

CHAPTER TWELVE

Envisioning Future Needs: From Pragmatics to Pleasure

JOHN V. H. BONNER

Department of Multi-Media and Information Systems,

School of Computing and Mathematics

Huddersfield University, Queensgate, Huddersfield, HD8 3DH, UK

and

J. MARK PORTER

Department of Design and Technology,

Loughborough University, Leicestershire, LE11 3TU, UK

12.1 INTRODUCTION

The success and failure of incrementally changing or radically new consumer products is ultimately decided in the market place. While there are many factors that influence the purchase and subsequent use of a product, a product that fulfils user needs should have a greater chance of survival. However, establishing future needs for future products that use a high level of interactive technology is fraught with problems.

Future needs have to be assessed against predictions of future behaviour and future developments in technology. Changes in behaviour and technology usually have reciprocating effects on each other, making it virtually impossible to draw any firm assumptions about what people will want and enjoy in the future. This process will always be more of an art than a science. But how can this 'art' be improved?

This chapter describes our attempts to address this issue by first examining contemporary user-centred methods and techniques that have enjoyed some degree of success or popularity in determining user needs in product design and other disciplines. We then go on to discuss how we adapted some of these methods so that we could specifically capture *future* user needs for new interactive products.

Two studies are reported which explore what type of user requirements methods are best suited for use by product interface designers and to capturing complex future user needs. Then, from this standpoint, some 'characteristics' of future user requirements methods and techniques are proposed.

12.2 CONTEMPORARY APPROACHES TO USER-CENTRED DESIGN

The inclusion of 'user-feedback' in the development of consumer products traditionally does not occur until the latter stages of the design process, when users' opinions on product variants are sought in 'hall tests' or consumer panels. However, with the increasing use of interactivity in consumer products, users now need to be involved in the interaction design process.

In the context of product design, different types of user-centred approaches have been reported, such as storytelling (Moggridge 1993), the use of modelmaking (Dolan and Wikland 1995), the use of focus groups (Caplan 1990), and more traditional usability testing methods (De Vries, Gelderen and Brigham 1994).

In comparison, user-centred design principles are more deeply rooted in the field of human-computer interaction (HCI). Apart from 'main stream' methods, which use observational or interview-based techniques, other approaches have emerged such as the use of scenarios to develop and refine user interface design proposals. An example of this is the use of cards, in discussion groups, to describe scenarios, which allow participants to specify and evaluate computer user interfaces. One method, known as CARD (Collaborative Analysis of Requirements and Design). This is coupled with a 'low level' approach known as PICTIVE (uses cards to facilitate the articulation of group task activity to establish system requirements to support this type of activity 'Plastic Interface for Collaborative Technology Initiatives through Video Exploration') which provides a close-up view of interface design proposals (Muller *et al.* 1995). The CARD approach has been modified by Lafrenière (1996). This modification, known as CUTA, enables a simple, user-derived task analysis to assist in interface design through the use of cards.

Both the CARD and CUTA methods use cards to depict elements of task activity such as task objects, for instance telephones and notepads, and process-based activities such as methods of working and situations; participants within the task activity are also depicted. Participants in both methods have identifiable and specific roles related to the task flows under discussion in the card sorting exercises. In both methods the cards are used as 'transitional objects' or points for discussion, in order to make explicit assumptions and interpretations about existing and future workflow methods. The methods require the participants to select task elements and place the cards in an agreed plan or sequence.

Many of these methods allow end-users greater possibilities to participate in and influence design decisions. Therefore, the user involvement in the design process moves from a consultative, or a merely user-centred role, to an active decision making or participatory role (Ehn 1988; Greenbaum and Kyng 1991). One of the problems with user participatory design, however, is how to provide adequate and appropriate support to users while they are engaged in design activity. Damodaran (1998) provides guidance by providing appropriate infrastructures within which users can operate. However, this guidance is aimed at organisations with management tiers with complex and interrelated decision making mechanisms. The challenge is to introduce effective participatory design at the product development level. Little has been reported on how true participatory design methods can be successfully implemented into product design organisations, but some attempts have been made to identify the hurdles in this process (Bonner and Porter 2000).

We therefore set about developing a user participatory design tool that could build on some of the methods described above, but which would also consider other factors that are important to the capture of future needs. These included:

- Encouraging users and designers to consider a wide range of speculative, innovative or novel aspects of interface design. This was important because consumer product

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interfaces vary in design characteristics more than computer user interfaces. Design factors such as display size demand less conventional interaction styles. Furthermore, the introduction of convergence-based technologies (telecommunications, computers and consumer products) suggests there will be many new commercial applications in the future.

