

Designing iTV Interfaces for Preschool Children

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ABSTRACT

The aim of this research is to investigate preschoolers' interactions with interactive television applications. The study involves the design of a prototype and empirical evaluation in order to produce guidelines and refine techniques of design and evaluation involving young children.

Categories and Subject Descriptors

H.5.2 [Information Interfaces and Presentation]: User Interfaces – *User-centred design*.

General Terms

Design, Experimentation.

Keywords

Children, Interactive Television, User-centred Design.

1. INTRODUCTION

This research is focused on the design and evaluation of interactive television interfaces for preschool children.

During the past years, research reported that screen entertainment could affect young children's development and guidelines were released first recommending that children under the age of two should not watch television [24] and more recently, a British study suggested that children under three year old should have no screen exposure [21]. However, despite the extensive research about the harms screen media could cause to children's development such as obesity [19], attentional disorder [4] and aggression [9]. There are several studies that highlight the benefits of television for cognitive and social development [6], [2], [5], [10]. The fact is, today's children have increasing access to a range of electronic media and different content is specially produced to each particular age group, denying preschoolers access to this content would prevent them to experience the legitimate benefit of media.

Research indicates that, among a variety of media devices and content such as computer games, the internet and portable electronic devices, television still appears to be a secure part of

children's cultural 'diet' and it is more important than other media because of its universal accessibility to all classes, ages and types of children [7].

Children's television has always been interactive, viewers since the early ages of TV were invited to dance, sing along, make arts and crafts. In the 1950s a programme pushed the boundaries and asked children to interact by drawing on the television screen using a special kit to help the character with what he needed during his adventures; broadcast in the United States on Saturday mornings *Winky Dink and You* is considered the first interactive television (iTV) programme.

There are several definitions for interactive television. It could be strictly related to programmes that are digital broadcast and make use of a return channel to establish a dialogue between the viewers and the broadcaster. Alternatively it could include interactivity through telephone, letters or simply by asking the audience to perform activities as described above. In this research, interactive television is defined as programmes, applications and services that the user interacts with using a device connected or directly linked to the screen (e.g. remote control, mouse). In this case the user is able to interact and alter the audiovisual content being displayed while the interactivity could take place locally at the set top box or another type of receiver or via return path and it is not limited to traditional TV.

2. AIMS AND OBJECTIVES

Currently there are very few studies on interactive television for children. Chorianopoulos and Lekakos (2007) explore the characteristics of interactive TV that facilitate education and play focused on a wider and older age group [3]. Hynd (2006) examines comprehension, attention or enjoyment of young children viewing different types of interactive TV programmes compared with those of children viewing non-interactive versions of the programmes [13]. Interactive television research still focuses on children as merely testers evaluating the interactive services at the end of the design process. Research on human computer interaction identifies user involvement as crucial to gain a better understanding of user needs and goals leading to a more useable product [17]. The interaction design for children literature had also already underlined the importance to have users contributing more actively during the design process.

In research with preschoolers, a participatory design approach involving them as design partners [8] would be time consuming and probably veer the focus of the analysis of their interactions towards solutions for an specific design. On the other hand, children participating as mere testers do not elucidate as much detail of their relationship with the media. If involved earlier in the research, they are more likely to give suggestions and talk about different ways of interaction than during usability testing

sessions with high-tech prototypes [20]. As a result, the informant design approach was chosen, as it resides between the user centred design and participatory design [20].

This qualitative research in which preschoolers are informants is not focused on the characteristics or effects of the media but on empirical evidence of how 3 and 4 year old children, the youngest users allowed by medical community, interact with the television, considering them viewers not learners.

More specifically, the aims of the proposed research are: (1) analyse these interactions complexities and details in order to further the understanding of the way preschoolers interact with the television, (2) contribute with design guidelines for preschool interactive television, (3) refine methods and add to the knowledge of design and evaluation techniques involving young children. In order to achieve these aims a prototype of an electronic programme guide (EPG) was developed with participants' contributions and is being tested. Video data combined with survey results gathered during the testing sessions will be analyzed and used to identify and articulate a set of related concepts which should constitute an integrated framework that can be used to explain or predict preschoolers' interactions with iTV applications. Then guidelines and refined methods will be presented to assist on the design and evaluation of interfaces that meet the needs, capabilities and interests of preschool children.

3. METHODOLOGY

As stated previously the main aims of the study is to analyse how preschoolers interact with iTV applications to infer design guidelines, refining methods of design and evaluation during the process, therefore the research approach is qualitative in nature.

