

PRODUCT QUALITY: USABILITY AND PERCEIVED USABILITY

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An ergonomic research product entitled “Research into the quality of use of a liquid soap dispenser in terms of product usability and usability perceived by users” was commissioned to the Product Usability Lab (PUL). The aim of the study was to explore user-product-context interaction in order to re-think the object in conceptual terms, and assess whether any new areas for the modification of the design existed.

This multidisciplinary, systemic research project enabled the PUL to apply and refine some of the procedures used to test the perception and usability of everyday products.

Usability, Perceived Usability, Product Quality, User-Centred Design.

1 Introduction

The Laboratory PUL of the Milan Polytechnic has devised procedures relating to the ergonomic quality and usability assessment of everyday products which are useful in the design, manufacture and testing of industrial products, starting with development of the theoretical and methodological contents of the User-Centred Design approach, with reference to the scientific literature and existing legislation.¹

A multinational wishing to collect information about a liquid soap dispenser contacted us to initiate a research project.

Its aim was to rethink the object in conceptual terms and investigate all possible relations between product and user, how users see or would like to see the object, and the possibilities of diversification.

On the basis of the factors described above, we devised a research plan designed to evaluate the quality of use of a liquid soap dispenser in terms of:

- product usability;
- usability perceived by the user;
- context of use.

This research enabled us to apply the procedures we were devising and to test and optimise their application.

¹ Some of the basic references are:

- the definitions and usability evaluation criteria contained in standard ISO 9241-1998; especially the sequence of “basic activities required by the User-Centred Design approach” in ISO 9241/2 “guidance on task requirement” and ISO 9241/11 “guidance on usability”;
- usability evaluation methods and their use criteria at the various stages of development of the design process, as identified in standard ISO/TR 16982-2002: “Ergonomics of human-system interaction — Usability methods supporting human-centred design”;
- ISO 13407-1999: “Human-centred design processes for interactive systems”.

2. Research premises

We agree with Jordan's hypothesis² that once the need for usability has been met, users look for something extra: "products that are not just tools, but objects... which bring emotional benefits... usability is just one of the problems associated with the global relationship between the person and the product".

While functionality is a pre-requisite for usability, usability is a pre-requisite for the *pleasure* that the object arouses in the user.

But what if the user has not yet been able to try the object? In many cases, the objects we now see on the market look very much alike, and have similar characteristics and functions. What leads us to choose one rather than another?

On the basis of these premises and to meet the client company's needs, we considered the product/project as the result of a research approach which can be defined as systemic. This enables us to consider the purchase/choice of the object as the result of a complex analysis that includes factors associated with use, appearance, perception, and the expectations aroused at the evaluation stage. To adopt this methodological approach, it was necessary to include in the research various professional figures associated with different disciplines, such as psychology, design and market research, all of whom were trained in ergonomics.

Assuming we can break down into stages what happens when a product is chosen, it can be postulated that the purchaser goes through at least three evaluation stages:

- visual: the purchaser scrutinises the various objects and stops at the one that attracts his/her attention;
- tactile: the purchaser reaches out to take one of the objects: the one which aroused his/her curiosity for some reason;
- testing: the purchaser tries to understand how the product works.

At the time of purchase, users probably do not analyse the actual functional capacities or use of a product or the pleasure it is likely to bring; however, they probably build up expectations of the object in terms of functional capacity and performance, dictated by the impact of the object in comparative terms. The aim of research with a systemic approach is to establish whether or not these expectations are met at the stage of use. This was essential to meet the needs of our client, which operates on a highly competitive market.

2 Objectives

The study as a whole was designed to evaluate aspects associated with the perceived use and actual use of liquid soap dispensers, with a view to the redesign of the product in question.

Specifically, our objectives were:

- to investigate the impact of liquid soap dispensers at the time of decision-making in a real purchase context (supermarket);
- to investigate the perceived usability of some dispensers, ie. purchasers' expectations of the product in terms of usability (efficacy, efficiency and satisfaction) at a stage which only involves visual perception;
- to investigate the actual usability of the dispensers in a use context;

² Jordan P.W., Thomas B. McClelland I. Weerdmeester B.A., *Issues for Usability Evaluation in Industry, Seminar Discussion*, in Usability Evaluation in Industry, Taylor & Francis, London, 1996.

- to investigate whether the expectations generated at the perception stage were met at the stage of use, both in a real context (home observation) and in the laboratory.