- Allowing the consideration of pragmatic user requirements such as usability, and less tangible requirements such as relevance to lifestyle and pleasure. All these factors are important to the product's success.
- Any proposed design tool has to be quick and easy to implement, without involving a high level of training either for the designers or the users. Also, most importantly, the design tools need to be developed in such a way that designers take ownership of them and continue to use them without further intervention or support. This is a critical and major departure from other methods described above, where ownership and the motivation to use participatory methods belongs to the facilitators. Our approach was to train designers to become implementers of the design tools; to convert them to use such methods. We had to design the tools so that the benefits and rewards of such a process quickly become obvious.

One of the main problems with user participation is that users find it difficult to communicate ideas or concepts which are beyond their own experiences. Criticisms often levelled at introducing user participation methods are that they do not know what they want or cannot articulate their needs. If they can, they do not know what is possible or impossible. They find it difficult to be perceptive about how they might use a product or conversely they respond superficially.

Therefore, the use of focus groups, questionnaires and product clinics often depends upon users being able to anticipate scenarios of product usage with which they are familiar, or being able to reliably describe or interpret their own usage behaviour with existing products. While these methods can reveal very useful information if performed correctly, designers can often be left with a huge amount of data that provides little insightful information which can actively assist in the specification and design of a product interface. Data gathering methods may require considerable analysis before any meaningful results can be revealed.

A 'card sorting' tool appeared to offer an approach that could overcome many of these problems. We could see four main advantages over more traditional user requirements capturing methods:

- The cards provide a discussion mechanism, or act as 'transitional objects' allowing more critical contextual thinking to occur.
- The process would allow cards to describe novel interaction styles without having to design the interface to support such a concept. This also allows participants to interpret or define concepts on their own terms.
- Cards can suggest concepts divorced from defined or existing technology, therefore product functionality not currently possible can be discussed.
- Card sorting exercises can provide a physical schema or representation of tasks which may assist in interface design.

We devised a set of card-sorting exercises that we thought would be appropriate for designers. The objective of the two studies was to establish if this kind of approach was acceptable to designers and whether it was effective. If so, we wanted to know how the design tool should be structured to ensure that it is used successfully and produces valid and meaningful results.

The first study involved practising designers working on the development of

advanced interfaces for a cooking appliance. The second study involved post-graduate design students in the initial stages of an individual, interface design project.

12.3 STUDY 1

Three designers from a large manufacturing organisation of domestic appliances volunteered to participate in the study. The designers agreed to use the proposed workshops to develop some proposals for a current design project related to advanced cooker interfaces.

Procedure

Four workshops were conducted over a two-day period, and all three designers were involved in the majority of the workshops. They were provided with verbal and written instructions on how to implement the card sorting tool, and were briefed on how to intervene and gather user requirements. They were instructed to take notes on the perceived effectiveness of the card sorting design tool and also on any design ideas that emerged from the exercises. The workshops and each subsequent exercise were introduced and explained by the researcher. During the exercises the researcher took little active part but took notes throughout the four group sessions.

The participants in the four workshops consisted of volunteer factory and office workers from the one of the manufacturing plants. Each group contained five or six male and female participants who were randomly assigned to each group. All workshops were video recorded for further analysis. Each group was given an introductory explanation of the purpose of the exercises.

All groups were given the four exercises to do, which were presented in the same order to each group. They were told that they had to prepare and cook a meal and explain the process by placing a set of cards on a table. It was explained that they had to decide how and where they placed the cards. The only rule they were asked to comply with was that they must discuss the process as a group and arrive at consensus agreement if any differences in opinion were found. They were also encouraged to talk to each other about the exercises. A time limit of 15 minutes was set on each exercise.

The first exercise required users to place cards depicting sub-task activity on a table (depiction of the sub-task activity had been devised by designers prior to the exercise) in such a way that the placement and selection of the cards indicates the users' representation of the overall task. In this exercise we asked participants to prepare and cook a meal using a series of cards that described cooking sub-tasks such as 'Check carrots to see if they are ready'. Sub-tasks were described in high level or general terms, with the addition of many other 'peripheral' activities to encourage alternative ways of representing the overall task. The intention was to allow the participants to discuss the whole cooking process and allow open discussions about the steps required in cooking.

