complex challenges facing the manufacturers of electrical household appliances, or white goods. Such companies are steering their work towards the promotion of new trends within the framework of sustainability, interaction and energy efficiency. The spread of ICT enables the creation of communication systems that connect the domestic appliances to the users and to other appliances, thus enabling the development of new systems of interaction.

This is the area of research in which the work presented here is inserted, illustrating the initial results of the POR CRoE-FP7 “High Chest” project developed with Whirlpool Europe S.r.l. Manufacturers generally consider the chest freezer as a commodity, in other words a product that performs its functions but does not feature any particular characterisations connected with the producer company. Consequently, to date aspects such as competitive price and profit margin have been given priority over technological innovation and performance. The aim of the High Chest project was to develop a new family of chest freezers that would be innovative in terms of environmental sustainability, energy efficiency and the promotion of eco-efficient behaviour guided by good design. This contribution is focused on ergonomics and design, and more specifically on the user-centred design (UCD) approach and its methods of usability and safety evaluation. “Design is seen as a way of identifying and solving user problems […]. User-centred design innovation stresses human needs, aspirations and abilities, and strives for holistic and visionary solutions”¹. In order to foster eco-efficient behaviour and improve the use of the chest freezer, the characteristics and needs of the users were examined in relation to different profiles in terms of age, habits, capacities, limitations, physical size and the capacity for movement. Expert evaluation methods and methods based on the direct involvement of the users were applied for the definition and development of a new product.

2. Method

In the first place, in liaison with the company a specific model of chest freezer was chosen to develop an expert evaluation. For an understanding of the characteristics and a better grasp of the aspects related to person-product interaction, the product was symbolically broken down into four macro-areas: accessibility, loading management, interface and functionality. As regards the scientific literature of the sector, aspects taken into consideration were anthropometry, biomechanics and cognitive aspects. Using virtual simulation software the relevant data were entered into the specific field of investigation, defining the ideal dimensions of the product to ensure maximum accessibility. The task analysis (TA) of the chest freezer was also developed (with reference to the standard UNI ISO 9241-11). The TA is a method used to analyse the activities related to the use of a product-system. Identification of the individual tasks that make up the activity makes it possible to identify potential criticalities and design ideas. Based on the results obtained from the expert evaluations, a session with users was planned. The test sessions involved the recruitment of users with different anthropometric characteristics, indicatively belonging to the 5th, 50th and 95th percentiles. Also taken into consideration were aspects such as: gender, provenance, habits, capacities, lifestyle and knowledge of the product. The sessions were attended by a total of 11 persons, 6 men and 5 women aged between 35 and 75 years. The sessions were held in the company premises, in an area in which the typical

¹ Design as a driver of user-centred innovation, European Union - Commission staff working document, Brussels, 2009
domestic conditions of use of the chest freezer were recreated. The users were involved in the experimentation of a hybrid method of investigation, simultaneously developing Contextual Inquiry, Observation and Thinking Aloud and following a heuristic approach. This approach made it possible to collect opinions, thoughts, expectations, criticalities and intuitions useful for the definition of the requisites of the design concept.

3. Results

The analysis and the processing of the data collected using the UCD methods made it possible to obtain information about user-product interaction and to define the needs of the users in relation to the context of use. Generally, as a result of its size and low aesthetic valorisation, the chest freezer tends to be placed in areas outside the main living area of the home, for example in the garage or in a basement. It was observed that the lifestyles of the users influence their nutritional habits, and consequently also condition the use of the chest freezer.

As regards the criticalities of the product, the most significant aspects to emerge were: the handle, which does not facilitate opening, the overall dimensions of the product which do not favour the use of the lower part of the storage cabinet among the bracket of users between the 5th and the 50th percentile; and, the current system of internal organisation which is not suitable for a rational use of the space. The data that emerged in the phase of expert evaluation and in the following phase of user involvement can be translated into a design proposal oriented towards internal accessibility (by lowering the point of access and raising the lower storage section) and to the introduction of an interface to facilitate the conscious management of the foodstuffs (space management).

This simple and intuitive interface guides the user through the operations of insertion and withdrawal as well as monitoring and managing a range of information including: the general status of the appliance (locally and remotely); the status of the containment areas and their position within the storage cabinet (each area is identified by a specific colour corresponding to a precise type of foodstuff); the expiry dates of the foodstuffs; recipes encouraging the use of food close to expiry so as to minimise waste.

4. Conclusions

The High Chest project is driven by the company’s need to respond to the strong competition from other companies in terms of costs, technological innovation and the overall performance of the product. The contribution presented, based on the ergonomics and design approach, offers an example of how the evaluation methods and the iterative character of UCD can yield useful data – also based on the direct involvement of the users – for enhancing person-product interaction and introducing new scenarios of use. The results also represent a starting-point for the development of analogous works that could demonstrate if and how the procedure itself could be improved or modified. The concept is currently in the prototyping phase. The next phase of the research could verify the compatibility between the end product and the general objectives of the work (namely enhancing the usability and safety of the product, fostering eco-efficient behaviour through good design solutions) through a further involvement of the users.

KEYWORDS

REFERENCES
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