A preliminary literature review covering children and television, interaction design for children and interactive television was done in the first stage of the research to enhance theoretical sensitivity and also to inform the design of the low-tech prototype. And then children were involved in the design process with the purpose of obtaining more information about the specific age group, to refine user requirements and improve the prototype and also in order to assist on structuring the framework.

3.1 Design Methods

3.1.1 Observing Children

The first stage of data collection involving children was the observation. The objectives of observing children in the nursery setting were: Familiarization with the age group, obtain inspiration and ideas, an opportunity to know children and their behaviour and for them to feel more comfortable with the researcher during the following stages of the study.

Twelve hours were spent observing five children, and these data was collected in form of field notes. The data was coded as collected, and categorized, actions and procedures were defined and informed the first version of the framework and prototype. Different concepts such as "play mode and style" and "preferences and ownership" were related to emerging categories such as "playing alone/sharing/competing", "favourites/likes and dislikes/sense of ownership" that reflected children's actions and behaviours and indicated prototype's requirements such as flexibility for one or more users and customization.

3.1.2 Card Sorting Activities

The observation sessions did not elicit enough data to establish

the categories to be implemented in the EPG, as a result, in order to define and refine these categories it was decided to conduct card sorting activities with children.

Card sorting techniques have been used to create information architecture eliciting conceptual structures from participants in order to reflect how users view the content [16]. Card sorting tasks have been carried out with children as young as eight years of age [12]. In this research this technique was adapted to be used with 3 and 4 years old children and contribute to the design of technology for this age group.

3.1.2.1 Closed Card Sorting

The first card sorting activity was inspired by the Dimensional Change Card Sorting (DCCS) task used to determine extradimensional shifting abilities in preschool children [14]. For the prototype development, an initial set of categories were pre-determined based on children's TV channels websites, children's film and book categories. The closed card sorting was then used to check how well those categories fit children's expectations.

There were six sessions conducted with fifty six children in five different nurseries. Each child was tested individually in a session that lasted for approximately ten minutes. Materials consisted of two side-by-side shoeboxes each with a plastic sheet to display a category plus a slot through which the child posted a laminated card showing a screenshot from a video. Two predefined categories were displayed at a time and the child's task was to post the card in the box they found more appropriate. In all eleven screenshots would have been sorted.

Results from this study indicated very strong evidence that participants were not guessing while conducting the activity, therefore preschoolers are capable of categorizing audiovisual content and would then benefit from an EPG with appropriate categorization. The activity also showed that children related screenshots to its video content; hence screenshots could represent videos on the EPG interface. According with the number of screenshots posted in the expected category box, results indicated that some predefined categories such as "Super Heroes" and "Fairy Tales" were well understood while other categories like "Make and Do" and "Around the World" were not as comprehensible for preschoolers so needed to be redefined or eliminated. It was also found that, despite the increasing number of children's channels broadcasting the same content and video on demand features that disconnect the content from the channel, the number of children who recognized the channel in which videos were broadcast was significant, so children's channels were included as categories in the EPG prototype.

3.1.2.2 Open Card Sorting

The categories tested by the closed card sorting were made for children, by adults. There was a concern that child based categories of audiovisual content could be completely different from what was pre-established based on existent categorization; therefore, it was decided to conduct an open card sorting activity. Based on the Hierarchical Taxonomic Concept Test [22] the task was explained to the participants as the grouping game, in which they had to put together things that are the same type or kind. They were handed sets of cards and given some time to make groups before the next set was handed. Children were motivated to consider all screenshots while making groups, not just the separated sets. And at the end of the activity children were asked to justify their choices.

This activity did not elicit design decisions. Children usually become overwhelmed when too many options were shown and could not associate them, nor could they explain their choices. It was found that this task has to be further developed to help in the design; it may require more of participants' time and would be probably necessary to have several sessions to achieve some level of contribution to the information architecture of a system.

3.1.2.3 Match-to-Sample

The results from the closed card sorting indicate which categories are well understood by children and which ones are not as clear. In case most participants relate a screenshot to the expected category the design decision is simple, to maintain that category. However when a category is not comprehended the design decision could be either eliminate or refine the category, and to do so it is essential to identify to which other category children would relate its members. In order to confirm the closed card sorting results and find if the screenshots that were not inserted into the expected category could fit within another pre-established category instead the match-to-sample activity was developed.

Mervis and Pani (1980) study was adapted organizing twenty four screenshots into six different groups of four screenshots each [15]. The groups were made by some of the pre-defined categories. The screenshots were printed in colour on A4 paper. Children were given a sticker with a black and white screenshot and asked to put it on the group they thought it would be most appropriate. After the child had chosen a group and had pasted the sticker, s/he was given another A4 sheet with the same categories but in random order and composed of different screenshots, and another sticker with another screenshot to be pasted. There were six different screenshots to be pasted on six A4 sheets.