In the second exercise participants inserted cards depicting descriptions of possible cooker functions, which can or could be found on a cooker control panel. These cards were divided into three groups: low, medium and high technology functions. These groupings were colour-coded. Low level functions included heater controls and selector switches, medium-level functions included auto timers and temperature probes, while high-level functions included cooking and menu planners.

The third exercise was devised to enable the participants to think about a week in the life of a cooker, and to place cards depicting typical cooking activities under cards labelled with the days of the week. The purpose of this exercise was to discover if

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12.4 STUDY 2

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participants would be able to identify aspects of cooking that they enjoyed or disliked and to make inferences about how their cooking habits could result in changes to the cooker interface.

The last exercise required the placing of cooker function cards under different character profiles. Participants were asked to match cooker functions to different profiles that reflected different levels of interest and enjoyment in cooking and the use of cooking technology. The intention for this task was to find out if users could make 'third party' design decisions on behalf of fictional characters.

In the final exercise one of the participants was asked to read out the character profiles from the cards provided and then to discuss what type of cooker features would be most suitable for each character profile. At the end of the exercises, participants were asked by the designers to make comments and to reflect on the card sorting process. After the participants had left, the researcher asked the designers for their thoughts and where improvements could be made.

Results

The design exercises definitely provoked discussion about cooking methods and strategies. However, this was not controlled or steered by the designers and therefore discussions were at times irrelevant to the objectives of the exercises, with many discussions resorting to personal experiences of cookers at home. Participants were observed adding function cards with little thought for their consequences to other related function cards, or the implications in terms of interface design. There was also a tendency to select functions based on normal cooking habits rather than on the cooking task presented.

The designers expressed initial concern about the card sorting exercise and were hesitant about a process over which they had no direct control. They were not sure how participants would react to many of the vague or unclear proposals depicted on the cards. During the exercises they appeared to be unclear of their role in the process, although they were more prepared to get involved in discussions at the end of the sessions.

The designers were surprised to observe participants demonstrating often conflicting user needs. For example, some of the participants expressed a strong suspicion of technology but were happy to consider some quite radical and advanced proposals during the exercises. When the designers were asked why they had not taken notes for use later on, they said they did not feel this was necessary. They felt that from the card sorting exercises they had a clear understanding of the direction they could take with future cooker interface proposals. They reported that the process had provided them with many new ideas and they found the exercises extremely illuminating and worthwhile. One designer said 'in the five years I've been here I have never been able to gather as much useful information from users as I've been able to do here'. They were encouraged and, indeed, surprised at the way the participants dealt with the situation, and thought that some of their ideas were very useful.

12.4 STUDY 2

In the second study, we decided to continue the development of the design tool, using post-graduate design students studying MA Digital Design at Teesside University. The key difference to the first study was the introduction of a further set of exercises once the card sorting exercises were complete. These were introduced as 'scenario design' based

activities, where more refined design proposals from the card sorting were tested using real-world scenarios.

Procedure

Six students volunteered to undertake the optional 15-week module in 'Interaction Design'. They were aware that some of their studies would involve untried methodologies and that therefore clear guidance would not always be possible due to the use of design tools currently under experimental development. Five of the students were graduates in industrial design and one in fine art. All students worked on their own interface design proposals.

Students were given tuition on the card sorting tools with a practical demonstration. They were instructed on how to conduct their own card sorting exercises, with at least 3-4 potential users, for their own proposed product. Some of the problems in the previous study were presented to the students and they were advised to consider these problems in the design of their own card sorting exercises. On completion of this work, students were asked to provide a methodological description, their findings and a critique of the exercises.

After this, the scenario design tool was introduced using one of the student's proposal as a case study – an interactive tourist map and navigational unit. The student was asked to prepare a block model of the device and be able to describe in high level terms the functionality of the device and how a user might interact with it. The students then developed a scenario in which a tourist must find their way from a railway station to a Tourist Information Centre. We then conducted a role playing session, where one of the students acted the role of 'tourist' at the local city railway station using the 'prototype' device, while the 'designer' then talked through the features and functions as they were requested by the 'tourist'. This exercise provided all the students with an opportunity to understand the objectives of the scenario design tool, and also to consider how this approach may be adapted for their own needs.

After this workshop, the students decided to conduct some scenario design work between themselves before working independently. The students then carried out their own scenario design activity and written reports were provided on their experiences.