As a result of this research some new scenarios of use of liquid soap were identified, leading to the drafting of guidelines for the redesign of the product in innovative terms.

3 Methods

Table 1 – summary of research methodology

	Objectives	Sampling	Procedure	Tools
In the supermarket	to establish the <u>impact</u> of the dispensers at the time of choice, in a <u>real context</u>	observation of everyone who approached the shelves; those who <u>bought</u> the dispenser were approached for the <u>interview</u>	<u>Observation</u> Customer: sex and estimated age Products: Brand Parts observed Time spent at shelf Observable behaviour <u>Questions</u> product characteristics reasons for purchase drivers of change refills and eco-refills	Data collection grids Questionnaire with open questions and multiple-choice questions
In the laboratory	<ul style="list-style-type: none"> • to establish the perception of usability • to establish the actual usability • to establish whether expectations were met in a <u>standardised, controlled</u> context 	10 women ³ aged 25-65 2 → 25-34 3 → 35-44 3 → 45-54 2 → over 54	A - Warm-up B - Impact/choice C - Perception stage D - Perceived usability E - Usability tests F - Debriefing	22 bottles + 11 refills 6 bottles + 5 refills Open questions Closed questions Ranking Scoring Free associations
At home	<ul style="list-style-type: none"> • to establish the perception of usability • to establish the actual usability • to establish whether expectations were met in a <u>realistic</u> context <u>familiar</u> to the user 	10 women aged 25-65 2 → 25-34 3 → 35-44 3 → 45-54 2 → over 54	A - Warm-up C - Perception stage D - Perceived usability E - Usability tests F - Debriefing	6 bottles + 5 refills Open questions Multiple-choice questions Ranking Scoring Free associations

Various tools were required to cover all areas of interest⁴:

- semi-structured interviews;
- observation;

³ Nielsen & Molich (1990): ± 50 % of problems appear with 3 participants

Virzi (1992): ± 80% of problems appear with 4-5 participants.

± 90% of problems appear with 10 participants.

if there are over 10 participants, the 90% prognosis does not change.

(the Usability Test is a qualitative test with no statistical aspects).

⁴ ISO/TR 16982-2002: “Ergonomics of human-system interaction — Usability methods supporting human-centred design”

- task analysis;
- and information was collection in a variety of locations:
- real context of choice (supermarket shelf);
 - controllable context (laboratory);
 - real context of use (home observation).

In a context of systemic evaluation, we viewed the user as purchaser; in other words, we used a methodological approach that enabled us to analyse the product at the decision-making as well as the use stage.

The research was therefore divided into three stages: (Table 1)

- a first stage of investigation in supermarkets, where we could see what users actually do at the time of selection, choice and purchase of the product, and especially how far perceptions of use (perceived usability) influence the choice/purchase process;
- a second stage of investigation in a controlled environment (LABORATORY), where the perceptive approach and the actual use of the product could be tested
- a third and final stage of product evaluation, with the same objectives as the laboratory stage, and also to investigate the everyday experience of users in an ordinary home context (HOME OBSERVATION).

3.1 Data analysis

We used a software package for the statistical processing of the quantitative data.

The nominal data were processed with descriptive statistics (frequency, mode and percentages), and the ordinal data with non-parametric statistics (Friedman analysis of variance, median and percentiles, maximum and minimum values).

Respondents' verbalisations were processed by clustering.

4 Results

We are unable to reproduce the specific results here for contractual reasons of confidentiality, but we can indicate the variety and type of results obtained with this research methodology.

Table 2. Stage 1 - In the supermarket

Observation method	Reasons for purchase	Drivers of change
Type B	price	quality and economy
Type C	brand awareness	out of <i>curiosity, new product, ...ecology, ...to try it</i> (rational purchases)
Type D	desire to try a new product, wish for something ecological	new product concept, <i>...ecological</i> (impulse buying)
Type E	brand loyalty	say that they are not willing to change their soap for any reason (habit buying)

4.1 Stage 1 - In the supermarket

Our observations⁵ broadly identified five different types of approach to the shelf.

An important analysis of the purchase behaviour adopted at sales outlets emerged from comparison of observation methods (type A was excluded as it only produced one purchase out of 8), reasons for purchase, and possible drivers of change (see Table 2).