Following this activity categories for the EPG were refined. The results suggested that children are able to cross-classify screenshots based on videos' type (e.g., movies), format (e.g., cartoons) or genre (e.g., fairy tales) suggesting that they are not restricted to a single form of categorization. This indicates that in an EPG children could benefit from a significant overlap in categories rather than one replacing the other. Therefore, for the prototype under development it was decided to make each category broader, so it could include all or most participants' grouping choices, and overlap the categories.

3.1.3 Low-Tech Prototyping with Children

Previous data collected informed the prototype being developed but there were still a lot of issues to be clarified such as icons to be used and where to place them on the screen. At this point it was decided to ask children for direct input on the "look and feel" of the interface. Scaife and Rogers (1999) suggestions for low-tech prototyping with children, such as the use of laminated images which could be manipulated against a background, were combined with some ideas to work with younger children as design partners [11] to create a session appropriate for this age group but not as time consuming as the cooperative inquiry.

During the low-tech prototyping session preschoolers were asked for input and suggestions. Children were told we were working on a "programme finder" and needed their help. They were given a A3 paper in which a TV set was printed, then each one received the first screenshot and asked to choose one icon among three options provided that would be more appropriate to help children find the particular programme. The same procedure was carried

out for nine screenshots and then they were asked to choose one icon to help children find "help", one to close or exit the "programme finder", one to find their favourite programmes. Children were then provided with glue and crayons to create with the material chosen their own EPG.

The icons chosen by most participants were the ones used in the EPG prototype. And from this process it was also possible to have a glimpse on how children understand the interaction process, as they paste the images and draw on their low-tech prototypes they talked about what they were doing and what would happen during the interaction with their "programme finders".

3.1.4 Prototype Adjustments with Children

There was the concern that some of the icons could not be easily recognisable. The icons used on the prototype were chosen with children during previous stage of the research, but they were provided with a very limited amount of options. So it was decided to test if the 3 icons, that were most criticized by the experts in their evaluation, could be replaced by a more meaningful option.

In this session, children were explained how the prototype worked. Then they were asked to perform the same task as the experts, however they were not told the exact steps to be followed, so tips were provided if they got stuck. As soon as they accomplished the task another version of the prototype in which other options for icons were included was shown. Children were asked if they could identify the icon for a certain function, then they were shown two other options and asked which one amongst the existent and the two other options was the most appropriate icon. The optional icons could be dragged and dropped above the existent one replacing it. Following children's suggestions, one of the 3 icons tested was replaced after this session.

This activity could probably be related to a high-tech prototyping session, yet prototype adjustment with children was found more appropriate because it was decided that at this stage the only crucial input needed was to check the appropriateness of icons so children were not given enough room and structure to opinion.

3.2 Evaluation Methods

3.2.1 Expert Evaluation

Experts from academic and industry specialized in interactive technologies, children and/or interactive television were asked to analyse prototype and make suggestions for improvement. This analysis was important to improve the prototype to be shown to children with a reduced number of navigational problems.

First experts were asked to conduct a cognitive walkthrough [23], in which they performed a task and should check for each step how easy it was for a new user to accomplish the task. The walkthrough was used as a way to provide structure to explore the prototype, and then they were asked to answer some questions with their opinion about the system. These questions were based on the structured expert evaluation method [1], an analytical evaluation method designed to assess fun and usability of young children's computer games and adapted to suit an iTV application.

Thirteen experts from six different countries evaluated the prototype. The evaluations assisted on improvements on the prototype and together with the literature review also helped to stimulate thinking about properties and furnish initial ideas.

3.2.2 Testing Sessions

This is the stage the research is currently in. The EPG prototype was tested with children in two Nurseries in São Paulo, Brazil and one Nursery in London, UK. An additional session will be run in another Nursery in London.

Children were asked to interact with the prototype using the mouse and remote control, and their interactions and facial expressions were recorded. After testing the prototype participants were asked to fill in the Fun Toolkit survey [18] in which they rated with smiley faces the experience they had using the mouse and remote, if they would like to use any of the devices again to interact with the prototype and which device was the best one.

The data from the testing sessions will be analyzed and as soon as it is decided which categories best explain what happens in the study, they will be treated as concepts to generate the framework.

4. MAIN CONTRIBUTIONS

It is expected that the data collection and analysis process described will result on a set of concepts related through statements of relationship, which together constituted an integrated framework that can then be used to explain or predict how young children interact with iTV applications. These results will then be used to develop design guidelines for preschool interactive television. During this process methods are being refined to be added to the knowledge of design and evaluation techniques involving young children.

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