Results

In general, there was a positive response to the use of the cards, with many responding that having done it once they would have a much better understanding of how to conduct exercises in the future. Again, some reported surprise at the level of insight their participants demonstrated. One of the design students had used the card sorting tool with children and reported that this method was readily accepted by the children, although he did find a heavy degree of peer pressure in the conclusions the children arrived at. All provided constructive criticism on how card sorting could be improved.

The design students expressed uncertainty about how to introduce, control and conclude design issues during scenario design activity, but were surprised at the quality and inventiveness of suggestions made by the participants used in the scenarios. Most of the student designers reported problems in recording and noting participants' comments but felt that this would improve with practice. All the students enjoyed working with the participants although they did find problems with the quality of the feedback.

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12.5 DISCUSSION

Overall, in the first study the card sorting tool was regarded as successful by both the participants and the designers. The designers found it a useful device for gleaning user requirements and testing some speculative interface design proposals. Our concern was that despite the designers having read the design tool instructions and having our support throughout the planning and execution of the card sorting exercises, they were still unclear about their role, how they should control the exercises and also what they should be concluding from the outcomes.

We felt that to overcome some of these problems we had to improve the design tool so that the involvement and role of the designer was more explicit (which occurred in the second study). The objectives of the card sorting exercise needed to be clearly defined and made more explicit both to the designers and the participants. Although using high level or broad description cards generally worked well, particularly in promoting active discussion amongst the participants, cards needed to be composed more carefully and more accurately to reflect potential user needs. The designers also needed to be actively involved in the process and be able to effectively glean information from the exercises.

The second study provided an opportunity to test some of the conclusions we had drawn from the first study, in particular the notion of participatory design involving more real world scenarios and making the process more explicit and transparent. Real scenarios were introduced to see if many of the learning problems experienced by both the designers and participants could be improved, and also to reduce dependence on 'contrived' tasks. This was indeed effective, but the game playing rules still appeared to be unclear. While further attempts were made to clearly describe the steps involved in conducting the card sorting exercises, the only effective mechanism was through experiential learning. Students frequently stated this in their reports. They progressed through 'doing' rather than through instruction.

There was no doubt that this method of gaining user requirements had an affect on some of the students. One student reported that his whole perception of design had changed in light of using the design tools. Despite this a dilemma still remains. On the one hand, both the designers and their participants appeared to enjoy the experience and thought it worthwhile. On the other hand, there was still too little evidence that meaningful outcomes were being gained from the process.

It should also be noted that, in the second study, design students were being used. As students they are motivated by assessment which will inevitably distort their design behaviour and attitudes towards the design tools. Furthermore, design students have more time, are more willing to experiment and can take more risks than practising designers. The results from the second study must therefore be treated with a degree of caution, as demonstrable acceptance with student designers is not necessarily an indicator of success in a commercial environment.

12.6 CONCLUSIONS

Clearly the studies demonstrate a paradox. Both the designers and the users or participants expressed enjoyment in using the design tools, but there is little tangible evidence that valid and reliable outcomes are being obtained. The design tools, however, have demonstrated that designers can influence the way that users articulate their perceptions and intuitions about future products and their associated needs. It is encouraging that many of the participants could articulate feelings beyond usability, and could begin to consider strong and deep subjective feelings relating to their future expectations of and preferences towards very speculative design proposals. Designers in

both studies remarked on the insightful comments that participants were capable of making. In spite of this both studies suggested that much of the design data gathered by the designers were a result of serendipity rather than of systematic and planned investigation.

In summary, if this type of approach to capturing future, highly subjective user requirements is to prove successful, subsequent generations of these methods will need to consider the following factors:

1. Bringing designers and participants together through scenario game playing appears to be an effective and enjoyable experience and provides ample opportunity to discuss speculative design proposals, but the objectives of any exercise need to remain clear and explicit throughout the process
2. For designers to adopt and implement such methods there must be a very quick acceptance of their effectiveness. Our studies suggest that this can only be achieved through experiential learning.
3. Process mechanisms still need to be developed that help to control and guide discussion within the design space or problem. These mechanisms need to help both the designers and the participants to understand their roles and the scope of the design problem in order to ensure that viable outcomes are obtained. Our studies suggest that prescriptive approaches do not work.
4. Improvements still have to be made to how design suggestions or proposals are prioritised and consolidated, again to achieve measurable and viable outcomes.

12.7 REFERENCES

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