4.2 Stages 2 and 3 (laboratory and home observation)

⁵ The sample consisted of 65 people who approached the shelf and made a total of 42 purchases.

This research methodology enabled us to collect a great deal of information, not only about liquid soap as an object, but also systemic information about the environment and behaviour associated with the ritual of hand washing. In particular:

- *The bathroom - Soap as an object - Habits*

In the design context, an object is closely associated with the context in which it is used, including all the use characteristics of soap; use does not only involve physical use, but also has personal, domestic, ritual, psychological, playful, hygienic and safety connotations, etc. with allusions to purely perceptive aspects such as perfume, tactile and visual inferences.

- *The choice of soap: words and actions*

Another important factor is the difference between what people say and what they do. While they may say that they expect the product to offer good value for money, in the case of objects with no identifying characteristics evaluations seem to be based on entirely different factors, such as transparency, colour choice, the size of the various parts, etc. In particular, attention seems to focus on factors that often allow inferences to be drawn about the perfume, tactile and use aspects of the product as well as its purely formal design.

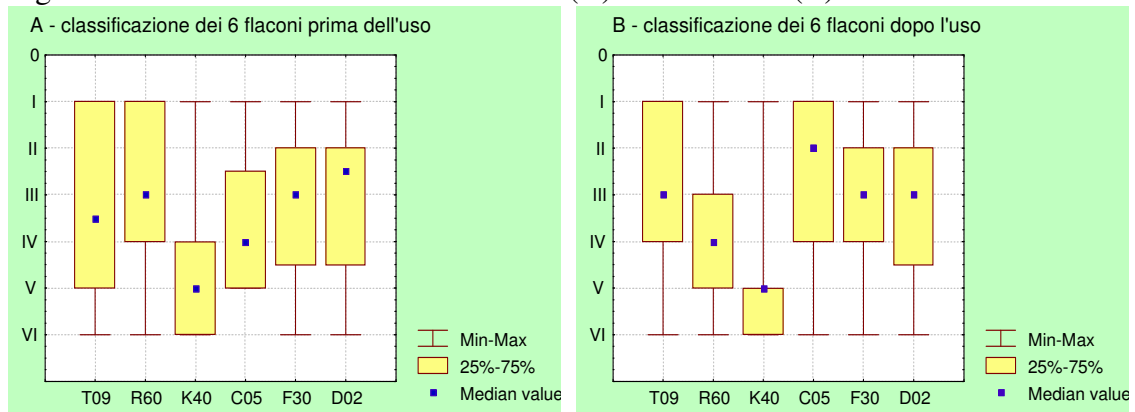
- *Perceived usability and actual usability*

These two charts show how evaluations of the six products differed before and after use. Specifically, respondents were asked to classify the six bottles from the most usable (ordinal value 1) to the least usable (ordinal value 6). Objects considered better than others at the perception stage were sometimes less liked during use, and vice versa. This finding has important implications as regards product advertising: some products actually *lie* when they claim a usability that does not exist, while others fail to convey their usability clearly enough.

- *Presentation of results to client*

Using these data collection methods we were able to provide the client with a series of *guidelines* based not only on a theoretical/conceptual description but also on a series of evocative imagines sometimes drawn from objects belonging to other product categories, which are often used to perform functions that have nothing to do with the bathroom but which, as suggested by respondents, could provide an excellent basis for improving the quality of use and communication of use of the dispenser, at both the choice and use stages.

Fig. 1 Classification of 6 bottles before use (A) and after use (B)



5 Discussion

Our aim here is to draw attention not so much to the results obtained for our client's purposes as to demonstrate that the methodological complexity of the systemic approach enabled us to perform a global analysis of the interaction between user and product in a context that not only involves the use of the object in question, but also includes all aspects associated with the person: emotions, sensory aspects, memories, familiar and social environment, etc.

The innovative aspect of this study is represented not only by the type of results obtained, but also by the variety and quality of the data collected and the method of presenting the results. We call this research approach "systemic" because it provides a broader view by inserting the ergonomic approach to research designed to assess the usability of a product into a wider context, as a result of the use of other disciplines and the study of users' behaviour. Thus we were able to offer our client company a complete package, which was not limited to testing the usability of the product but allowed users' needs to be analysed. This was made possible by close cooperation with the client company and a two-way dialogue with other disciplines such as marketing and psychology, which enabled us to create a close relationship between user, object, use environment and designer.

6 References

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